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METHOD AND APPARATUS FOR FORMS SPLICING

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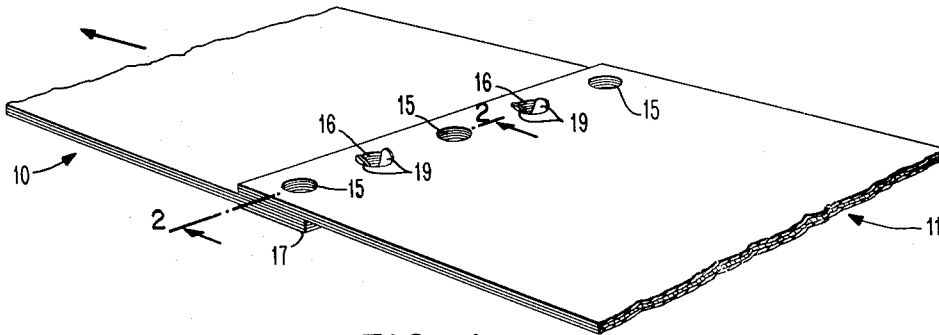


FIG. 1

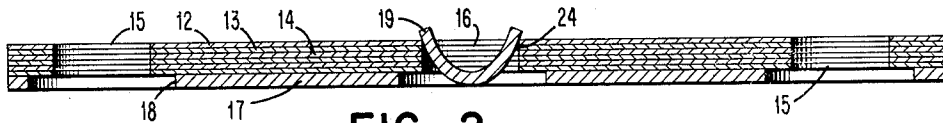


FIG. 2

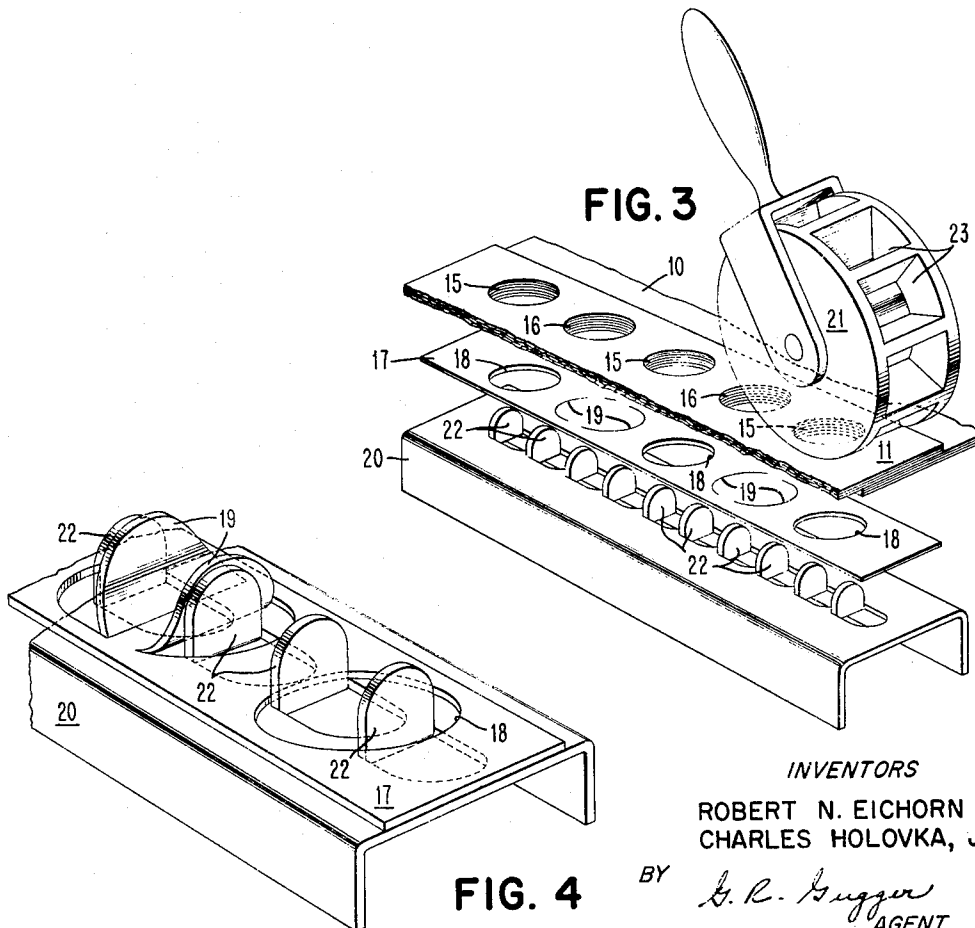


FIG. 3

FIG. 4

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METHOD AND APPARATUS FOR FORMS SPLICING
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This invention relates to a method and apparatus for connecting or splicing the trailing edge of a web of sheet material, such as paper, to the leading edge of another such web while printing and/or other operations are being performed on said first web.

In printing or record controlled accounting machines in which printing and/or other operations are performed continuously upon a traveling web of paper or other flexible sheet material, and the web is supplied to the machine in the form of a stack of continuous forms, it is often necessary or desirable, shortly before one stack of forms has been used up, to supply the web from a new stack of continuous forms without interrupting the operation of the machine. Continuous paper forms are generally spliced together with adhesive tape or staples and in the case where two single ply continuous forms are being spliced together the use of a strip of adhesive tape has worked fairly well except that rather complicated and expensive equipment is required in order to satisfactorily apply the adhesive tape. Where multiple ply continuous forms are involved and each form comprises in superposed relationship a writing sheet and one or more transfer sheets and copy sheets, it has been found that the application of a strip of adhesive tape does not work satisfactorily because the leading and trailing edges of the multiple plies are not all positively fastened in alignment. Hence, there is an undesirable play between the plies during high speed feeding and printing operations. The use of staples or metal fasteners has also proved unsatisfactory due to the danger of damaging type slugs in the printing machine and the possibility of electrical problems caused by detached metal fasteners.

To overcome the above-mentioned shortcomings of adhesive strip and staple splicing the present invention is provided whereby a "zipper" type nonadhesive splicing tape or strip of resilient material is simply and economically applied to join the trailing edge of a stack of continuous forms in use to the leading edge of a new stack. The nonadhesive splicing tape is provided with feed holes and pre-slit locking tabs arranged alternately in a row. The tape is placed on a tab forming channel plate having a row of vertically extending ears and is rolled down with a forming tool to erect the pre-slit locking tabs. This permits the feed and splice hole perforated trailing edge of the form being used to be rolled down around the erected locking tabs of the splicing tape. The feed and splice hole perforated leading end of the new stack is then placed in position and rolled down around the locking tabs.

A firm grasp and pull at either end of the splice will allow the resilient tape tabs to spring apart successively and lock every alternate splicing hole as the splice tape strips away from the channel plate. The splice tape is designed for maximum utilization of material and maximum resistance to failure because of the semi-tubular configuration formed by the locking tabs in the direction of maximum stress. In addition to providing a low cost positive splicing system, the present simplified procedure may be carried out at the printer or in a remote location on the customer's premises.

Accordingly, a principal object of the present invention is to provide an improved and simplified method and

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apparatus for splicing the trailing edge of a web of sheet material to the leading edge of another such web.

A further object of the present invention is to provide an improved method and apparatus for positively splicing the trailing edge of a stack of continuous forms in use to the leading edge of a new stack of continuous forms.

A still further object of the present invention is to provide an improved method and apparatus for splicing together multi-ply continuous forms and which utilizes a non-adhesive splicing tape.

A still further object of the present invention is to provide an improved method and apparatus for splicing together multi-ply continuous forms wherein tab portions on a strip of nonadhesive resilient splicing tape are formed and engaged through splice holes in all plies of the continuous forms.

A still further object of the present invention is to provide a simplified, low cost device for splicing continuous forms, which device may be used at the printer during use of the continuous forms or at a remote location.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawings.

In the drawings:

FIG. 1 is a perspective view of two multi-ply continuous forms, the edges of which are spliced together in accordance with the present invention.

FIG. 2 is a sectional view taken on line 2—2 of FIG. 1 showing the locking action between a locking tab portion of the nonadhesive splicing tape and the splice holes in the continuous forms.

FIG. 3 is a perspective view showing the manner of assembling the splice and showing the tab forming channel plate and the roll down hand forming tool.

FIG. 4 is a partial perspective view showing the erection of a pair of locking tabs after the splicing tape has been rolled down on the tab forming channel plate.

Referring to FIG. 1, there is shown two multi-ply continuous forms 10 and 11 the edges of which have been spliced together in accordance with the present invention. For purposes of illustration, the forms are shown as three ply forms, each one comprising a writing sheet 12, a carbon or transfer sheet 13 and a copy sheet 14. However, it will be understood that the present invention may be equally applied to the splicing of continuous forms having more than three plies and to single ply forms as well.

Disposed laterally across each leading and trailing end of each ply of the forms and transverse to the direction of feed is a row of holes, such as is shown across the leading end of the form 11 shown in FIG. 1. Each row comprises feed holes 15 and splicing holes 16 arranged alternately across each ply. In spliced relationship the leading edge of the new form will overlap the trailing edge of the form in use with the rows of holes in superposed alignment or, if desired, the leading edge of the new form may underlie the trailing edge of the form in use. In order to lock the overlapped edges of the forms in the spliced relationship shown in FIG. 1, a strip of nonadhesive splicing tape 17 is provided which extends across the forms and in superposed alignment with the superposed rows of feed and splice holes in the forms. The splicing tape 17 may be made from any suitable nonadhesive resilient material. As one example, it has been found that a plastic film such as commercially available "Mylar" will work very well. As shown in FIG. 3, the strip of splicing tape 17 is provided with a row of alternately disposed feed holes 18 and pre-slit semi-circular locking tab portions 19. When the forms are spliced together, in the manner to be described, the feed

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holes 18 and the pairs of oppositely extending pre-slit tabs 19 will be in alignment respectively with the feed holes 15 and splicing holes 16 in the forms and the pre-slit tabs 19 will be erected and inserted through the splicing holes 16 of all plies of the forms, as shown in FIGS. 1 and 2, to effectively splice the forms together with the individual plies of the forms locked against relative movement with each other.

Referring to FIGS. 3 and 4, to carry out the splicing operation there is provided a tab forming channel plate 20 and a tape roll down hand forming tool 21. The channel plate is provided with a plurality of vertically extending semi-circular ears 22 arranged equidistantly apart in a row similar to a toothed rack. The disposition of the ears along the channel plate and the holes and slits along the splicing tape 17 is such that when the splicing tape is superposed or positioned on the channel plate there will be two adjacent ears 22 in alignment with each feed hole 18 and two adjacent ears in alignment with each pair of the pre-slit semi-circular tab portions 19. The roll down tool or roller 21 is provided with a plurality of recesses 23 arranged equidistantly around its periphery to receive the ears 22, thus enabling the roller 21 to coast with the ears 22 in gear-like fashion as it is rolled along the channel plate.

To initiate a splicing operation then, a strip of the splicing tape is first positioned on the channel plate and rolled down by the forming roller 21. As shown in FIG. 4, the ears 22 on the channel plate will erect or bend to a vertical position the oppositely extending pre-slit locking tab portions 19 in the tape. The ears not in alignment with the pre-slit tab portions will project up through the feed holes 18. With the tape strip thus rolled into position on the channel, the trailing edge of the form 10 is rolled down around the erected locking tabs 19 after which the leading edge of the new form 11 is placed in position and rolled down. After the tape and forms have been rolled down, a firm grasp and pull at either end of the splice will allow the tape tabs 19 to spring apart successively and lock every alternate splicing hole 16 as the splice tape strips away from the channel plate.

As shown in FIG. 2, when the assembly is stripped away from the channel plate the locking tabs 19 which were initially erected to substantially a vertical position will spring or flatten out, due to the resiliency of the tape material, against the inner edge 24 of the splice holes to exert a positive locking action and to prevent any relative movement between the individual plies of the forms. It will also be noted that the splice tape is designed for maximum utilization of material and maximum resistance to failure because of the semi-tubular configuration of the locking tabs 19 in the direction of maximum stress, i.e., in the direction of feed of the forms, as shown by the arrow in FIG. 1.

As an alternative approach, there could be combined a splicing tape dispenser, roll down form wheel, a channel plate wheel, and a cutoff knife. This approach may require a groove to permit the splicing tape tabs to go through the forms splice holes and expand on the other side and this method may have some advantage in speed.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. The method of splicing together continuous forms having splice holes therein with a resilient splicing tape having pre-slit locking tabs which comprises:

positioning the splicing tape on a support member having vertically extending ears thereon;
rolling said tape down around said ears to erect the pre-slit locking tabs;

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positioning a continuous form over said tape and rolling the splice holes therein down around the erected locking tabs;

positioning another continuous form over said first form and rolling the splice holes therein down around the erected locking tabs; and

stripping the forms and tape assembly off from said support member whereby the erected tabs of resilient tape will flex and lock the splice holes of said forms.

2. The method of splicing together a continuous form having a row of splice holes across the trailing edge thereof with a continuous form having a row of splice holes across the leading edge thereof which comprises:

positioning a splicing tape of resilient material and having a row of pre-slit locking tabs therein on a support member provided with a row of forming elements;

rolling said splicing tape down around said forming elements to erect the pre-slit locking tabs;

rolling the trailing edge of said one form down on the tape and around the erected locking tabs;

rolling the leading edge of said other form down on said first form and tape and around the erected locking tabs; and

stripping the forms and tape assembly off from said support member whereby the erected tabs of resilient tape material will flex and lock said tape and the superposed edges of said forms together.

3. The method of splicing together continuous multi-ply form each having a row of alternately disposed feed and splice holes across one end thereof which comprises:

positioning a resilient splicing tape having a row of alternately disposed feed holes and pre-slit locking tabs therein on a support member provided with a row of forming elements;

rolling the feed holes and pre-slit locking tabs of said tape down and around the forming elements on said support member to raise the pre-slit tabs to a substantially vertical position;

rolling the row of feed and splice holes of a multi-ply form down on the tape and around the forming elements and raised tabs;

rolling the row of feed and splice holes of a second multi-ply form down on the first form and tape and around the forming elements and raised tabs; and
pulling the forms and tape assembly off from the row of forming elements on said support member whereby the raised locking tabs of the resilient tape will successively flex from their vertical position to lock each splicing hole as the splicing tape is stripped away from the support member.

4. The method of splicing together continuous multi-ply forms each having a row of alternately disposed feed and splice holes arranged across one end and transverse to the direction of feed thereof which comprises:

positioning a strip of nonadhesive resilient splicing tape having a row of alternately disposed feed holes and pairs of oppositely extending pre-slit locking tabs therein on a support member provided with a row of vertical forming elements;

rolling the feed holes and pairs of pre-slit tabs of said tape down and around the forming elements on said support member to raise each oppositely extending pre-slit tab of each pair to a substantially vertical position;

rolling the row of feed and splice holes of a multi-ply form down on said tape and forming elements whereby the forming elements will project up through the feed and splice holes in all plies of the form and the pairs of raised locking tabs will project up through the splice holes in all plies of the form;

rolling the row of feed and splice holes of a second multi-ply form down on said first form, tape and forming elements whereby the forming elements will project up through the feed and splice holes in all

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plies of said second form and the pairs of raised locking tabs will project up through the splice holes in all plies of said second form; and

pulling from either end of the forms and tape splice to allow the vertical locking tabs of resilient tape to spring apart successively and lock every alternate splice hole as the splicing tape strips away from the forming elements on the support member.

5. The method of splicing together a continuous multi-ply form having a row of splice holes arranged across the trailing edge thereof with a continuous multi-ply form having a row of splice holes arranged across the leading edge thereof which comprises:

superposing a strip of resilient splicing tape having a row of pairs of oppositely extending pre-slit locking tabs therein on a support element provided with a row of vertical forming elements whereby the oppositely extending pre-slit tabs of each pair are raised toward each other to a substantially vertical position by said forming elements so that each pair of raised tabs has a semi-cylindrical configuration; superposing the row of splice holes across the trailing edge of said one form and the row of splice holes across the leading edge of said other form down over said raised tabs and forming elements; and stripping the forms and tape assembly to allow the raised locking tabs of resilient tape to spring apart successively and lock the splice holes as the splicing tape strips away from the forming elements on the support member;

the semi-cylindrical configuration of the pairs of raised locking tabs being in the direction of feed of the spliced forms.

6. The method of splicing together a continuous multi-ply form having a row of splice holes arranged across the trailing edge thereof with a continuous multi-ply form having a row of splice holes arranged across the leading edge thereof which comprises:

positioning a strip of nonadhesive resilient splicing tape having a row of pairs of oppositely extending pre-slit locking tabs therein on a support member provided with a row of vertical forming elements; rolling said pairs of pre-slit tabs on the tape down and around the forming elements on said support member to raise each oppositely extending pre-slit tab of each pair of a substantially vertical position; positioning the row of splice holes across the trailing edge of said one multi-ply form over the tape and in alignment with said row of forming elements and rolling the splice holes down on said tape and forming elements whereby the forming elements and the pairs of raised locking tabs will project up through the splice holes in all plies of said form;

positioning the row of splice holes across the leading edge of said other multi-ply form over said first form and in alignment with said row of forming elements and rolling the splice holes down on said first form and forming elements whereby the forming elements and the pairs of raised locking tabs will project up

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through the splice holes in all plies of said other form; and

pulling from either end of the forms and tape splice to allow the vertical locking tabs of resilient tape to spring apart successively and lock the splice holes as the splicing tape strips away from the forming elements on the support member.

7. Apparatus for splicing together continuous forms having a plurality of splice holes disposed therein with resilient splicing tape having a plurality of similarly disposed pre-slit locking tabs which comprises:

a forming member plate on which the tape and forms to be spliced are positioned;

a row of vertically extending ears arranged across said forming member plate to underlie the pre-slit locking tabs of splicing tape and the splice holes of forms positioned on said member; and a hand operated roller forming tool adapted to be manually rolled along said row of ears for rolling positioned splicing tape down over said vertically extending ears whereby the pre-slit tabs in the tape will be erected and for rolling the splice holes of forms to be spliced down over said ears and erected tape tabs whereby after being stripped from said forming member plate the forms and tape assembly will be held in spliced relationship by the erected tape tabs.

8. Apparatus for splicing together continuous forms each having a row of splice holes arranged across one end thereof with a strip of resilient splicing tape having a row of pairs of oppositely extending pre-slit locking tabs therein which comprises:

a forming member plate on which the tape strip and forms to be spliced are superposed;

a row of vertically extending ears arranged across said forming member plate so that a pair of ears will underlie each pair of pre-slit locking tabs of the splicing tape as well as a splicing hole in the forms positioned on said member; and

a hand operated roller tool having a plurality of recesses arranged around its periphery to receive said ears and adapted to be manually rolled along said row of ears for rolling positioned splicing tape down over said vertically extending ears whereby the pairs of oppositely extending pre-slit tabs in the tape will be erected and for rolling splice holes of forms to be spliced down over said ears and erected tape tabs whereby after being stripped from said forming member plate the forms and tape assembly will be held in spliced relationship by the erected pairs of tape tabs.

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