July 31, 1962 G. D. LYALL ET AL 3,047,311

CONTINUOUS TABULATING CARD STRIP

Filed Feb. 18, 1960 2 Sheets-Sheet 1

FIG. 1.

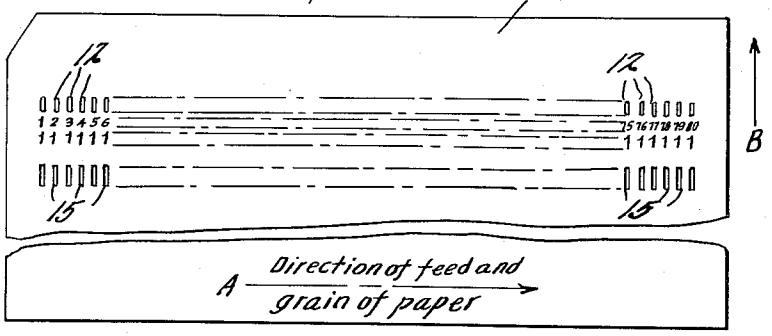


FIG. 2.

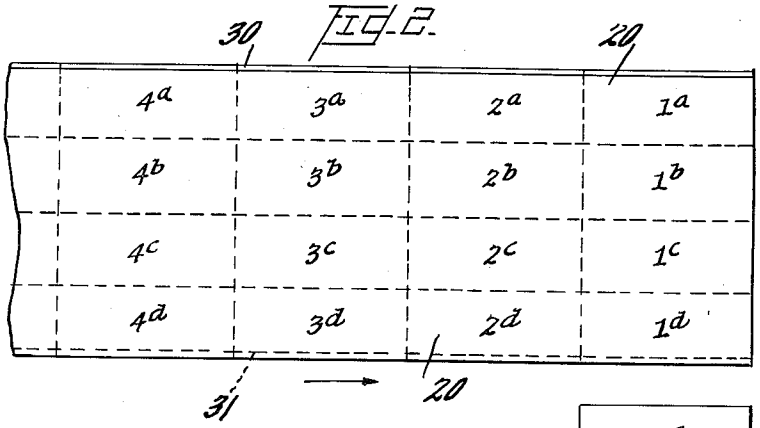
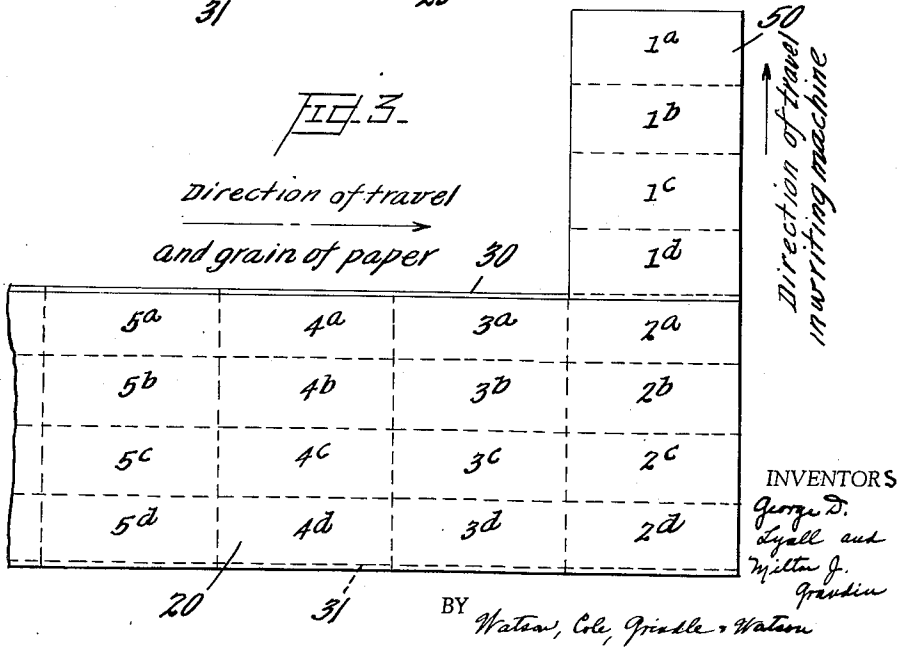


FIG. 3.



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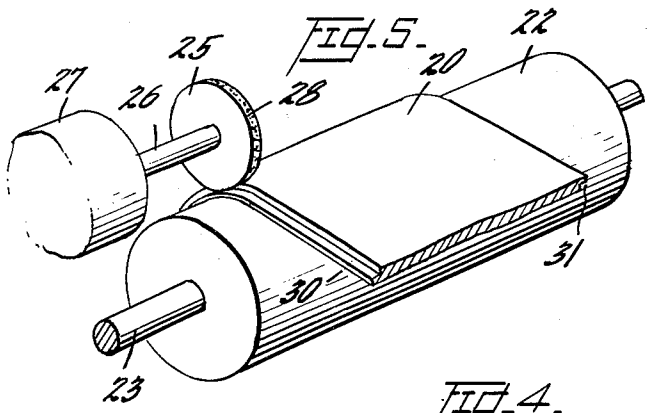


FIG. 5.

FIG. 4.

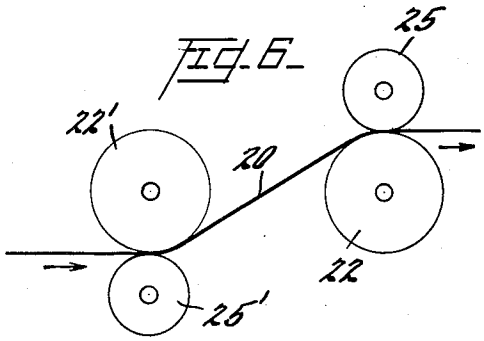


FIG. 6.

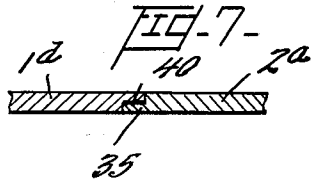


FIG. 7.

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CONTINUOUS TABULATING CARD STRIP

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2 Claims. (Cl. 281—5)

This invention relates to tabulating cards or the like and to methods of manufacture and assembly of such cards into continuous strips.

The general object of the invention is the provision of a novel and improved continuous strip or web of tabulating cards and the provision of a method of assembly which results in a better product which is uniform in thickness, in a speed-up of production, and in a saving in costs.

Printed tabulating cards, each of which is machine inscribed with individual data, are used in tremendous volume today, and it is essential to quantity handling that the user have available elongated strips of such cards for speedy continuous writing. However, principally due to extreme dimensional precision which the use of tab cards requires, the production of a satisfactory continuous strip of cards and the use of such strips have presented problems.

As a preliminary to a detailed exposition of the present advance in the art, it would be well to discuss certain peculiarities of these tabulating cards which make them and their manufacture sui generis in the paper making arts.

As manufactured, all paper and card stocks have the grain of the fibers running in the direction of web flow through the paper making machine, and this is also the direction of movement of the web through a continuous rotary printing press by which the preliminary textual matter or indicia is impressed upon the series of forms comprising the web or strip.

It is recognized that papers, card stocks and the like inherently encounter dimensional changes when subjected to changes in relative humidity of the surrounding atmosphere. The dimensional changes referred to hereinafter are based upon a relative humidity increase of from 20% to 75% with 73° F. temperature, these being the conditions frequently used for prescribing the maximum allowable dimensional change for card stock used for tabulator operations.

It is further recognized that dimensional changes in paper or card stock, due to changes in relative humidity of the surrounding atmosphere, are much less in the paper grain direction than in the direction at right angles to the grain. The most popular dimension of tabulating cards is probably the 7⅜" x 3¼" size with the longer dimension extending widthwise of the card. Each card must be susceptible of having as many as eighty columns of data widthwise thereof, with many or all of these columns to be punched with tabulating machine brush contact apertures. This permits only about thirty-two thousandths of an inch of lateral space between the apertures.

Now with the aforementioned relative humidity conditions, if the grain of the card is parallel with or along the shorter dimension of the card, the dimensional change in the longer dimension of the card will be about 0.051", whereas if the grain is parallel with the longer dimension of the card, the dimensional change in that longer direction is only about 0.015".

Therefore, unless the grain of the paper stock extends in the longer or widthwise direction of the card, the dimensional change would be prohibitive in attempting to accommodate say eighty contact apertures along the card. Thus, the cards must be made with the grain extending widthwise thereof.

This has been recognized in the prior art and cards

have been produced in a continuous web of a width of a single card and then the individual cards severed and reattached along their upper and lower margins to provide another web for passing vertically and continuously through the writing machines for the entry or imposition of the data. This is a time consuming and rather expensive expedient and the present invention has for one of its objects the effecting of economies in both time and expense in producing these cards, together with providing a superior product, as will be more fully set forth in the following specification.

Another object of the invention is to improve the tabulating card web product in facilitating its passage through typewriting or tabulating machines by increasing the uniformity of thickness of the web. In prior methods, the reattachment of the severed cards along their upper and lower edges has been effected simply by overlapping these edges of the cards and securing them together by the application of adhesive. This of course produces a double thickness at the junctions of the successive cards and results in a build-up of thickness and an increased rigidity which can cause feeding difficulties in the writing machine and damage to the product while the strip or web is passing through the restricted throat area beneath the platen of the machine. The double thickness overlapping area is ordinarily too rigid to conform to the arc of the surface of the platen. Thus, troublesome accidental detachment of the cards at the severance lines has resulted and occasionally the adhesive has failed to take hold at these junctions.

Also, the overlapping thickness in the prior art assemblies multiplies greatly at both fold ends of a zigzag folded pack of continuous cards to such an extent that proper packing in a shipping carton to prevent transit damage is difficult.

Even more important is the fact that the above-mentioned multiplied thickness at the fold ends of the zigzag pack, reduces greatly the number of cards which the continuous pack can contain for safe packaging, and this, in turn, reduces substantially the number of cards which can be continuously written without stopping the writing operation for installing additional packs in the writing machine.

These difficulties and drawbacks have been obviated or greatly reduced by the provisions of the present invention whereby the edges of the cards are rabbeted by the novel process disclosed herein so that the overlapping edges secured by adhesive are reduced in thickness and better adherence of the adhesive is insured.

Other objects and features of novelty will be apparent from the following specification when read in connection with the accompanying drawings in which one embodiment of the invention is illustrated by way of example.

In the drawings:

FIGURE 1 is a diagrammatic plan view of a finished and stripped tabulating card illustrating the general type of article involved and graphically presenting the need for minimizing the dimensional changes due to variations in relative humidity;

FIGURE 2 is a diagrammatic plan view of the oncoming end of a web of cards proceeding from a printing press, the direction of movement being the same as the direction of extent of the grain of the paper stock;

FIGURE 3 is a similar diagrammatic plan view of a further step in the manufacture and assembly of the novel tabulating card strip where the leading terminal group of cards has been severed from the web and then reattached to the upper margin of the next group which has replaced the first group through the progress of the web toward the right;

FIGURE 4 is a similar view showing a further stage in the progress of the web;

FIGURE 5 is a diagrammatic view in perspective of a portion of a suggested apparatus for effecting the rabbeting of the web edges, the card web in this view being greatly enlarged for purposes of clarity of illustration;

FIGURE 6 is a diagrammatic view in end elevation of two grinding stations for rabbeting the opposite faces of the side edges of the web; and

FIGURE 7 is an enlarged transverse sectional view of the joint between the sets of cards in the ultimate web, as taken on line 7—7 of FIGURE 4.

The ultimate tabulating card as shown in FIGURE 1 at **10** may be taken as an example of the final product of typical items of this sort, when the product is ready for tabulating use in a tabulating machine, whether made in accordance with the present invention or not. The marginal scrap borders have been stripped away and only the bare card remains.

These cards **10** are usually of a dimension approximately 7⅜" wide by 3¼" high. The columns of printed indicia indicated at **12** may be of any desired character, the ones partially shown in FIGURE 1 being typical. Within each of the columns **12** there are impressed rectangular apertures **15**, one or more for each column, these apertures being for the purpose of providing contact for the tabulating machine brush elements to properly sort or account for the data on the cards. In a card of this type there are as many as eighty of such apertures along the longer widthwise dimension of the card indicated by the arrow A.

Now if the grain of the paper stock and also the direction of run through the press had been in the direction indicated by the arrow B, that is, in a vertical direction as viewed on the card **10**, the lateral or widthwise dimensional change of the card, when subjected to the aforementioned relative humidity conditions, would have amounted to about 0.051" and this would have caused at least some of the apertures **15** to be displaced an amount which would throw the operation of the tabulating machine out of proper functioning.

It is therefore necessary or highly desirable in the production of these cards to insure that the direction of feed through the printing press and the direction of the grain of the paper extend as indicated by the arrow A, namely, widthwise of the card, whereby the expansion or shrinkage due to the aforementioned relative humidity change would be a maximum of only 0.015", which alteration would not affect the shifting of the terminal apertures **15** an intolerable degree.

In prior methods, the cards have been run through the press in the direction of the arrow A in single file, and the end cards have been severed and then attached along the upper and lower edges to the succeeding cards and a new web created which would run vertically of the individual cards or in the direction of the arrow B.

As previously pointed out, this adds considerably to the cost of manufacture and creates a double thickness junction between the cards which is deleterious and actually destructive to the strip in the passage through writing machines and the like.

In accordance with the present invention, the initial web **20** is sent through the printing machine in multiple arrangement of say four cards abreast, these cards being numbered **1***a*, **1***b*, **1***c*, and **1***d* in the first row; **2***a*, **2***b*, **2***c*, and **2***d* in the second row, and so on. The production of a wider web of this character results in a saving of time in producing the ultimate right-angled strip and also a saving in adhesive which in the case of large production is a considerable factor.

The paper or card web as it passes through the printing press, is subjected to a rabbeting process which is clearly shown in diagrammatic fashion in FIGURES 5, 6 and 7 of the drawings. This initial web designated **20** passes over an anvil roller **22** carried upon an axle **23** driven in any suitable manner and synchronized with feed rollers for drawing the web through the device. Adjacent the appropriate margin of the web **20** there is disposed an abrasive wheel **25** carried upon a shaft **26** driven by a motor **27**. The abrading edge surface **28** of the wheel **25** may be of any suitable edged metallic construction or abrasive stone composition and the distance of the effective edge **28** of the wheel from the surface of the anvil roll **22** is accurately set to just one-half the thickness of the web **20**. The wheel is thus adjusted at the edge of the strip to rabbet this edge out at a depth of one-half of the thickness of the card and to a lateral extent equal to the desired overlap of the cards in the ultimate web, as indicated at **30**.

Obviously either the device or the web has to be inverted in order to cut the rabbet at **31** upon the opposite edge of the web **20**. One way of accomplishing this is shown diagrammatically in FIGURE 6 of the drawings where the web **20** passes down an anvil roller **22'** and a grinding wheel **25'** which will cut the rabbet **31** and thence passes between the anvil wheel **22** and the grinding wheel **25** for cutting the rabbet **30** shown in FIGURE 5.

Proceeding from the stage depicted in FIGURE 2 of the drawings to that illustrated in FIGURE 3, it will be seen that the first row of cards **1***a*, **1***b*, **1***c*, and **1***d* is severed from the strip **20** and as the strip **20** moves forwardly, that is toward the right in these figures, the severed strip is moved upwardly and the bottom margin of the card **1***d* is overlapped at the rabbeted edges with the similarly rabbeted edge of card **2***a* as clearly indicated at **35** in FIGURE 3. Then the portion of the strip **20** comprising the cards **2***a*, **2***b*, **2***c*, and **2***d* is severed from the advancing strip **20**, moved upwardly and similarly joined to the next row by adhesively securing the lower edge of card **2***d* to the upper edge of card **3***a* as shown at **37** in FIGURE 4. Thus a new tabulating card strip **50** is formed to extend and be fed in a direction at right angles to the original web **20**.

The junction of the cards is shown very clearly in the enlarged view of FIGURE 7 which was taken on the line 7—7 of FIGURE 4 and which shows the card **1***d* secured to the card **2***a* at the junction **35** whereby a layer of adhesive **40** is interposed between the overlapping flanges of the adjoining cards.

Not only is much less adhesive used in this instance since it is unnecessary to join the cards **1***a*, **1***b*, **1***c*, and **1***d* etc. together, but the adhesive effects a firmer grip in uniting the card edges since the ground surfaces of the rabbets **30** and **31** are of a slightly irregular or rougher and more porous texture than the finished partially glazed surface of the card as it comes from the paper making machine. This enables the adhesive to penetrate somewhat more effectively and insures a stronger bond.

The ultimate result of the provisions of the present invention not only insures the use of less adhesive, and the more effective bonding by the adhesive, but also the necessity of joining only every fourth card rather than each successive card.

Adhesive affixation is inherently a relatively slow operation, good adhesives are costly, and therefore worthwhile savings both in time and money are attained by the more efficient method presented by this application. Of even greater significance is the fact that the chance of accidental and very annoying breaking apart of the adhesive joints during the continuous writing operation, is actually reduced fourfold.

At the same time the invention effectively eliminates the troublesome thickness build-up and increased rigidity at the junctions of the cards which, as pointed out above, gives rise to difficulties in passing the ultimate web **50** around the platen of a writing machine, and in folding the cards into zigzag packs for safe transportation, and more importantly, the more frequent time wasting installing of zigzag packs in the continuous writing machine as encountered with the conventional product.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. The process for making and assembling a tabulating machine punch card strip or the like consisting of a series of multiple card units attached edge to edge, which process comprises preparing an initial web of card stock with the grain extending longitudinally of the web in conventional manner, delineating on said web the outlines of tabulating cards in multiple alignment across the web as well as longitudinally thereof, with the dimension of said cards along which is to extend the longest projection of contact orifices disposed in alignment with said grain, rabbeting the opposite side edges of said web on respectively opposite surfaces thereof to a depth equal to approximately one-half the thickness of the stock and in such manner as to somewhat roughen the rabbeted areas, severing the forward terminal multiple card unit from the web, applying adhesive to the relatively rough rabbet areas, rejoining the severed unit to the next succeeding unit of the web by overlapping one rabbeted edge of said severed unit with a rabbeted edge of said next unit, and then severing the next unit from the web and successively repeating the rejoining of the severed units, whereby the resulting assembled strip comprises a series of tabulating cards with the grain extending transversely of said strip.

2. The process for making and assembling a tubulating machine punch card strip or the like consisting of a series of multiple card units attached edge to edge, which process comprises preparing an initial continuous elongated web of card stock with the grain extending longitudinally of the web in conventional manner, delineating on said web the outlines of tabulating cards in longitudinal series

of strip units each unit comprising a series of cards, which series of cards extends transversely of said web, with the dimension of said cards along which is to extend the longest projection of contact orifices disposed in alignment with said grain, running said web in the direction of its length, continuously rabbeting the opposite side edges of the running web on respectively opposite surfaces thereof to a depth equal to approximately one-half the thickness of the stock and in such manner as to somewhat roughen the rabbeted areas prior to severing the web, and continually severing the respective forward terminal multiple card units from the web, applying adhesive to the relatively rough rabbet areas, rejoining the respective severed units to the next succeeding units of the web by overlapping one rabbeted edge of a severed unit with a rabbeted edge of the next unit, whereby the resulting assembled web comprises a series of tabulating cards with the grain extending transversely of said strip, most of the cards integrally joined, and the fewer adhesively connected joints offering no difficulties in the passage of the completed web around the platen of a writing machine or in zigzag pack folding.

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