COLLATING APPARATUS
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This invention relates to a collating machine for assembling a plurality of continuous webs of flexible material and more particularly to a collating machine which includes a mechanism for loosely inter-locking the webs together along the marginal edge portions of the webs so that limited relative motion is allowed among the webs.

Collating machines of the type referred to above are frequently employed to assemble several continuous webs of preprinted paper along with inter-leaved carbon paper webs, primarily for the purpose of constructing business forms. Generally speaking, on such collating machines several rolls of both carbon and preprinted paper are mounted on horizontal arbors and the end of each roll is fed upward around a series of idler rods and tension bars to a main feed cylinder where the webs are collected to form a continuous supply of multiple copy business forms.

In order to maintain accurate registration between the several copies of the forms, it has been found desirable to provide the preprinted paper webs with marginal perforations which are accurately spaced for engagement of pins extending from the feeding cylinders on both the collating machine and on the business machine which ultimately processes the form. Also, it is common to provide the preprinted paper webs and the carbon paper webs with transverse perforations between the individual forms so that the forms may be easily torn along the transverse perforated line when it is desired to separate the forms after they have been processed through the business machine.

Furthermore, it is frequently desirable to separate one form from an adjacent form on the web without releasing the several copies or disturbing the registration among the copies. A method which has been used for this purpose is to provide the collating machine with a mechanism that adds a line of glue between the several webs along the marginal edge. However, it has been found that this method is not satisfactory since, in effect, the several copies are glued rigidly together, along the margins with no provision for allowing one copy to shift slightly longitudinally in relation to another copy. Thus, when the multiple copy forms are fed through a business machine as continuous webs and are required to move around a small radius, as for example, a typewriter platen, or when the webs are folded in a zig-zag fashion, the inner web cannot shift slightly in relation to the outer web because of the rigid interlock resulting from the glued parts and consequently one of the copies of the form will frequently tear or crease.

The present invention relates to a novel mechanism which can be installed on a collating machine and which provides the multiple paper webs with an interlocking means such that the copies will remain properly together in registry and will also permit the webs to move slightly longitudinally with relation to each other. It is therefore an object of the present invention to provide a collating machine for web materials with a mechanism which produces a series of flexible tabs on at least one of the webs for loosely inter-locking the multiple webs near the edge portion of the webs.

Another object of the present invention is to provide a collating machine with a mechanism which will lock the webs together in such a manner that the webs may be folded in a zig-zag fashion without tearing or creasing the webs.

A further object of the present invention is to provide a mechanism which may be installed on a collating machine for loosely inter-locking the multiple webs together but which may be easily bypassed when the interlock feature is not used.

Still another object of the present invention is to provide a collating machine with a mechanism for loosely inter-locking the multiple webs of a manifold type of form together by means of a series of tabs which are lanced out along the margin of one outer web, and where the tabs pass through a corresponding series of openings in the intermediate webs and are glued to the underneath side of the web on the opposite side of the manifold.

As another object, the present invention provides a mechanism for a collating machine which will loosely inter-lock the multiple webs together along the margin and which dispenses only a series of small spots of glue for the inter-locking tab such that the margins of the webs do not stiffen as is common with a continuous line of glue.

As another object, the present invention provides a mechanism for a collating machine which will produce a loosely inter-locked multiple copy business form where all the copies are fed merely by tearing off the top or bottom copy.

Still another object of the present invention is to provide a mechanism for use on a collating machine which will produce a loosely inter-locked multiple copy business form where the top original copy is smooth and clean, and where it is not apparent from the top that the copies of the form are inter-locked together.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings:
FIG. 1 is a somewhat schematic plan view of a collating machine showing the arrangement and location of the inter-locking tab mechanism according to the present invention;
FIG. 2 is an expanded perspective view of a three-copy business form with interleaved carbon papers showing the arrangement of the inter-locking tab feature among the multiple webs as produced by a mechanism in accordance with the present invention;
FIG. 3 is an enlarged sectional view of several webs with an inter-locking tab as produced by one form of using the mechanism of the present invention;
FIG. 4 is an enlarged sectional view of several webs inter-locked together as produced by another form of using the mechanism of the present invention;
FIG. 5 is a detailed end view of the rotary punch and die which produce the series of lanced-out tabs which extend from the edge portion of the web, in accordance with the present invention;
FIG. 6 is a top view of a punch insert, the side view of which is shown in the broken away section of FIG. 5;
FIG. 7 is a detailed elevation view of the lower web feed cylinder and rotary wheel adhesive applicator as shown schematically in FIG. 1;
FIG. 8 is a detailed top view of the feed cylinder and adhesive applicator, showing the spring metal fingers which urge the tabs extending from the webs into engagement with the glue wheel; and
FIG. 9 is an enlarged partial view of the edge portion of a paper web showing the engagement relationship between the spring metal finger and a tab extending from the web.

Referring to the drawings, FIG. 1 shows, in a schematic manner, the overall arrangement of the collating machine...
and the paths of the multiple webs as they move through the machine in order to receive the interlocking tab feature as provided by the present invention. In general, the collating mechanism, on which a mechanism in accordance with the present invention is mounted, is provided with a series of horizontal arbors 22 mounted in a cantilevered manner on a frame (not shown) and are adapted to receive rolls of preprinted paper webs 24. The preprinted webs are fed around the idler rods 26 which serve primarily to space the paper webs so that their paths do not interfere with each other. The webs then pass around the tension bars 27 which are used to control the tension of the webs as they proceed around the main feed cylinders 28 and 28a.

Mounted on the cantilevered arbors 29, in a manner similar to the preprinted webs 24, are a series of carbon web rolls 30 numbering one less than the number of preprinted paper rolls. The carbon paper webs are fed around the carbon idler rods 32 and upwards to the main feed cylinders 28 where each carbon web is spaced on top of a preprinted paper web. The feed cylinders 28 are power driven in synchronization and normally contain a series of retractable pins spaced circumferentially around one end of the cylinder for engaging the marginal perforations of the preprinted webs in order to prevent slippage between the webs and the feed cylinders. As the several preprinted paper webs and carbon paper webs are collected along the path 37, in an overlapping manner, it is apparent that each carbon paper web is interlaced between two preprinted paper webs in order to compose a multiple-copy business form.

In general, most of the basic parts which compose the novel mechanism and which are assembled on a collating machine in accordance with the present invention, include a power operated punch and die set 40 and 41, respectively, a similar but optional punch and die set 43 and 44, another punch and die set 46 and 47, the spacing bars 49 and a rotary glue applicator 52.

As shown in the expanded view of FIG. 2, the edge portion of the overlapped multiple webs, which are collected in a collating machine having a mechanism in accordance with one form of the invention, would have an upper preprinted web 60, a lower preprinted web 62 and at least one intermediate preprinted web 65 with interlaced or interspaced carbon webs 67. As stated previously, the 29 spaced along the edge portion of the preprinted webs are provided for engagement by the conventional retractable pins contained in the main feed cylinders 28 so as to maintain accurate registration between the multiple webs as they are collected together in the collating machine. The pins are made retractable primarily to prevent tearing of the perforations as the webs leave the feed cylinders 28.

Referring to FIG. 1 in conjunction with FIG. 2, the punch and die set 40 and 41 receive the edge portion of the lower web 62 and are constructed to lance out a series of U-shaped tabs 72 along the edge portion of the lower web. The punch and die 46 and 47 are positioned to receive the edge portion of all the intermediate preprinted webs 65 along with the intermediate carbon paper webs 67 and to punch a series of holes 74 which are spaced correspondingly to the tabs 72. This latter punch and die set may be of the conventional type as for example the type used on the printing machine for punching the perforations 69.

According to one use of the mechanism of the invention, the upper web 60 does not receive any treatment along the edge portion and is prevented from entering the punch and die set 46 and 47 by the spacing rods 49 which are mechanically interposed between the punch and die set 46 and 47 when the edge portion of the upper web 60 is extended in the manner of a tab around the punch and die set. The tabs 72, which are extended slightly as the lower web proceeds around the feed cylinder 28a so that only the end of the tab contacts the rotary glue applicator 52 which deposits a small spot of glue on the tab.

As the lower web 62 is collected with the upper web 60, the intermediate preprinted webs 65 and carbon webs 67, at the point 78, the tabs 72 are spaced downwardly and the webs 62 are pressed upward through the holes 74 so that the ends of the tabs are joined with the underside of the web 60 at the point 80 shown in the enlarged sectional view of FIG. 3.

Since the webs composing the multiple copy forms are frequently folded in a zig-zag manner as the webs leave the collating machine, it is desirable that the glue placed in the glue box 82 and applied by the rotary applicator 52 be of the quick-setting type. For this reason, the glue applicator is positioned next to the final feed cylinder 28a so that the tabs 72 will receive the spot of glue immediately before the web is joined to the upper web at the point 78, shown in FIG. 1.

While FIG. 2 shows only one intermediate preprinted web 65 and two intermediate carbon webs 67, it is to be understood that any number of intermediate webs and carbon webs could be used depending upon the number of copies required in the business form. For example, FIG. 1 shows a collating machine where three intermediate preprinted webs 65 are used along with four carbon paper webs 67 which would be required in order to have one carbon web interleaved between each preprinted web.

According to another arrangement and use of the mechanism of the invention, in addition to the tabs lanced from the lower web 62, a series of similar and corresponding tabs 84, shown in FIG. 4, are lanced out of the upper web 60 and the two tabs are joined together through the holes 74 in a manner identical with that used for joining the tabs to the underside of the upper web as shown in FIG. 3, and explained above.

When the double tab interlocking arrangement as shown in FIG. 4 is desired, as for example, when a slightly greater longitudinal flexibility is desired among the multiple webs than that provided by the interlocking tab of FIG. 3, the upper web 60 is directed along the path shown by the dotted line 88, of FIG. 1, where it is received by the punch and die set 43 and 44 which lances out the series of tabs 84 along the edge portion of the web. The upper web is then fed along the path 37 where it is collected with other webs as earlier explained.

When it is necessary to use the collating machine for assembling webs in registration where the tab interlocking feature is not required, the roll of paper for the lower web is placed in the position shown by the broken line 24 of FIG. 1 and the lower web is directed along the path as indicated by the broken line 62a. Thus, there would be no web passing through the punch and die set 40 and 41 or in contact with the rotary glue applicator 52. In order to eliminate the holes in the intermediate webs 74, the punch and die set 46 and 47 are separated from each other and all of the webs including the upper web 60 and the lower web 62 proceed along the path indicated by 37a. Of course, the upper web 60 does not pass through the punch and die set 43 and 44 but instead follows along its normal path at 67a for the interlocking tab arrangement shown in FIG. 3.

Referring to the detail view of FIG. 5, the rotary punch and die set, which is employed to lance out the tabs 72 extending from the lower web 62, consists of a punch 40 which is mounted on the driven shaft 92 and fastened for rotation therewith by the key 94. The rotary punch includes four equally spaced metal inserts 96 which are retained in the punch by tightening the four set screws 98 against the tapered flat 100 which is machined into the cylindrical surface of the punch insert. The lance portion of the punch insert 96 includes an oblong U-shaped projection having one rounded end 106, as shown in FIG. 6, and a top surface 110 which is inclined toward the leading edge of the projection. The side walls 110 taper inwardly towards the center of the projection.

The rotary die 41 includes four equally spaced recesses 112, corresponding to the four projections on the
punch inserts 96 and which are slightly longer than the projections on the punch inserts. Thus, as shown in FIG. 5, the punch 40 and die 41 cooperate to limit the tab 72 along the two parallel sides and the rounded end, but do not shear the tab along the straight end due to the slope on the top of the punch insert, and the difference in length between the projection of the punch insert and the recess within the die. The purpose of the back tapered side walls 110 on the cooperative to limit the tab 72 along the two parallel sides and the rounded end, but do not shear the tab along the straight end due to the slope on the top of the punch insert, and the difference in length between the projection of the punch insert and the recess within the die. The purpose of the back tapered side walls 110 on the punch insert 94 is to enable the projection on the insert to withdraw easily from the recesses 112 without binding along the edges.

Referring to FIGS. 7 and 8, the feed cylinder 28a which received the lower web 62, includes the conventional retractable pins 120 which engage the series of correspondingly spaced perforations 69 along the edge portion of the webs in order to maintain accurate registration among the webs. These pins are mounted within the feed cylinder so that the pins automatically extend and retract, as the feed cylinder picks up and releases the web, and thereby prevent the pins from tearing the perforations. Each side of the feed cylinders 28 and 28a is driven through a shaft 122 by a chain drive (not shown) at the same constant speed.

As shown in FIG. 8, the feed cylinder 28a which receives the lower web 62, is provided with a circumferential groove 124 which is spaced next to the pins 120. Mounted within the groove and uniformly spaced around the circumference is a series of spring metal fingers 128 which are spaced to correspond with the series of tabs 72 that extend from the edge portion of the lower web 62. As shown in FIG. 7, the spring metal fingers 128 lie directly under the tabs 72.

The rotary glue applicator 52 is positioned far enough from the feed cylinder 28a that only the end portion of the tab 72 engages the V-shaped groove 129 around the circumference of the glue applicator. It can be seen in the enlarged view of FIG. 9 that the spring metal finger 128 is slightly smaller than the tab 72 in order to prevent the spring metal finger 128 and the spring metal finger in case the web should move slightly on the feed cylinder. The shaft 130 mounting the rotary glue applicator is driven in a suitable manner, for example through a reversible variable speed drive so that the applicator will be rotated at the optimum speed for depositing a small but sufficient amount of glue on tab 72.

Referring to FIG. 7, as the lower web 62 is carried by the feed cylinder 28a to the uppermost point where the lower web comes in contact with the other webs which have been collected, including the upper web 60 and the lowermost carbon web 67, the spring fingers 128 will press the tabs 72, which have the glue spot on the end, through the holes 74 in the intermediate webs and against the underneath side of the upper web 60 which is moving under and against the back-up plate 135.

After all of the webs are collected and the interlocking tabs are joined, the multiple webs are fed into the cross-perforating rolls 137 (FIG. 1) where all of the webs as a unit receive the transverse perforations marking the separation lines between adjacent forms printed on the webs.

It is understood, of course, that the interlocking tab feature as produced by the present invention may be used on many different forms of multiple webs which are collected together in a collating machine, with or without interspaced carbon paper webs.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A machine for assembling a plurality of continuous webs of flexible paper material into an overlapping relationship including a pair of outer webs and at least one intermediate web, a mechanism for loosely locking the webs together along the edge portion of the webs, said mechanism comprising, means for spacing one of said outer webs from the intermediate web, a first set of punch and die means adapted to receive the edge portion of an intermediate web and to perforate a series of apertures therein while said one outer web is spaced from the intermediate web, a second set of punch and die means adapted to receive the edge portion of the other outer web and to perforate a series of tabs integrally connected thereto and extending therefrom spaced in corresponding relationship with said apertures, and means operative to extend said tabs through said apertures in the intermediate web and to join said tabs to the underneath side of said one web.

2. In a machine for assembling a plurality of continuous webs of flexible paper material into an overlapping relationship including an upper and a lower web and at least one intermediate web, a mechanism for loosely locking the webs together along the edge portion of the webs, said mechanism comprising, means for spacing the upper web from the intermediate web, a first set of punch and die means adapted to receive the edge portion of an intermediate web and to perforate a series of apertures therein while the upper web is spaced from the intermediate web, a second set of punch and die means adapted to receive the edge portion of the lower web and to perforate a series of tabs extending therefrom spaced in corresponding relationship with the apertures, means for applying adhesive to the tabs formed from the lower web, and means for joining the tabs of the lower web to the underneath side of the upper web through the corresponding apertures in the intermediate web.

3. In a machine for assembling a plurality of continuous webs of flexible paper material into an overlapping relationship including an upper and a lower web and at least one intermediate web, a mechanism for loosely locking the webs together along the edge portion of the webs, said mechanism comprising, a first set of punch and die means adapted to receive the edge portion of the intermediate web and to perforate a series of tabs extending therefrom, a second set of punch and die means adapted to receive the edge portion of the upper web and to punch a series of tabs extending therefrom, a second set of punch and die means adapted to receive the edge portion of the lower web and to punch a series of tabs extending therefrom, means for applying adhesive to the tabs formed from the lower web, and pressure means for joining the tabs on the lower web to the tabs on the upper web through the corresponding apertures in the intermediate web.

4. In a machine for assembling a plurality of continuous webs of flexible paper material into an overlapping relationship including an upper and a lower web and at least one intermediate web, a mechanism for loosely locking the webs together along the edge portions of the webs, said mechanism comprising, a first set of a rotary punch and die adapted to receive the edge portion of the upper web and to punch a series of U-shaped tabs therefrom, rod means for spacing the upper web from the intermediate web, a second set of a rotary punch and die adapted to receive the edge portion of the intermediate web while the upper web is spaced therefrom and to perforate a series of tabs in the intermediate web, a second set of a rotary punch and die adapted to receive the edge portion of the lower web and to punch a series of tabs extending therefrom, a second set of a rotary punch and die adapted to receive the edge portion of the lower web and to punch a series of U-shaped tabs which correspond with the series of apertures in the intermediate web and the series of tabs formed from the upper web, a rotary applicator for applying adhesive near the ends of the U-shaped tabs extending from the lower web, and means for joining the series of tabs extending from the lower web to the series

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of tabs extending from the upper web through the corresponding series of apertures in the intermediate web.

5. In a machine for assembling a plurality of continuous webs of flexible paper material into an overlapping relationship including outer webs and at least one intermediate web, a mechanism for loosely locking the webs together along the edge portion of the webs, said mechanism comprising, means for spacing one of said outer webs from the intermediate web, a first rotary punch and die set receiving the edge portion of the intermediate web and operating to perforate a series of apertures therein while said one outer web is spaced from the intermediate web, a second rotary punch and die set receiving the edge portion of the other outer web and operating to form a series of U-shaped tabs extending therefrom spaced in corresponding relationship with said aperture, means applying adhesive to said tabs on a portion thereof facing the other webs, and a plurality of spring fingers operative to push said portions of said tabs through the corresponding apertures in the intermediate web and against the parts of said other web overlying said apertures.

6. In a machine for assembling a plurality of continuous webs of flexible paper material into an overlapping relationship including means for supporting supply rolls of the multiple webs, means for guiding the webs into a common path where the webs are in registration with each other, and further including an upper and a lower web and at least one intermediate web, the combination of, a mechanism for loosely locking the webs together along the edge portion of the webs comprising; means for spacing the upper web from the intermediate web, a first set of punch and die means adapted to receive the edge portion of an intermediate web and to perforate a series of apertures therein while the upper web is spaced from the intermediate web, a second set of punch and die means adapted to receive the edge portion of the lower web and to punch a series of tabs extending therefrom spaced in corresponding relationship with the apertures, means for applying adhesive to the tabs formed from the lower web, and means for joining the tabs of the lower web to the underneath side of the upper web through the corresponding apertures in the intermediate web.

7. In a machine for assembling a plurality of continuous webs of flexible paper material into an overlapping relationship including means for supporting supply rolls of the multiple webs, means for guiding the webs into a common path where the webs are in registration with each other, and further including an upper and a lower web and at least one intermediate web, the combination of a mechanism for loosely locking the webs together along the edge portion of the webs, said mechanism comprising, a first set of punch and die means adapted to receive the edge portion of the upper web and to punch a series of tabs extending therefrom, a second set of punch and die means adapted to receive the edge portion of an intermediate web and to perforate a series of apertures therein in a corresponding relationship with the series of tabs, means for spacing the upper web from the intermediate web while perforating the intermediate web, a third set of punch and die means adapted to receive the edge portion of the lower web and to punch a series of tabs extending therefrom, means for applying adhesive to the tabs formed from the lower web, and pressure means for joining the tabs on the lower web to the tabs on the upper web through the corresponding apertures in the intermediate web.

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