United States Patent

Wakeman

[15] **3,655,222**

[45] **Apr. 11, 1972**

[54] MANIFOLD FORMS

[72] Inventor: **William R. Wakeman,** Niagara Falls, N.Y.

[73] Assignee: **Moore Business Forms, Inc.,** Niagara Falls, N.Y.

[22] Filed: **May 1, 1970**

[21] Appl. No.: **33,854**

Related U.S. Application Data

[62] Division of Ser. No. 732,597, May 28, 1968, Pat. No. 3,558,159.

[52] **U.S. Cl.** .....**282/11.5 A**

[51] **Int. Cl.**.....**B41l 1/26**

[58] **Field of Search**.....282/11.5 R, 11.5 A, 22 R; 281/21 R

[56] **References Cited**

UNITED STATES PATENTS

1,954,423	4/1934	Meisel	281/21 R
2,108,462	2/1938	Wiswall	282/11.5 R

FOREIGN PATENTS OR APPLICATIONS

956,512	1/1957	Germany	282/22 R
944,328	12/1963	Great Britain	282/11.5 A
908,177	8/1945	France	282/11.5
1,161,756	1/1964	Germany	282/22 R

Primary Examiner—Jerome Schnall

Attorney—Watson, Cole, Grindle and Watson

[57] **ABSTRACT**

This invention provides a new way of attaching carbonless copying sheets in layered assembly, each sheet except one outer sheet having a coating on one side. The attachment is by adhesive applied to an uncoated surface of one outer sheet and the joining of it with an uncoated surface of the other outer sheet by an appropriate structure to get a secure adhesive bond to hold the sheets in assembled relationship.

1 Claims, 10 Drawing Figures

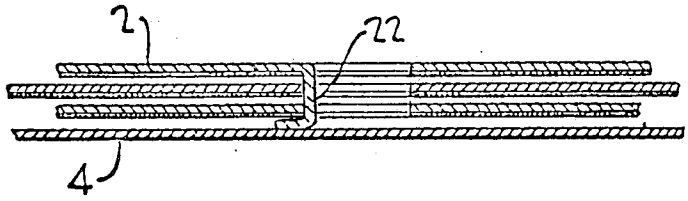


FIG. 1

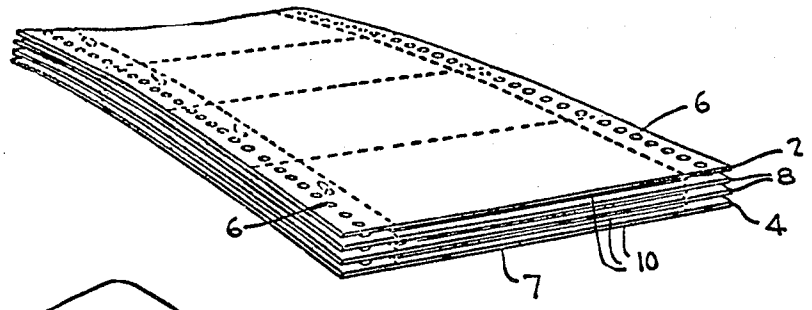


FIG. 2

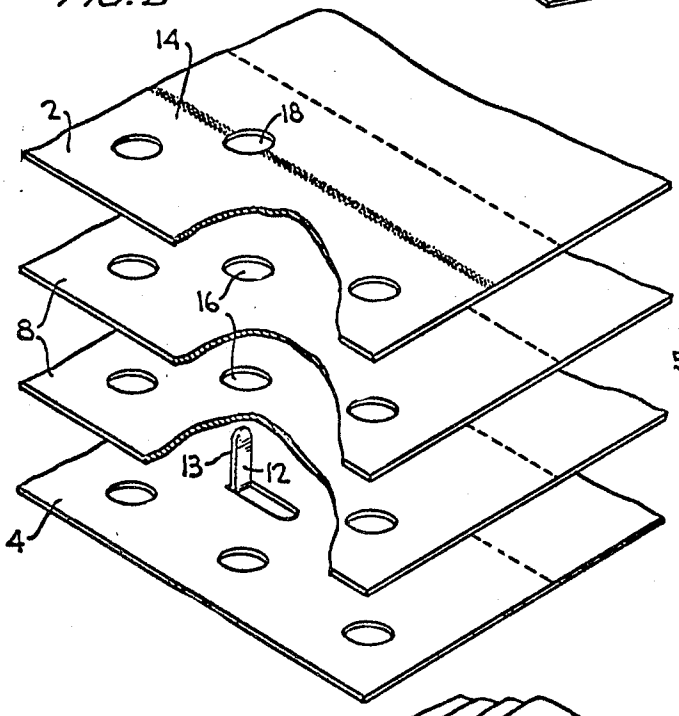


FIG. 3

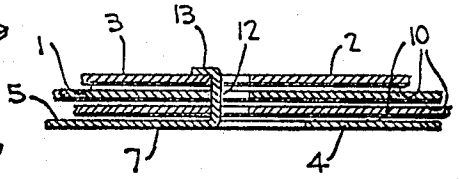


FIG. 4

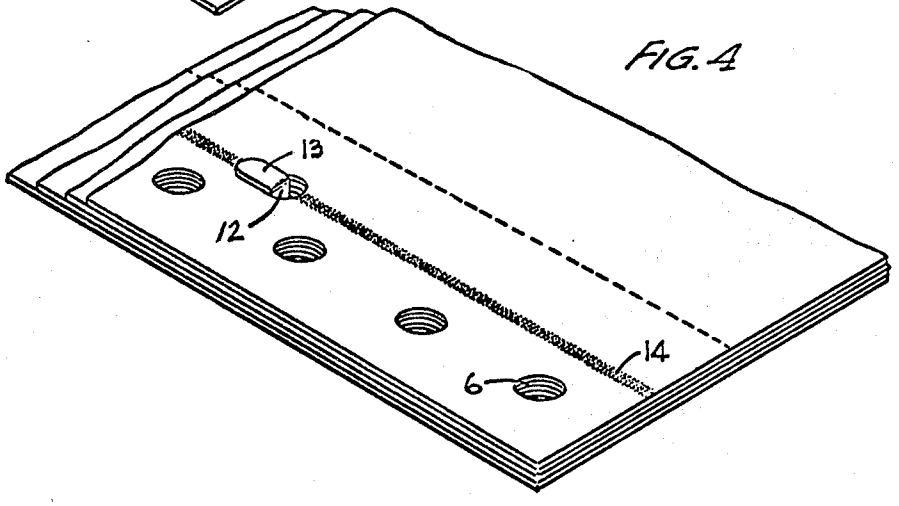


FIG. 7

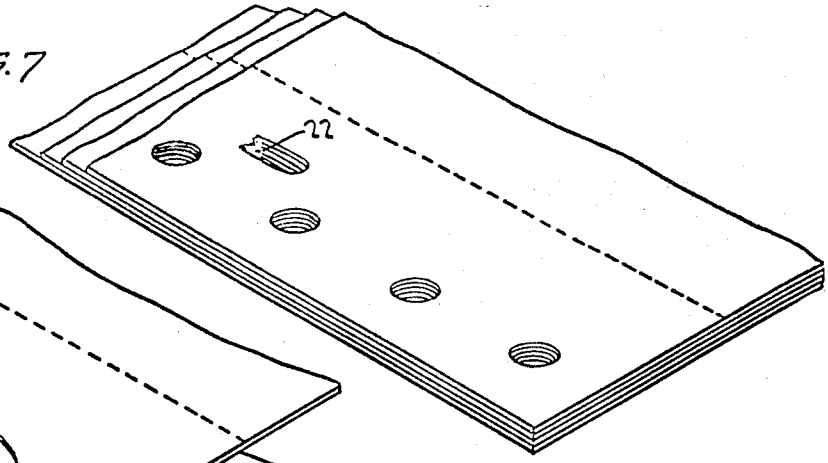


FIG. 5

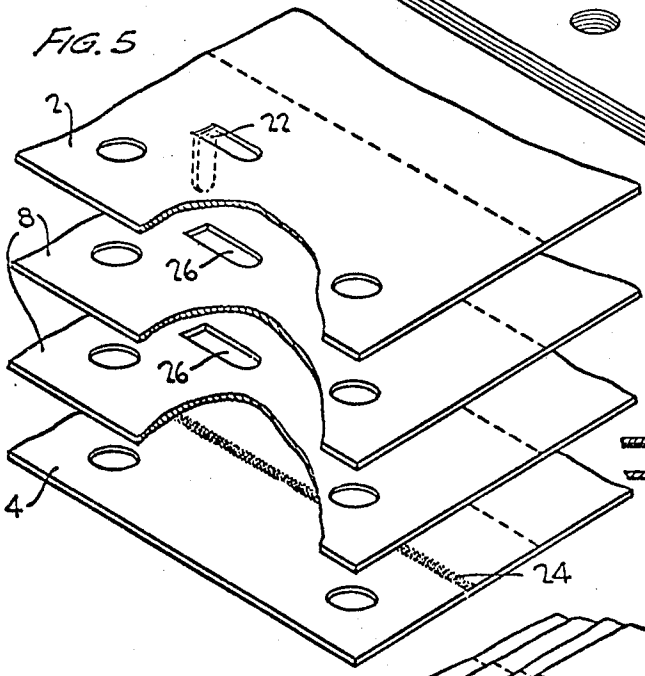


FIG. 6

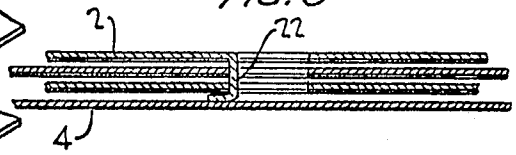


FIG. 10

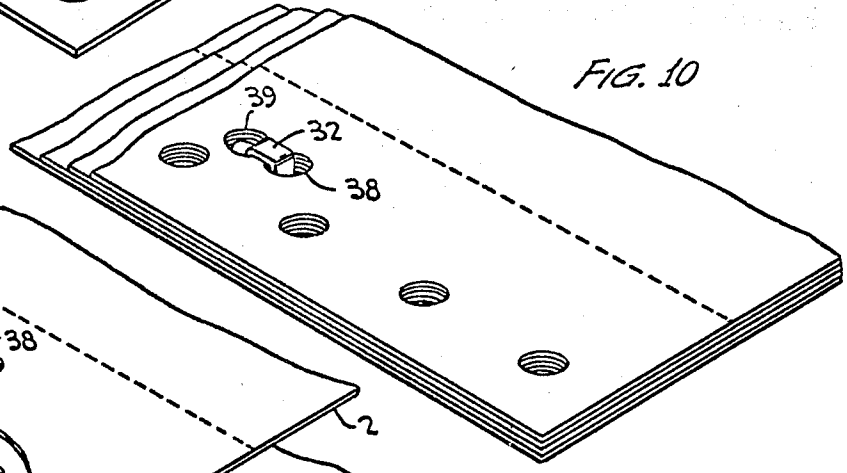


FIG. 8

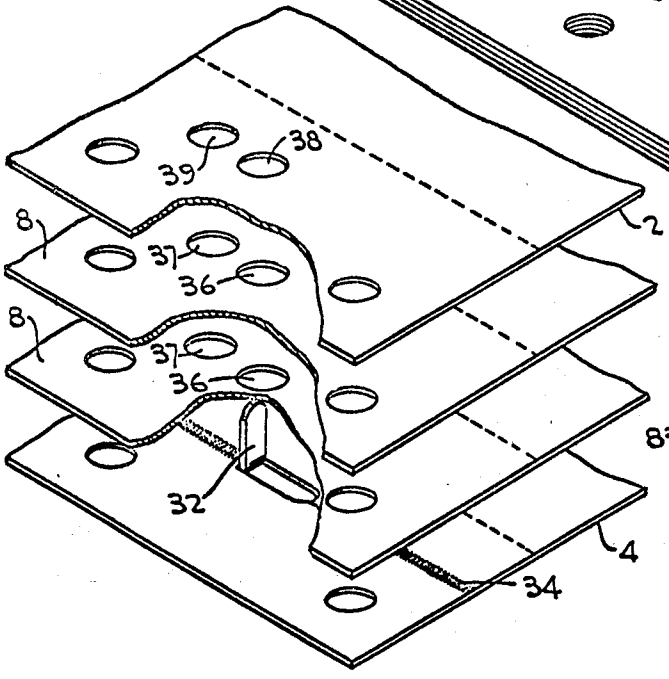
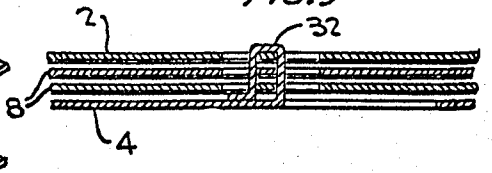


FIG. 9



MANIFOLD FORMS

This application is a division of copending application, Ser. No. 732,597, filed May 28, 1968, now U.S. Pat. No. 3,558,159.

BACKGROUND OF THE INVENTION

It is customary in modern business procedure to provide business forms in a manifold set or assembly of an original and the desired number of copies which assemblies are printed and supplied to the user in continuous form. These sets are customarily provided with a series of spaced perforations along at least one, and preferably both edges thereof to be engaged by suitable registering and feeding mechanisms. It is also the usual practice for the printer to stack a lengthy, i.e. continuous series of such form assemblies in zig-zag fashion or on a circular roll for ease of handling and later delivery to business machinery for processing. However, when a series of forms is thus deformed, the individual sheets thereof tend to move or shift longitudinally relative to each other. If the superposed sheets in each individual set of the series are immovably connected as by customary stitching, stapling, gluing, and the like, they cannot be successfully or conveniently arranged in zig-zag stacks or rolls because buckling, distortion and even tearing of the interconnected sheets may occur.

It is obviously necessary that the apertures or perforations provided in the sheets be maintained in accurate lateral alignment at the time the continuous forms are being fed through a business machine. This requirement holds even though the apertures or perforations of the sheets may be thrown into mis-alignment when they are stacked or rolled.

One expedient that has been employed in order to maintain the sheets of manifold assemblies in the necessary condition of alignment while still leaving the individual sheets free to undergo sufficient relative shifting movement as to avoid damage thereto, is the development of a tongue, tab or the like punched or otherwise struck out of one of the sheets, which is usually located on the exterior of the assembly for practical reasons, such tongue having its extreme free end adhered to the inwardly facing surface of the other exterior sheet and passing through an aperture formed for this purpose in any intervening copy sheets. The inherent flexibility of the tongue combined with clearance of the apertures tolerates slight relative shifting of individual sheets yet prevents any gross misalignment. Examples of prior art utilizing this concept and variations on the same theme are; U.S. Pat. Nos. 1,954,423, Meisel, issued Apr. 10, 1934; 1,956,244, issued Apr. 24, 1934, Meisel; 3,066,957, Huffman, issued Dec. 4, 1962 and 3,112,125, Darrow, issued Nov. 26, 1963.

There are on the market now the so-called carbonless copying sets which consist of a plurality of sheets having a specially devised coating on the back of the sheet which, under the application of pressure, releases transfer material onto the front of the underlying sheet, such material forming a visible image on the face of the adjacent sheet either directly by virtue of its own coloration or indirectly by virtue of reaction with some component provided for that purpose on the underlying sheet. The main difficulty in fastening together multiple sets of these sheets in the manner just described to form the manifold assembly is that conventional adhesion will not effectively adhere to the coated surface of sheets of this type. The easy release of the transfer material for duplication interferes with adherence of the adhesive. This problem led to the adoption of the practice of strip-coating, that is, leaving on the sheet surface spaces free of the coating at the locations of the connections. However, this practice adds considerably to the cost of the paper.

The object of the invention is an improved manifold set of at least two, and preferably three or more, sheets, the interior surface of the uppermost sheet, and preferably the corresponding surface of each inner sheet that is present, carrying a coating comprising a pressure-transferable image-forming material with at least one surface of each exterior sheet free of any such coating, the sheets of the set being held in loosely

aligned relationship by means of at least one tongue struck out from an exterior sheet, projecting through vertically registering apertures in any inner sheets and folded at its extreme free end to place its uncoated surface in parallel contacting relation with an uncoated surface of the same or opposite exterior sheet, said contacting surfaces being adhered together with adhesive coating.

A more precise object of the invention is a multiple sheet manifold set of the type described in which the tongue is struck out of the uppermost sheet, extended vertically through aperture in any inner sheets and folded at its free end to place the uncoated exterior side of the tongue end in adhering relation against the uncoated inwardly directed surface of the lowermost sheet.

Another object of this invention is to form a multiple sheet manifold set of the type described in which the tongue is struck up from the lower external sheet, passed through an aperture in the upper external sheet and adhered at its end to the upper external sheet.

Another object of this invention is a multiple sheet manifold set in which the tongue is passed through any intermediate sheets and the other exterior sheet of the set by means of a series of registering holes, folded over a short length of the outer surface of the other outer sheet, and doubled back upon itself and passed through the other outer sheet and intermediate sheets by means of a second series of registering holes closely adjacent the first interior surface of the tongue being adhered to the interior surface of the outer integral with said tongue.

FIG. 1 is a fragmentary top plan view of a typical, folded commercial continuous business form;

FIG. 2 is an enlarged perspective of a corner fragment of one embodiment of the invention;

FIG. 3 is an exploded view of the fragment of FIG. 1;

FIG. 4 is a vertical cross-sectional view across the fragment of FIG. 2;

FIGS. 5–7 are views similar to FIGS. 2–4 of another embodiment of the invention; and

FIGS. 8–10 are views similar to FIGS. 2–4 of still another embodiment of the invention.

Referring now to FIG. 1 of the drawings, a manifold set or assembly is illustrated in zig-zag folded position and consisting of two or more sheets or longitudinally perforated webs, in vertically aligned relation. The manifold set includes two outer sheets 2 and 4, respectively. Each sheet includes a series of perforations 6 in alignment with those in the other sheets, providing a means for registering and feeding the form through high speed tabulators, printers and the like.

One or more intermediate sheets 8 may be placed between the outer sheets 2 and 4. On the bottom surface of each sheet of the set exclusive of the lowermost sheet 4 is a coating 10 which releases ink or other image-forming material under pressure and creates an image on the upper surface of the adjacent sheet, which is left uncoated for that reason. The bottom sheet 4 in the first embodiment has no coating on either surface. This embodiment of the invention utilizes a top outer sheet 2 having a coating on its inner surface, but not on its outer surface, and a lower outer sheet 4 having no coating on its inner surface 5 with or without a coating on its outer surface 7, as may be desired.

Referring now to FIG. 2, the exploded relation of the several sheets aids partly in illustrating the details of assembly of the first embodiment. The arrangement shown in FIGS. 2–4 has the advantage of allowing the sheets to be collated before the adhesive is applied or any fastening operation is done. The sequence of assembly is as follows:

1. A tab 12 having one free end 13 is struck from bottom sheet 4, the tab being elongated in the direction of the length of the sheets;
2. The sheets are collated with the base end of tab 12 aligned with registering apertures 16,18 in the other sheets;
3. Adhesive 14 is applied to the uncoated side of top sheet 2;

4. Tab **12** is pushed through openings **16** of the intermediate sheets **8** and through opening **18** in top sheet **2**, the length of the tab being such that its free end **13** projects above the plane of top sheet **2**; and
5. The end **13** of tab **12** is bent and pressed down on the exterior surface of top sheet **2**, as shown in FIGS. **3** and **4**, and pressure is applied to ensure a good contact and adherence between the tab **12** and adhesive **14**.

The embodiment of FIGS. **2–4**, as in the other variations, utilizes an adhesive connection between an uncoated surface of an outer sheet and an uncoated surface of a tab struck from an outer sheet. For this purpose, a stripe or ribbon of pressure-sensitive adhesive is applied, as at **14**, to the top surface of top sheet **2** along lines spaced inwardly of the side margin of the sheet in registration with the apertures **16,18** in sheets **2** and **8**.

FIGS. **5–7** illustrate an alternative embodiment of the invention in which the securing tabs, here designated **22**, are not exposed on either exterior surface of the manifold set. In this form, the adhesive stripe **24** is first applied to the upper uncoated surface of bottom sheet **4** before the sheets are collated and the tab is punched out of the top sheet **2**. Tab **22** must be pushed down through openings **26** and folded back before the pressure to effect good adherence is applied. It should be observed in FIG. **6** that the upper surface of top sheet **2** is uncoated but its lower surface is coated with the transfer material; the adhesive would be ineffective if it were in contact with the coated surface of tab **22**. The tab **22** is therefore folded back or under to expose its uncoated surface to the adhesive **24**. Because the surface of intermediate sheet **8** is adjacent to bottom sheet **4** and has a coating thereon preventing adhering contact with the strip of adhesive **24**, the internal location of the adhesive strip does not cause the sheets to stick together.

The slots **26** through sheets **8** are shown in FIG. **6** to be the same shape as tab **22**. The congruity makes for an easier operation in pushing tab **22** through the openings in the case of this particular embodiment.

The arrangement of the openings and the folding of the tabs illustrated in the several forms serves to minimize expense. In all cases, the adhesive may be applied in a continuous strip. This eliminates the expense of more sophisticated equipment for intermittent application, although such equipment may be used with this invention, if preferred.

Another variation of the invention is illustrated in FIGS. **8–10**. The sequence of assembly here is as follows:

1. A strip of adhesive **34** is applied to the inside surface of lower sheet **4**;
2. Tab **32**, similar to the tabs in earlier versions, is struck from sheet **4**;
3. The sheets are collated;
4. Tab **32** is pushed up through registering holes **36** and **38** of the intermediate sheets **8** and top sheet **2**, respectively;
5. The exposed projecting portion of tab **32** is pressed down upon the upper face of sheet **2** over a second series of registering openings similar to holes **36**, **38** but spaced slightly in the lengthwise direction from the first series and including opening **39** in the top sheet and an opening **36** in each of the intermediate sheets **8**;
6. The terminal portion of tab **32** is pushed down through holes **39** and **37**; and
7. Pressure is applied to secure the extreme end of tab **32** to the upper face of the bottom sheet **4**, see FIG. **9**.

Since the tab in the latter form is, in effect, doubled back through the spaced parallel series of openings, its length must, of course, be greater than that of the tabs of previous versions. The size of the opening is selected to permit easy manipulation of the tabs.

The adhesive used in this embodiment may be any regular suitable adhesive, or a contact type adhesive may be used. A contact type adhesive, that is an adhesive which will adhere only to itself, may be desirable in some operations. As can be seen in FIG. **9**, if contact type adhesive is used, the only physical restraint on sheets **8** and shet **2** is the loops provided by the folded over tabs **32**. The various sheets are more free for relative movement in this case because the contact type adhesive on tab **32**, and on the inner face of sheet **4**, will not adhere to the other sheets. If a more rigid joint is desired, regular adhesive may be employed.

It is possible to select a modified shape for the holes through the various sheets. The particular shape of the holes may be dictated by the equipment available, the type of adhesive used or the intended use of the continuous manifold of business forms.

It will, of course, be understood that while only a single connecting tab is visable in the several drawings, such tabs would be located at spaced points along the length of the manifold set and normally would be present on both sides of the set. Assuming that the feed holes are spaced on three-fourths inch centers, a tab about every dozen or so of such holes gives a satisfactory securing action. This frequency is naturally variable as desired. Usually the clearance between the feed holes does not permit the connecting tabs to be located in line with the feed holes. Consequently, they are preferably placed just slightly inwardly of the line of feed holes. Other locations are equally useful dependent upon the distance the feed holes are arranged from the side edges of the set and so on.

Except as herein specified, the construction and characteristics of the manifold sets of the invention may be selected in accordance with the prior art and need not be described further here.

The transfer coating carried on the sets of the present manifold sheets has been described only in terms of a pressure-transferrable image-forming material inasmuch as such material is normally in widespread use with sheets of this type. However, it will be obvious that where the manifold sheets utilize coatings of other types which are subject to the same fundamental problem as the image-forming materials, namely of having a very poor adherence for conventional adhesives and the like, then the concept of the invention is obviously equally adaptable for use in conjunction with such other coatings and the invention should be construed to encompass this equivalent practice. Other alterations and modifications may, of course, be made in the subject matter herein disclosed without deviating from the intended scope of the invention.

I claim:

1. A multi-sheet manifold set comprising a plurality of superposed continuous webs of paper of the self-copying type, superposed transverse fold lines spaced along the length of said webs whereby said superposed webs may be zig-zag folded and divided along certain of said fold lines into superposed record sheets, each of said superposed web with the optional exception of the bottom one being coated on its underside with a coating of pressure transferable image-forming material and each having its upper surface free of such coating and thus being an adhesive-compatible surface subject to being adhesively adhered to another similar surface, means constituting part of the uppermost one of said web and partaking of the above described coated and uncoated conditions for comprising a self-contained securing means for holding the webs of said set in loosely aligned relationship, said means comprising a plurality of longitudinally spaced tongues struck from said uppermost one of said webs, vertically registering openings through the webs above the lowermost one adjacent the position of each of said tongues, each of said tongues extending through said openings, the terminal portion of said tongue projecting beyond the last of said openings being back bent so as to present its uncoated adhesive-compatible surface in parallel contacting relation to the similarly uncoated adhesive compatible surface of the lowermost one of the webs and a continuous strip of adhesive applied to the uncoated upper surface of the lowermost web to which the tongue is adhered, both said strip of adhesive and the back-bent terminal portion of the tongue extending longitudinally of the webs and thus in the direction of feed of said webs.

* * * * *