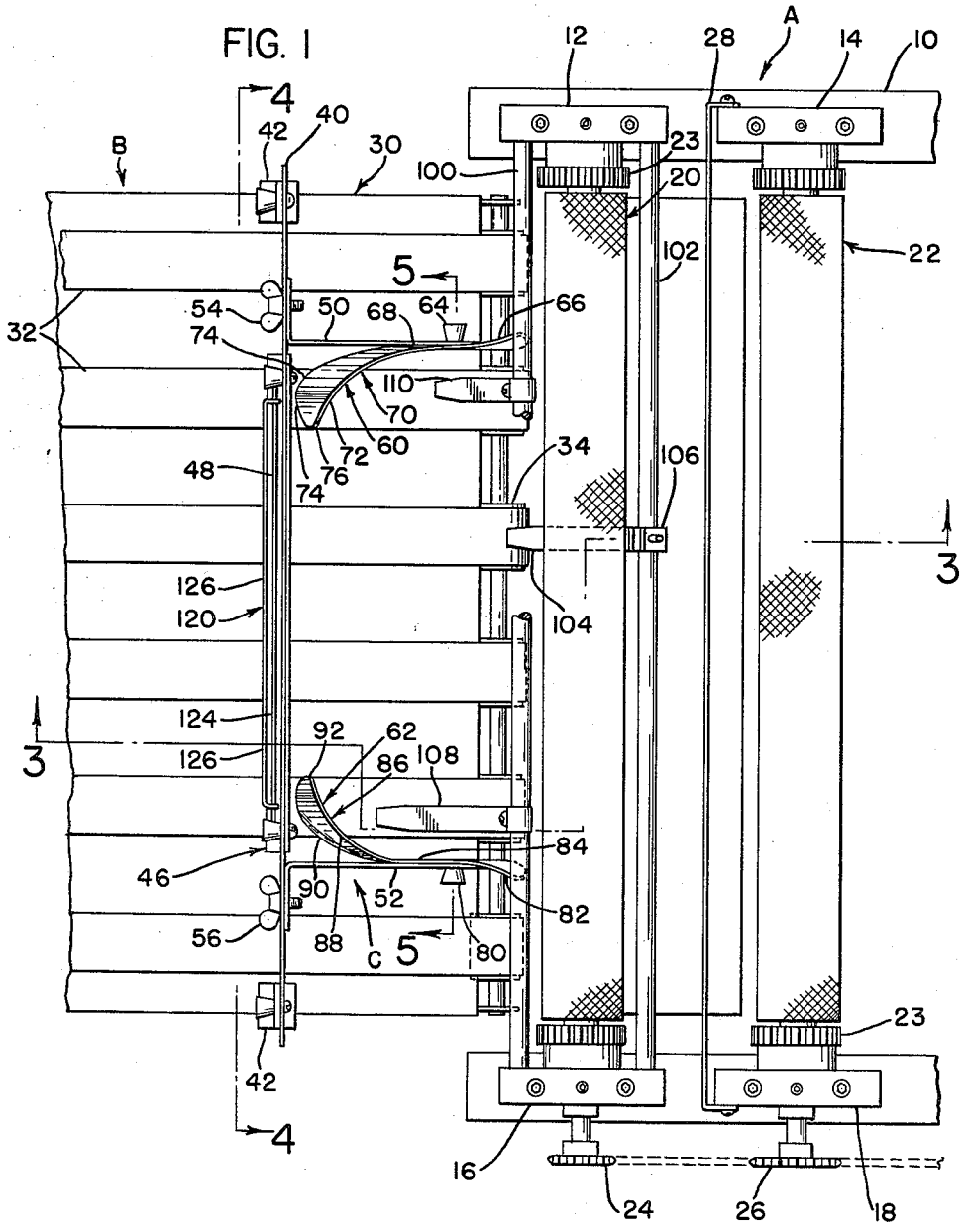
Oct. 29, 1963 C. J. DIETRICK 3,108,796

COLLATING DEVICE

Filed March 16, 1962 4 Sheets-Sheet 1

FIG. 1



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COLLATING DEVICE

Filed March 16, 1962 4 Sheets-Sheet 2

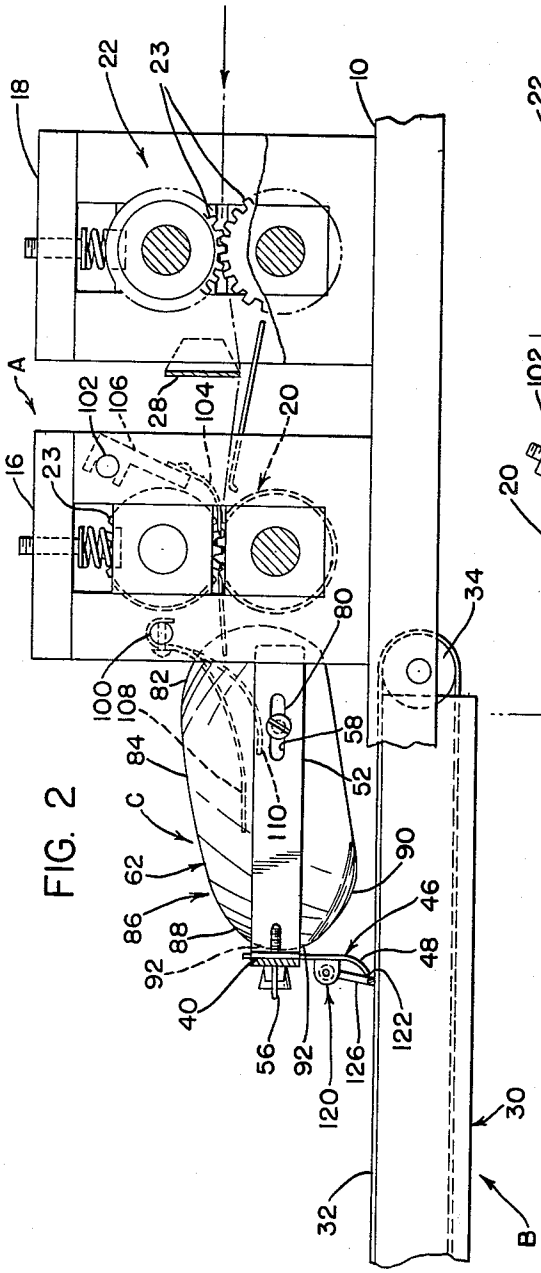


FIG. 2

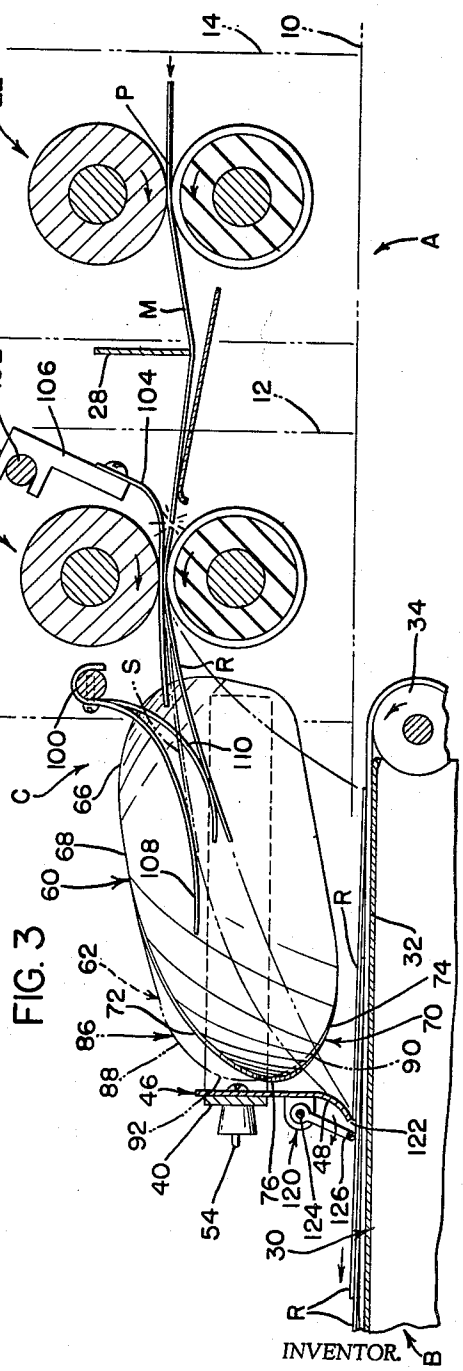


FIG. 3

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COLLATING DEVICE

Filed March 16, 1962 4 Sheets-Sheet 3

FIG. 4

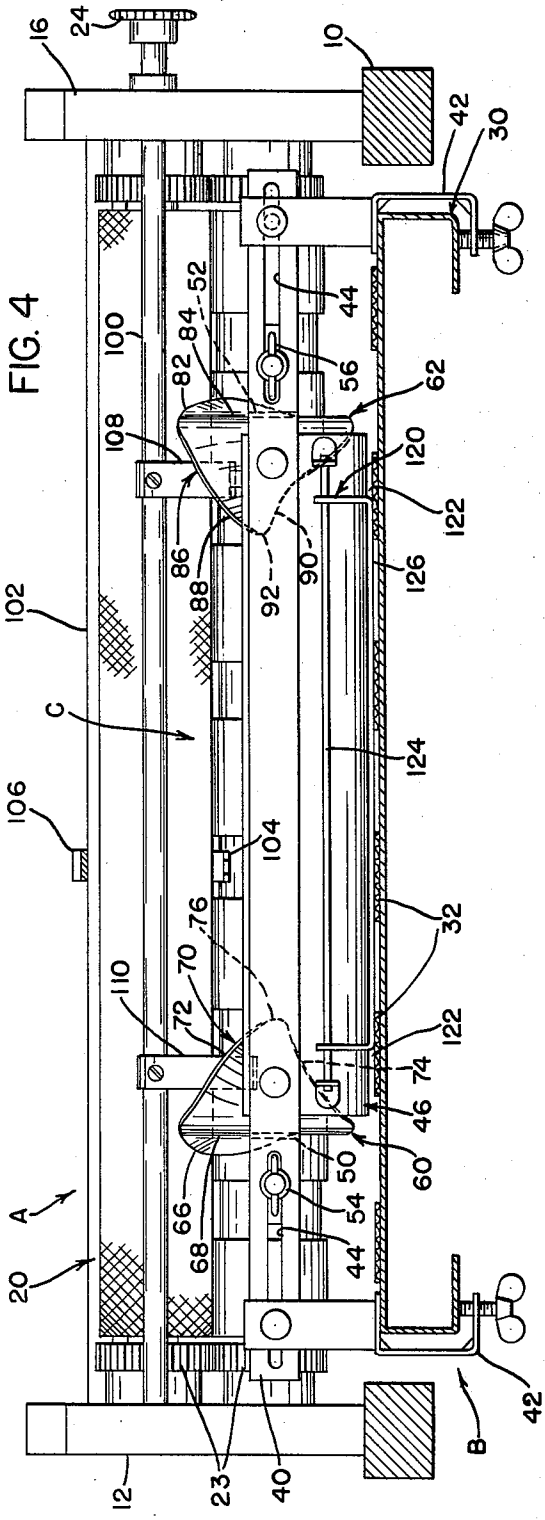
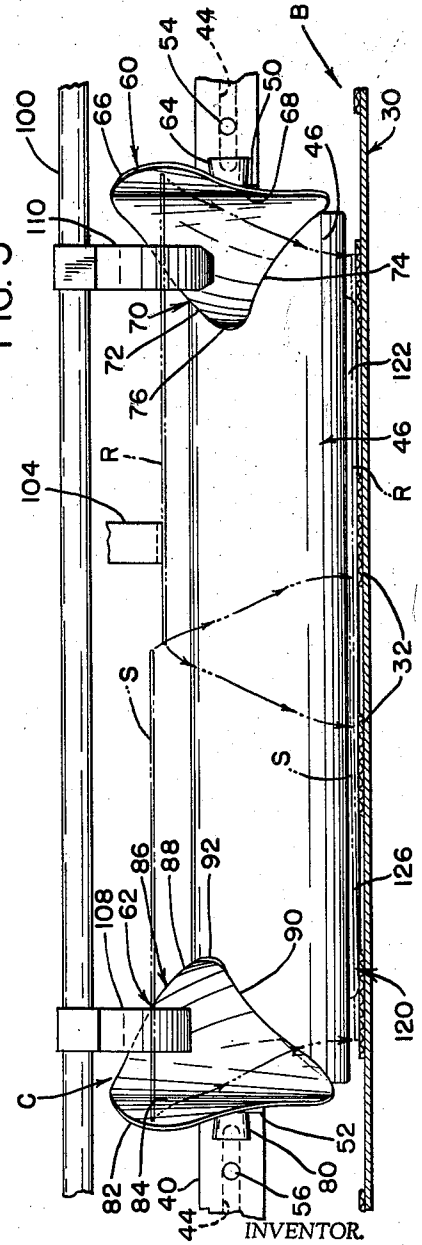


FIG. 5



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Filed March 16, 1962 4 Sheets-Sheet 4

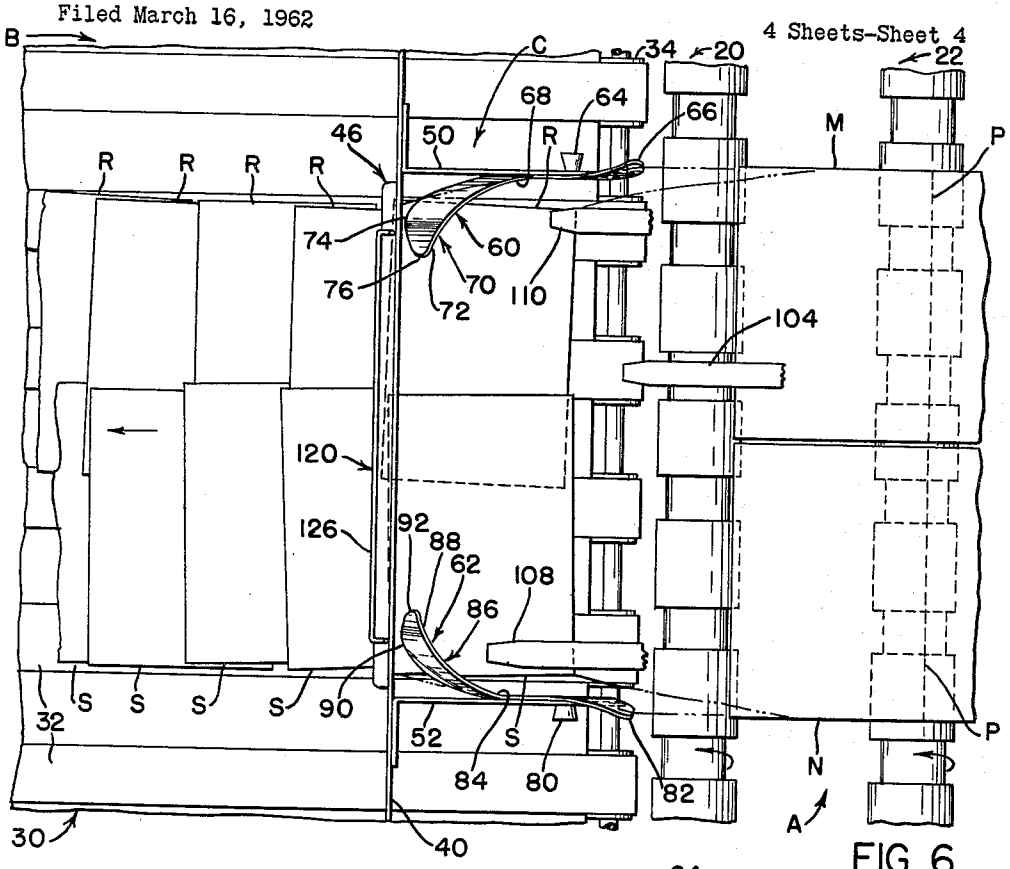
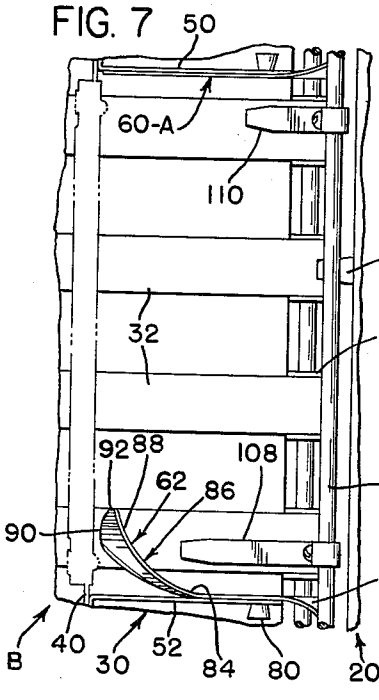


FIG. 6

FIG. 7



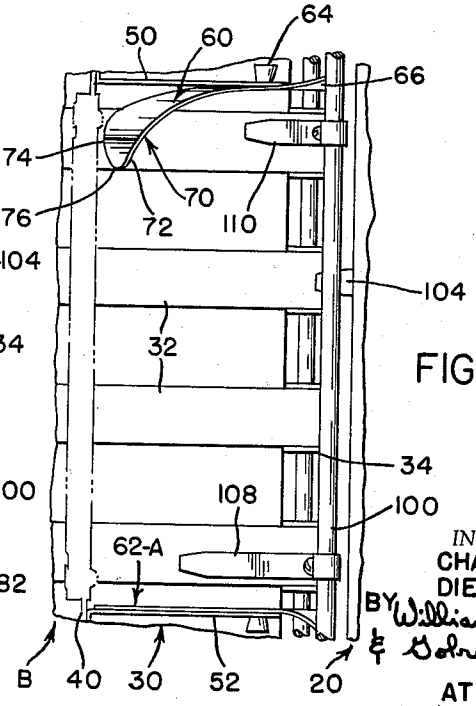


FIG. 8

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COLLATING DEVICE

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11 Claims. (Cl. 270—53)

This invention pertains to the art of collating cards or other thin printed sheets, and more particularly to a device adapted to collate printed cards issuing in side-by-side relationship from a high speed machine.

The invention is particularly applicable for collating printed cards as they issue in side-by-side relationship from a high speed billing and bursting machine and it will therefore be discussed with particular reference thereto; however, it is to be appreciated that the invention has much broader application and could be used for collating individual cards issuing in side-by-side relationship from a large variety of machines, such as high speed rotary printing presses, or the like.

A major task of certain types of large organizations, and particularly public utilities, is accurate and regular customer billing, usually on a monthly basis. Because of the enormous number of cards to be prepared, it has become common practice to utilize mechanized procedures to process these cards. A variety of mechanized procedures are presently in use, and one of the procedures involves printing the billing information onto a plurality of individual bills which are arranged in a long continuous strip adapted to be threaded through a printing machine that transfers information from a computer onto the bills. This elongated strip is comprised of individual cards arranged in side-by-side relationship and having perforated dividing lines for separation of the cards after the billing information has been printed thereon. As parallel strips of cards are fed through the machine, means are provided for tearing or so called "bursting" each card forward in a predetermined horizontal path adjacent the exit end of the machine. Because of this "bursting" operation, the machines are commonly referred to as "bursting machines" and will hereinafter be so designated.

As a bursting machine propels a pair of separated cards in a substantially horizontal direction from the exit end thereof, it is necessary to place one card on top of the other in a predetermined sequence. To assure proper stacking of the cards with a card from one strip always above a card from the other adjacent parallel strip, it is known to provide a device opposite the exit end of the bursting machine in which cards are allowed to float downward solely by force of gravity into a boxlike member having vertically inclined walls. However, this type of device, not being positive in action, is far too slow to keep pace with the potential speed of the bursting machine. Since known bursting machines are presently designed to burst up to nine pairs of cards per second, this volume of cards cannot be handled by present collating accessories. As a consequence, bursting machines must be operated far below designed capacity because of the bottleneck effect of the collating device.

The present invention is directed to a collating device particularly adapted for use on a high speed bursting machine of the type described which overcomes the above-mentioned disadvantages of prior art collating devices, and is easily adapted for use on a variety of billing or printing machines which require collation of side-by-side cards issuing from the machine.

Basically, the present invention utilizes the positive momentum of the cards issuing from the bursting machine to provide positive collation at a rate automatically in synchronization with the speed of the bursting machine. In accordance with the present invention, the device comprises means in the horizontal path for forcing the first

card downwardly with respect to the second card; baffle means in the horizontal path and substantially aligned with the exit end of the machine for forcing the cards into overlapping relationship with the first card under the second card; and a means for forcing the overlapping cards in a downward direction.

In accordance with another aspect of the present invention, there is provided a device for collating a pair of individual cards as they issue from the exit end of a machine in side-by-side relationship in a predetermined horizontal path, the device comprising, in combination: a pair of deflectors adjacent the exit end of the machine and on opposite sides of the horizontal path, the deflectors having entrant portions and exit portions, the entrant portions being adjacent the exit end of the machine and spaced from each other a distance greater than the combined width of both cards. At least one of the deflectors is provided with a baffle adjacent the machine exit end thereof. This baffle has a surface inclined inwardly toward the horizontal path of the cards and downwardly from the machine with a terminal tip remote from the machine spaced from the other deflector a distance less than the combined width of the card. Means are also provided for deflecting one of the cards vertically with respect to the other before the cards reach the baffle.

In accordance with another aspect of the present invention, there is provided a collating device of the type described wherein each deflector is provided with a baffle as defined, a back plate extending between the deflectors at the ends remote from the machine, and defining a transversely extending opening for feeding the collated cards onto a conveyor. A gate means yieldably closes the opening to prevent passage of more than two pairs of cards through the opening at one time.

The term "horizontal path" as herein used is only relative, and refers to the movement of cards in a direction of edgewise travel, or substantially parallel to their flat sides, instead of vertically in a direction perpendicular to their flat sides. Thus, the horizontal path may be slightly curved without causing the cards to move perpendicular to their flat side.

It is among the objects of this invention to provide: a collating device for sequentially arranging pairs of cards issuing in a horizontal path and in side-by-side relationship from the exit end of the machine, which device utilizes the momentum of the cards as they are propelled from the machine for collating one predetermined card above the other card of each pair; a collating device for sequentially arranging pairs of cards issuing in a horizontal path and in side-by-side relationship from the exit end of the machine, which device is positive in operation and tends to prevent the cards from being arranged in an improper order; a collating device for sequentially arranging pairs of cards issuing in a horizontal path and in side-by-side relationship from the exit end of the machine, which device provides a pair of deflectors in a horizontal path so that the cards are forced into overlapping relationship as they are being propelled from the machine; and a collating device of the type described which device positively overlaps the cards in each pair and deposits them in pairs onto a belt conveyor.

These and other objects and advantages will become apparent from the following description hereinafter set forth to illustrate preferred embodiments of the invention as read in connection with the accompanying drawings in which:

FIGURE 1 is a plan view illustrating the preferred embodiment of the invention;

FIGURE 2 is a side elevational view showing the preferred embodiment of the invention;

FIGURE 3 is a cross sectional view taken along line 3—3 of FIGURE 1;

FIGURE 4 is an elevational view taken along line 4—4 of FIGURE 1;

FIGURE 5 is an elevational view showing the path of travel of cards through the preferred embodiment of the invention;

FIGURE 6 is a plan view similar to FIGURE 1, showing the movement of the cards through the preferred embodiment of the invention.

FIGURE 7 is a plan view of another embodiment of the invention; and

FIGURE 8 is a plan view of yet another embodiment of the invention.

Referring now to the drawings, wherein the showings are for the purpose of illustrating a preferred embodiment of the invention only, and not for the purposes of limiting same, FIGURE 1 shows a bursting machine A for supplying two continuous side-by-side strips of perforated cards to be separated and collated into a predetermined sequence; a continuously moving conveyor B for transferring the collated individual cards away from the exit end of the bursting machine A; and a device C for positively collating the cards issuing from the bursting machine A and depositing the collated cards onto the conveyor B. In the usual installation, the cards passing through the bursting machine A have been previously printed with various information and are ready for use after they have been collated and stacked by the collating device A.

Referring now to FIGURES 1–3, the bursting machine A is comprised essentially of an appropriate supporting frame **10** for mounting spaced journal stands **12**, **14**, **16** and **18** which are so arranged to provide a mounting means for spaced bursting roll sets **20**, **22**. As is best seen in FIGURES 2 and 3, the sets of bursting rolls are spaced transversely from each other but are generally aligned so that the contact area between the individual rolls of each set are substantially in the same horizontal plane. To provide the proper gripping between the rolls and the cards which pass between these rolls, the outer surfaces of the upper rolls are usually knurled and the lower rolls are usually provided with a rubberized outer surface. Adjacent each end of the bursting roll sets are interconnected spur gears **23** which synchronize the movement of each roll in the sets. Drivingly affixed to the ends of the upper bursting rolls are drive sprockets **24**, **26** of different diameters adapted to rotate the bursting rolls. Positioned between the bursting roll sets is a transversely extending bursting rail **28**. The construction of the bursting machine A is conventional and forms no part of the invention but is described in detail to better appreciate the environment to which the present invention is directed.

As the cards issue from the bursting machine A, they are deposited on the conveyor B which, in essence, is comprised of a generally flat table **30**, a plurality of endless belts **32** slidably received on the table and driven by appropriate power means (not shown), and a plurality of idler wheels **34** for supporting the endless belts **32**. This conveyor forms no part of the invention and the conveyor may be completely removed to allow depositing of the cards in a stack below the collating device C.

The collating device C, which is a preferred embodiment of the invention, is provided with a supporting framework comprising a transversely extending mounting rail **40** supported on the conveyor cable **30** by transversely spaced clamping stands **42**, as is shown in FIGURE 4. To provide adjustment of the rail **40** with respect to the upright stands **42**, the rail is provided with appropriate elongated slots **44**. Of course, various modifications could be made in the rail and its adjusting mechanism; for instance, it is within the contemplation of the invention to mount the rail fixedly onto the conveyor or another supporting structure without an adjusting means.

The transversely extending mounting rail **40**, provides a support for mounting a back plate **46** which extends transversely along the intermediate portion of the mounting rail and has a terminal, generally curved, end **48** as shown in FIGURES 2 and 3. The function of this back plate will be hereinafter described in detail.

In accordance with the preferred embodiment of the invention, spaced longitudinally extending mounting rails **50**, **52** are secured onto the transverse rail **40** by appropriate means such as wing bolts **54**, **56**. To provide an adjusting feature as will be described later, the longitudinally extending mounting rails **50**, **52** are provided with appropriately located slots **58** as shown in FIGURE 2.

The basic components of the collating device C are the card deflectors **60**, **62**, constructed to collate cards issuing in side-by-side relationship from the exit end of the bursting machine A. In the preferred embodiment the deflectors differ slightly from each other and will therefore be discussed separately.

Deflector **60** is provided with an appropriate bolt **64** which is adapted to coact with the elongated slot **58** of longitudinally extending mounting rail **50** so that the deflector may be adjusted both pivotally and longitudinally with respect to the mounting rail **50**. This allows minute and accurate adjustment of the deflector to provide optimum operation of the collating device. As seen in FIGURES 1–5, the card deflector **60** is generally vertical with respect to the conveyor and bursting machine and extends longitudinally from the exit end of the bursting machine. An entrant end **66** of deflector **60** is closely spaced from the bursting machine and has a slight outwardly extending curvature so that cards coming from the bursting machine will be funneled into an intermediate portion **68** which portion is substantially a vertical surface over a predetermined longitudinal length. The deflector has an exit end **70** remote from the exit end of the bursting machine which, in essence, forms a baffle having an upper edge **72**, a lower edge **74** and an inwardly extending tip **76**. As is best shown in FIGURE 1, the upper and lower edges are curved inwardly toward deflector **62** and provide a compound inclined surface which curves toward the baffle **62** and also slopes downwardly and outwardly from the exit end of the bursting machine. The upper edge **72** is shown as being spaced in a longitudinal direction from the lower edge **74** so that the baffle **70** has a vertical slope extending away from the bursting machine. The inwardly facing surface of deflector **60** is highly polished so that there is a minimum frictional drag as a card slides along this surface.

Referring now to deflector **62**, there is provided an adjusting bolt **80** which is identical in structure and function to the bolt **64** of deflector **60**. Deflector **62** comprises an entrant end **82** having an outwardly curved surface, an intermediate portion **84** which is substantially vertical, and an exit end or baffle **86** which components are substantially identical to the corresponding components of the deflector **60**; however, the baffle **86**, comprising an upper edge **88**, a lower edge **90** and an inwardly extending tip **92** is slightly different in configuration from the baffle **70** of the deflector **60**. The basic difference being that the slope defined by the upper edge **88** and the lower edge **90**, is more nearly vertical than the corresponding slope of the baffle **70**. This slope, of course, can be changed by adjusting the pivotal relationship of the deflector with respect to the rearwardly extending longitudinal mounting rails **50**, **52** as has been described.

The curvature of baffles **70**, **86** must be such that the cards issuing from the bursting machine are forced into overlapping relationship without jamming against the surfaces of the baffles. As an ancillary function, the outward and downward slope of the baffles **70**, **86** as viewed from the exit end of the bursting machine, forces downwardly any card or sheet being propelled in a horizontal direction against these baffles.

On the bursting machine A, there are provided transversely extending support rods 100, 102 adapted to provide the mounting means for a plurality of control fingers. Although various groupings of control fingers are within the contemplation of the invention, in a preferred embodiment there is provided a forwardly extending rear control finger 104 affixed to a mounting bracket 106 of the support rod 102 and extending through an appropriate recess between the bursting rolls of set 20. This rear finger is positioned to the right of the bursting machine centerline, as viewed looking from the bursting machine toward the collating mehcanism, and in the portion of the horizontal path followed by the right card. A forwardmost control finger 108 is secured onto the support rod 100 and extends outwardly on the corresponding left side of the bursting machine. A control finger 110, extends outwardly to longitudinal position between the control fingers 104 and 108, and is positioned laterally on the right side of the bursting machine. Referring to FIGURES 2 and 3, the outermost control finger 108 is spaced vertically with respect to the control finger 110 for a purpose to be hereinafter described in detail.

Referring to FIGURES 3 and 4, the back plate 46 is provided with an escapement 120 adapted to yieldably close a space 122 defined by the under surface of curved end 48 and the upper surface of the endless belts 32, which space is greater than the thickness of the card or sheets being handled by the collating device C. A transversely extending journal rod 124 supports a swinging gate 126 which swings into closing engageemnt with space 122 to control the passage of cards under the backing plate 46.

The operation of the collating device and the path followed by the cards being collated are illustrated by the phantom lines of FIGURES 3, 5 and 6. A continuous strip of side-by-side printed cards is fed into the bursting machine A. By a slitting mechanism (not shown), the single strip of cards is slit and trimmed into separate longitudinally extending strips M, N passing through the right and left portion of the machine respectively as seen in FIGURE 6. The individual cards of each strip are divided by perforated lines P between each individual card. As the cards of both strips M, N pass between the roll sets 20, 22 the differential speed of the rollers separates the right card R and the left card S from the strips M, N by rupture along the perforated line P. Consequently, the right and left cards are propelled at high speeds from the roll set 20 toward the collating deflectors 60, 62. Initially, the cards are in side-by-side relationship with each other and the spacing between entrant ends 66, 82 is at least slightly greater than the combined width of both cards R, S. The right card R is engaged by the rear control finger 104 in the horizontal path of card R to deflect this card slightly downward as it engages the entrant end of the deflector 60. The momentum of the cards as they are propelled outwardly from the bursting machine carries the cards along the intermediate portions 68, 84 of the deflectors at which position the control finger 110 in the horizontal path of the right card forces card R further downwardly before it engages the baffle 70. Control finger 108 in the horizontal path of the left card engages the upper surface of the card S so that the card is directed into the sloping portion of baffle 86 and can be forced slightly inwardly and downwardly by this baffle. Cards R, S are thus forced inwardly into overlapping relationship by the momentum generated by the bursting machine as it propels the cards outwardly against the deflectors 60, 62. The downward slope of the deflectors directs the cards downwardly onto the belts 32 and without these slopes, or if they were not gradual, the end of the baffle would tend to absorb the kinetic energy of the fast moving cards and cause an abrupt stop of the cards which would interrupt the flow of the cards. By the construction of the deflectors with this slight outward slope with respect to the exit end of the bursting machine, the kinetic energy of the cards not only positively shifts the cards inwardly into overlapping relationship, but also positively forces the cards downward onto the conveyor. Referring to FIGURE 3, the exit end of the deflector 62 is somewhat above the exit end of the deflector 60. This allows the deflector 62 to engage the higher card S on surface having substantially the same slope as the portion of deflector 60 contacting the lower card. The horizontal path followed by cards R and S is disclosed in FIGURES 3 and 6 which illustrate that the cards are propelled in an edgewise direction into the baffles 70 and 86 so the momentum of the cards forces the cards into overlapping relationship. Extension of the control fingers into the path of the cards deflects the cards downwardly slightly and thus the so called "horizontal" path of the cards may have a slight downward curve.

Referring now specifically to FIGURE 3, the swinging gate 126 of the escapement 20 rides along the surface of the cards as they pass through the space 122. Thus, as one pair of cards R, S are passing under the back plate 46, the gate 126 prevents other cards from following at once but allows the second pair of cards to lag substantially behind the leading edge of the first pair of cards. This arrangement of the cards is best shown in FIGURE 6 where the pair of cards are in slight overlapping relationship as they progress along the conveyor. The gate 126, prevents passage of more than four layers of cards stacked on top of each other and thus prevents a pair of cards from passing under the backing plate until the overlapping portion of the two previous pairs of cards has been passed, at which time the next card can follow on the trailing end of the immediately preceding card. Since there are four layers of cards passing under the center of the back plate, the space or opening must be greater than four times the thickness of the cards. By this escapement it has been found that a substantial stack of cards behind the backing plate can be disposed of individually without jamming the collating device.

In FIGURE 7 is shown a second embodiment of the invention in which right deflector plate 60 has been substituted by a straight side deflector 60–A. In this embodiment lateral deflection is imparted only to card S by deflector 62. In FIGURE 8, left deflector 62 has been substituted by straight side deflector 62–A, wherein it is card R to which is imparted lateral deflection by deflector 60, rather than card S as shown in FIGURE 7. The operation of the collating mechanism is otherwise similar in all other respects. These embodiments of FIGURES 7 and 8 are contemplated for use in applications where simultaneous lateral deflection of both cards R and S is not desirable.

Although particular emphasis has been placed on the use of the invention as a collating device for customer billing cards, it is appreciated that a variety of other printed cards could be collated by the present invention and it is not intended that the invention be limited to use on a customer billing machine. Accordingly, the invention has been discussed in connection with but three preferred embodiments; however, it is appreciated that various other structural changes may be readily suggested to those skilled in the art upon reading the foregoing description of the invention, and may be made without departing from the spirit and scope of the invention as defined by the appended claims.

Having thus described my invention, I claim:

1. A device for collating first and second individual cards as they issue from the exit end of a machine in side-by-side relationship in a horizontal path comprising: a means for forcing said first card downwardly with respect to said second card, a pair of deflectors adjacent the exit end of said machine and on opposite sides of said horizontal path, and at least one of said deflectors having a surface inclined inwardly and intersecting said path for forcing said cards into overlapping relationship,

said surface also being inclined downwardly for forcing said overlapping cards in a downwardly direction.

2. A device for collating first and second individual cards as they issue from the exit end of a machine in side-by-side relationship and along a predetermined path comprising: means for forcing said first card downwardly with respect to said second card, baffle means substantially aligned with said exit end of said machine for forcing said cards into overlapping relationship, and a means for forcing said overlapping cards in a downward direction, said device including a conveyor below said baffle means and having an endless belt moving in a plane substantially parallel and below said horizontal path, a back plate having a lower edge and extending across said conveyor, said lower edge being spaced from said endless belt a distance greater than four times the thickness of said cards, and a gate means biased towards said machine for yieldable movement into a pressure relationship between said lower edge and said endless belt.

3. A device as defined in claim 2 wherein said gate means comprises a springable gate and means for pivotally mounting said gate onto the side of said back plate.

4. A device for collating first and second individual cards as they issue from the exit end of a machine in side-by-side relationship and along a predetermined path comprising: means for forcing said first card downwardly with respect to said second card, baffle means substantially aligned with said exit end of said machine for forcing said cards into overlapping relationship, and a means for forcing said overlapping cards in a downward direction, said means for forcing said first card downwardly comprises a control finger extending downwardly into the portion of said path followed by said first card and means for mounting said control finger adjacent said exit end of said machine, and a conveyor below said baffle means and having an endless belt moving in a plane substantially parallel and below said horizontal path, a back plate having a lower edge and extending across said conveyor, said lower edge being spaced from said endless belt a distance greater than four times the thickness of said cards, and a gate means biased towards said machine for yieldable movement into a blocking relationship between said lower edge and said endless belt.

5. A device as defined in claim 4, wherein said gate means comprises a swingable gate and means for pivotally mounting said gate onto the side of said back plate opposite said machine.

6. A device for collating first and second individual cards as they issue from the exit end of a machine in side-by-side relationship and in a predetermined horizontal path, the device comprising, in combination: a first finger extending into the portion of said horizontal path followed by said first card, a second finger spaced vertically from said first finger and extending from above the portion of said horizontal path followed by said second card, a baffle means in said path and substantially aligned with said exit end for forcing said cards into overlapping relationship with said first card under said second card, said baffle means, including an inclined surface intersecting said path, for forcing said overlapping cards in a downward direction.

7. In the combination of a bursting machine having an exit end for issuing first and second cards simultaneously in side-by-side relationship and in a predetermined horizontal path, a conveyor means having an endless belt, said endless belt moving in a plane substantially parallel and below said horizontal path, and a device for collating said cards in a predetermined sequence, the improvement comprising in combination: said collating device including means in said path for forcing said first card downwardly with respect to said second card, baffle means in said horizontal path and substantially aligned with said exit end for forcing said cards into overlapping relationship with said first card under said second card and means for forcing said overlapping cards in a downward direction.

8. The improvement as defined in claim 7, including a back plate having a lower edge and extending across said conveyor, said lower edge being spaced from said endless belt a distance greater than four times the thickness of said cards, and a gate means biased toward said machine for yieldable movement into a blocking relationship between said lower edge and said endless belt.

9. The improvement as defined in claim 8, wherein said gate means comprises a swingable gate and means for pivotally mounting said gate onto the side of said back plate opposite said machine.

10. The improvement as defined in claim 7, wherein said baffle means comprises a pair of deflectors adjacent the exit end of said machine and on opposite sides of said horizontal path, at least one of said deflectors having a baffle surface inclined inwardly and intersecting said path for forcing said card into overlapping relationship.

11. In the combination of a bursting machine having an exit end for issuing first and second cards simultaneously in side-by-side relationship and in a predetermined horizontal path, a conveyor means having an endless belt, said endless belt moving in a plane substantially parallel and below said horizontal path, and a device for collating said cards in a predetermined sequence, the improvement comprising in combination: said collating device including means in said path for forcing said first card downwardly with respect to said second card, baffle means in said horizontal path and substantially aligned with said exit end for forcing said cards into overlapping relationship with said first card over said second card and means for forcing said overlapping cards in a downward direction.

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