MAGNETIC INDEX CARDS AND METHOD FOR PRODUCING SAME
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This application is a continuation-in-part application of my said prior application Ser. No. 179,020 which was filed Mar. 12, 1962 and now abandoned. Accordingly, individual tabulating cards have, in the past, been insurmountable task. Accordingly, individual tabulating cards have, in the past, been adhesively assembled into a continuous belt having separable marginal and end strips for use in manipulating and assembling the cards.

According to this scheme, individual blanks of the card stock are first printed with the data form and then assembled as a continuous belt for feeding into the printer or puncher which is to record specific information on the cards. The adhesive assembling of pre-printed data cards has proved to be a substantial hindrance to efficient operations, and the overlapping regions of the cards in such a continuous belt have proved to be difficult to handle, particularly at very high speeds.

In view of the prior difficulties, important and broad objects of the present invention are to provide a new and improved laminated card having magnetizable elements therein and to provide both methods and apparatus for fabricating such a card.

Additional important objects of the present invention are to provide laminating tabulating cards in a continuous form and to provide both methods and apparatus for fabricating such an article.

Other important objects of the invention are to provide a magnetically actuable, business machine card having magnetic elements disposed along opposite sides thereof and extending the entire height of the card and to provide both methods and apparatus for fabricating such a card.

Another object is to provide a greatly simplified method for positioning magnetizable metal inserts at two parallel edges of a laminar card.

Still another object is to provide an improved method for arranging a filler including a magnetizable portion in juxtaposed relationship between outer covering layers.

Yet another object is to combine in a single, multi-step method a sequence of operations wherein paper in webs is united with magnetic strips in a predetermined relation, the resulting structure then being printed and severed into discrete cards for storing information.

And yet another object is to combine in a single, multi-step method a sequence of operations wherein paper in webs is united with strips of magnetic material in a predetermined relationship to form a continuous belt of uniform thickness, which belt contains severable card elements and which belt is arranged to be handled at high speed and with great precision in transferring information to the separable card elements thereof.

Still another object is to provide an improved, flat, generally rectangular card of uniform thickness having magnetizable portions thereon.

Yet another object is to provide a card of the type described composed of outer laminae of non-magnetic quality and a central filler comprising magnetizable strips disposed along opposite edges of an intermediate lamina of a non-magnetic quality.

A further object is to provide a card of uniform thickness in which the lateral edges are supportingly reinforced with metal strips whereby to afford utilization of such cards for magnetic sorting.

These and other objects and features of the invention will become more apparent from a consideration of the following descriptions.

The invention, both as to its organization and method of operation, will be better understood by reference to the following specification taken in association with the accompanying drawings wherein like reference numerals designate like parts throughout, in which:

FIG. 1 is an elevational, diagrammatic view of an apparatus embodying the principles of the present invention for fabricating a plurality of laminar cards;
FIG. 2 is a fragmentary perspective view of the apparatus shown in FIG. 1; FIG. 3 is an exploded, sectional view on an enlarged scale of the several webs of sheet material processed by the machine of FIG. 1; FIG. 4 is a greatly enlarged, fragmentary sectional view taken in the direction of the arrows along the line 4—4 in FIG. 2; FIG. 5 is an exploded view of a card made in accordance with and embodying the principles of the present invention; FIG. 6 is an assembled view of the card shown in FIG. 5; FIG. 7 is a greatly enlarged, sectional view taken in the direction of the arrows along the line 7—7 in FIG. 5; FIG. 8 is a view similar to the showing of FIG. 7 but taken in the direction of the arrows along the line 8—8 in FIG. 6; FIG. 9 is an elevational, diagrammatic view of modified apparatus embodying the principles of the invention and arranged for fabricating a continuous belt of separable, laminous cards; FIG. 10 is a fragmentary perspective view of the apparatus shown in FIG. 9; FIG. 11 is an enlarged plan view of the continuous belt produced by the apparatus of FIG. 9, the top lamina being removed for purposes of illustration; FIG. 12 is an exploded, sectional view on an enlarged scale of the several webs of sheet material processed by the apparatus of FIG. 9 in producing the continuous belt of FIG. 11; FIG. 13 is a perspective view of the belt of FIG. 11 showing separation of a tabulating card therefrom; FIG. 14 is a perspective view of the separated tabulating card of FIG. 13, indicating in broken outline at one edge the positioning of the magnetizable strip and illustrating the outer laminae of the card being peel ed back at the opposite edge to reveal the construction of the edge of the card; FIG. 15 is an enlarged, sectional view taken in the direction of the arrows along the line 15—15 in FIG. 14; FIG. 16 is a schematic view of the card of FIG. 14 arranged with laterally disposed permanent magnets to illustrate the self-locating character of the magnetic field in the magnetizable strips; FIG. 17 is an enlarged perspective view of the perforating and slitting roller and the cooperating backup roller employed in the apparatus of FIG. 9 in processing the continuous belt of FIG. 11; FIG. 18 is an elevational, diagrammatic view showing apparatus in which the continuous belt of FIG. 11 is used, illustrating in particular the pre-printing, data printing and bursting of the individual tabulating cards from the continuous belt; and FIG. 19 is an enlarged, sectional view taken in the direction of the arrows along the line 19—19 in FIG. 18 to illustrate construction of the core and end blocks used in winding the continuous belt of FIG. 11.

The card of the present invention is well shown in FIGS. 5-8, being generally designated therein by the numeral 10. The card 10 is generally rectangular or oblong in form, shown clearly in FIG. 6, and has a long top or upper edge 12, a long bottom or lower edge 14, a somewhat shorter right side edge 16, and a generally similar left side edge 18. The card is opposable to properly indexing a plurality of cards 10, an upper left hand corner 20 may be beveled between the edges 12 and 18.

The card 10 is of multi-layer or laminar construction and includes a first outer layer 22, a second outer layer 24, and an intermediate or filler layer 26. The first and second outer layers 22 and 24 are generally identical in shape and thickness and are formed of non-magnetic materials, for example, paper, pressboard, or sheet materials composed of resinous polymers. The exposed surface of the first lamina or layer 22 may be printed with characters for storing information on the card 10; or alternatively, rectangular holes (not shown) may be punched in the card 10 at predetermined intervals to effect information storage in a manner well known in the art.

The central lamina 26 includes an intermediate sheet 28 of a material generally identical to that of the laminae 22 and 24. Further, the central layer 26 includes two generally rectangular strips 30 and 32 of ferritic metal or other magnetic material, these strips being arranged on opposite ends of the sheet 28 adjacent the shorter dimensions thereof. The metal strip 30 is of a thickness identical to that of the sheet 28 which may be, for example, 0.002 inch. The material from which the strips 30 and 32 are formed is characterized by being magnetically permeable but practically without any remanence in order to preclude sticking together of a plurality of cards 10 subsequent to their being exposed to an external magnetic field. One suitable material for the strips 30 and 32 is steel foil; and the foil may be coated, as with metallic tin, or left uncoated as is desired.

In the juxtaposed, layer-like, assembled position of the laminae 22, 24 and 26 the sheets 22, 24 and 26 define spaced pockets 34 which are substantially filled by the respective strips 30 and 32 as is clearly shown in FIG. 8. A layer of adhesive is interposed between the confronting surfaces of the laminae 26 and 22 and 24 to bond the three layers securely into a united structure. It has been found that the adhesive may be applied to both planar surfaces of the central lamina 26 or to the non-exposed planar surfaces of the laminae 22 and 24. The adhesive employed to achieve the bonded relationship may be of a heat curing type or of a pressure sensitive variety, these adhesives being well known in the paper making arts.

In FIGS. 1 and 2 of the drawings, there is shown an apparatus designated generally by the reference numeral 36. This apparatus is constructed and arranged in accordance with the principles of the present invention and is adapted to fabricate the card 10 in a rapid and economical manner. More specifically, the apparatus 36 includes a first spindle 38 having a first web or roll 37 of sheet material mounted thereon; a second spindle 40 having a second web or roll 39 of sheet material operatively mounted therewith; and another or intermediate spindle 42 having a third roll 41 of sheet material mounted thereon, the roll 41 on the spindle 42 being of narrower width than that of the webs 37 and 39. It is to be appreciated that the spindles 38, 40 and 42 are all freely rotatable and the web framework (not shown) in a manner well known in the art and forming no part of the instant invention.

The material wound in the webs 37, 39 and 41 is withdrawn in lengths 37a, 39a, and 41a along predetermined paths from the respective webs, each length or sheet being disposed in a plane at the outer displaced from the others. Along the path of web withdrawal, a fourth spindle 44 affords mounting means for two spaced apart coils of magnetic metal strip material respectively designated 46 and 48. The coils of metal 46 and 48 are so mounted on the apparatus 36 whereby the lengths 46a and 48a which are withdrawn from the respective coils are disposed in close adjacency with the edges of the sheet 37. Thus, the combined width of the material 41a and strips 46a and 48a equals the width of the outer sheets 37a or 39a, clearly shown in FIG. 2. Further, the thickness of the central sheet 41a is generally equal to the thickness of the metal strips 46a and 48a, such thickness and the thickness of the metal strips 46a and 48a may be from about 0.001 to 0.002 inch and sometimes as much as 0.003 inch, thereby affording the requisite amount of magnetic material to lend the desired function to the cards.

The materials on the respective webs or coils are withdrawn therewith and the construction of the pairs 50 along the aforementioned paths. A spaced pair of guide rollers 52 is arranged transversely of the path, one roller 52 being disposed in the plane of the sheet 37a and the other roller 52 being arranged in the plane of the sheet
A drying oven 58 receives the juxtaposed length of material from the pressure rollers 54 to cure the adhesive in the laminated structure as it passes through the oven. The continuous sheet issuing from the drying oven 58 is received into a printing and severing mechanism designated generally by the numeral 60 and including a platen 62 having a plurality of printing plates 63 mounted thereon for applying characters to the continuous length of material in discrete areas. Intermediate the printing plates, there is arranged on the platen 62 a knife 64 which cooperates with a complementary slot 66 in a roller 68 arranged below the platen 62. Thus, as the platen 62 and the roller 68 rotate in synchronization, the knives 64 sever the length of sheet material into discrete cards 10, the cards being received in the respective slots 66. In this operation, it is to be appreciated that the cards are printed and severed.

Thus, it may be seen that there has been provided an apparatus to perform a method for continuously printing and fabricating cards 10 in a highly efficient manner. The magnetically attractive cards 10 are produced through the foregoing method in uniform thickness and possess stiffened portions adjacent opposite edges whereby to afford long life to the cards and little tendency to curl in an objectionable manner. The strips of metal received within the slots or pockets 34 in each card, being of a thickness in the range from about 0.001 to about 0.002 of an inch, afford a sufficient mass of magnetizable material to permit sorting of the cards 10 by magnetic means.

While a particular embodiment of the invention has been thus far shown and described, it should be understood, of course, that the invention is not strictly limited thereto since many modifications may be made. Therefore and in order to enhance the understanding of the invention, a modified embodiment of the invention, in the three aspects of method, apparatus and article of manufacture, is shown in FIGS. 9-19. The embodiment of FIGS. 9-19 is particularly characterized by the provision of laminar, magnetic cards which are separably interconnected to form a continuous web for ease in handling and initial processing.

More specifically and with particular reference to FIGS. 9 and 10, apparatus which is there indicated generally by the reference numeral 70 is arranged to include an upper spindle 72 and a lower spindle 74 which have wound thereon respectively first and second webs 76 and 78 of non-magnetic sheet material. The apparatus 70 also includes an intermediate spindle 80 having a third web 82 of non-magnetic sheet material wound thereon, the web being of narrower width than the webs 76 and 78. As in the case of the apparatus 36 described hereinbefore, the various spindles in the apparatus 70 are mounted in a framework (not shown) in a manner well known in the art and forming no part of the present invention.

The sheet material that is wound in the webs 76, 78 and 82 is withdrawn in lengths 76a, 78a and 82a respectively along predetermined paths from the corresponding spindles and in a generally common direction, each length which is withdrawn from the respective webs being disposed in a plane that is displaced from the others initially.

In the general direction in which the lengths are withdrawn from their respective webs, there are disposed successive spindles 84 and 86, and each of these latter spindles affords a roll 88. Intermediate the pressure rollers 54 and the spindle 44, a tube 56 is arranged on each side of the central sheet 41a and the metal portions 46a, 48a. Each tube 56 has a plurality of nozzles thereon to direct a mist or spray of adhesive onto the surface of the Intermediate layer 41a and the strips 46a and 48a adjacent thereto. Each tube 80 has a substantially associated supply of adhesive under pressure, the specific construction and arrangement of such not being pertinent to the features of the present invention.

A drying oven 58 receives the juxtaposed length of material from the pressure rollers 54 to cure the adhesive in the laminated structure as it passes through the oven. The continuous sheet issuing from the drying oven 58 is received into a printing and severing mechanism designated generally by the numeral 60 and including a platen 62 having a plurality of printing plates 63 mounted thereon for applying characters to the continuous length of material in discrete areas. Intermediate the printing plates, there is arranged on the platen 62 a knife 64 which cooperates with a complementary slot 66 in a roller 68 arranged below the platen 62. Thus, as the platen 62 and the roller 68 rotate in synchronization, the knives 64 sever the length of sheet material into discrete cards 10, the cards being received in the respective slots 66. In this operation, it is to be appreciated that the cards are printed and severed.

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More specifically and with particular reference to FIGS. 9 and 10, apparatus which is there indicated generally by the reference numeral 70 is arranged to include an upper spindle 72 and a lower spindle 74 which have wound thereon respectively first and second webs 76 and 78 of non-magnetic sheet material. The apparatus 70 also includes an intermediate spindle 80 having a third web 82 of non-magnetic sheet material wound thereon, the web being of narrower width than the webs 76 and 78. As in the case of the apparatus 36 described hereinbefore, the various spindles in the apparatus 70 are mounted in a framework (not shown) in a manner well known in the art and forming no part of the present invention.

The sheet material that is wound in the webs 76, 78 and 82 is withdrawn in lengths 76a, 78a and 82a respectively along predetermined paths from the corresponding spindles and in a generally common direction, each length which is withdrawn from the respective webs being disposed in a plane that is displaced from the others initially.
specifically, the knives 120 and 122 are arranged to cut completely through the web 106, but the desired lines of weakness may also be created with scoring knives or perforating tools if desired. Cooperatively, the roller 120 comprises a central barrel or drum 124 that is surfaced with a material which is soft enough to avoid seriously damaging the slitting knives as they pass through the material of the web 106 and which is resilient enough to urge the web into incising engagement with the slitting knives. Additionally, the drum 124 is fashioned with two series of peripheral recesses 126. Each series of recesses 126 is aligned radially and registered peripherally with a series of punches 118 in roller 108. Furthermore, the material which is disposed at the opposite ends of the roller 110 in the vicinity of the recesses 126 is selected to be stiff enough to support the material of web 106 against the entering edges of the punches 118 whereby to make clean sharp apertures in the web. This latter surfacing material may be but need not necessarily be the same material as that which is provided on the drum 124 in cooperative position with the slitting knives 120 and 122.

The punches 118 and the slitting knives 120 and 122 are fabricated from a suitable material such as hardened steel and have sharpened edges for cleanly cutting the web 106. Specifically, the punches 118 are arranged to perforate the web with a series of accurately spaced circular apertures 128 along the borders thereof. The apertures 128 are accurately aligned for purposes of receiving drive sprocket teeth in advancing the web 112 in a manner which will become more apparent hereinafter. The peripherally aligned slitting knives 120 are arranged to cut through the web forming parallel lines of slots 130 laterally inwardly from the apertures 128. Cooperatively, the axially aligned slitting knives 122 are arranged to cut through the web forming transverse slots 132. It is recognized that lines of small, circular or other shaped perforations or score lines can be substituted for the slots 130 and 132.

As will be apparent from an inspection of FIG. 17, the parallel lines of transverse slots 132 intersect the parallel lines of longitudinal slots 130 to outline or establish the distal edges of a series of rectangular cards 134, the cards 134 being interconnected by the material disposed between the individual slots 130 and the individual slots 132. However, the cards 134 may be readily separated into individual cards by rupture of this residual material. With reference to FIG. 11, it will be observed that the slots 130 are arranged to be located in the lengths 92a and 94a laterally outwardly of the lengths 88a and 90a which latter lengths are of the magnetic material. Facility in cutting clean straight sides on cards 134 wherein the magnetic material is metal sheet or foil is achieved in this manner. The transverse slots 132, however, cross the lengths 88a and 90a of magnetic material, and it has proved advantageous to extend a single slot 132 completely across the width of each of the lengths 88a and 90a in order to make separation of the individual cards from the web 112 an easy operation unassisted by fanning or ripping of the individual cards. This is particularly true when the lengths 88a and 90a are of continuous metallic material. Specially hardened and sharpened slitting knives may be employed for cutting through the web 112 at the lengths 88a and 90a. If desired and in addition, slots 132 which extend completely across each juncture with the lengths 88a and 90a may be combined with lines of fine perforations defining the remainder of the slots 132.

With reference to FIG. 14, an individual card 134 is seen to take generally rectangular or oblong form, having a long upper edge 136, a long lower edge 138 and short right side left sides or edges 140 and 142 respectively. The card 134 is, as will be apparent from the foregoing descriptions, of multilayer or laminous construction including portions of the various lengths 76a, 78a, 82a, 88a, 90a, 92a and 94a arranged generally as is shown in FIG. 12.

The layers 88a and 90a are selected to be of magnetic material, and the remaining layers are selected to be of nonmagnetic materials such as paper, pressboard, resinous plastic sheets or films as to complete the desired line of weakenings. As will be apparent from an inspection of FIG. 12, the intermediate layer of the web from which the card 134 is separated is of uniform thickness. In other words, the lengths 82a, 92a and 94a are arranged to have the same thickness as the lengths 88a and 90a. An exposed surface of the card 134, that is the length 78a or the portion of either length 76a or 78a, is printed with characters 143, as is shown in FIG. 14, whereby to record desired information on the card. Alternatively, rectangular holes, not shown, may be punched in the card at selected locations to effectuate information storage in the manner well known in the art.

As will be apparent from an inspection of FIG. 14, the portions or strips of the lengths 88a and 90a extend the entire height of the card. This arrangement has proved to be of particular advantage in using the card after it has been separated from the web 112 and printed or otherwise provided with the desired information. The cards 134, when grouped in a suitable tray, are intended to be fanned out through magnetic repulsion at the portions of the lengths 88a and 90a, magnetic poles of like polarity being induced in the magnetic material of these strips by means of an external magnetic field. Turning to a consideration of FIG. 15, the magnetically pole strips, lengths 144a and 146a are shown creating magnetic poles in the strips 88a and 90a. The permanent magnets 144 and 146 are shown situated adjacent the upper portion of the card. However, the permanent magnets may be located instead at positions adjacent the lower portion of the card, as is indicated in the broken line showing of permanent magnets 144 and 146a. The permanent magnets may also be located at any intermediate position as well because the presence of the strips 88a and 90a along the entire height of the card establishes a self-locating character in the induced magnets. This is markedly contrary to magnetic cards wherein the magnetically permeable material extends for only a portion of the height of the card. In these latter cards, the magnetic field of the permanent magnet has a tendency to lift the card making the cards behind it hard to read, pull it down obscuring it, or skew it making it "jump" when the cards are "hanging" or when making cards bind in the tray in extreme cases. These difficulties arise sporadically depending upon the position of the permanent magnets relative to the abbreviated magnetic inserts. No such problem exists with the magnetic card of the instant invention. Moreover, the presence of the magnetic strips throughout the entire height of the card creates a stronger magnetic reaction and thereby permits magnetic fanning of larger sized cards than heretofore thought possible.

The individual cards 134 which are connected together in the marginally apertured web 112 by the islands of material between the slots 130 and 132 contain no printing or other information, either by way of format printing or actual information printing. However, the interconnected cards 134 are in a form which is capable of being handled at high speed and with great precision. The cards are interconnected in a web of uniform thickness having smooth upper and lower surfaces free of any overlap or shingling. Moreover, the circular apertures 128 define a datum from which any particular point on a given card may be readily located. Accordingly, rotary printers having sprocket teeth for engaging the apertures 128 may be readily arranged to print either format or information on the cards 134 while they are interconnected in the web 112. More specifically and with reference to FIG. 18, the take-up roller 114 having the web 112 coiled thereon is shown feeding the web into a rotary format printer 148 from whence is delivered the rotary information printer 150 and to a burster 152. The printers 148 and 150 and the burster 152 are machines which are well known in the data processing art and, hence, are only shown diagrammatically. The format printer 148 prints.
the form on the individual cards and comprises generally a printing drum 154 having sprocket teeth 156 which engage the circular apertures 128 in the web 112. An inking roll 158 delivers ink to the printing drum 154, and a backup roll 160 supports the web under the printing drum. Similarly, the rotary information printer comprises a drum 162 having sprocket teeth 164 which engage the apertures 128 in the web 112. The drum 162 houses, in planar form, a plurality of cylindrical line printers 166, and these line printers are individually controlled by an electrical encoder which reads information from tabulation cards or from magnetic tape in the well known manner for transfer to the cards 134. The rotary information printer 150 also includes a backup roller 168 which supports the web against the drum 162. Moreover, the rotary information printer 150 is of a type characterized by high speed printing, printing on the order of 600 lines per minute. The interconnected nature of the cards 134 which is achieved by virtue of their incorporation in the web 112 permits them to be handled in an operation conducted at such speeds.

After the individual cards 134 have been printed with a format and have had individual data recorded thereon, the web 112 enters the burster 152. The burster 152 operates in the conventional manner to separate the cards 134 from the web 112, delivering the individual cards from an exit chute 170 into stacked relationship and expelling the remaining sheet material into an opening 172 and into an awaiting bin 174. A card 134 which has been burst from the marginal scrap 171 is illustrated in FIG. 13.

One convenient construction for the take-up roller 144 is illustrated in FIG. 19. There, the web 112 is seen to be wound on a tubular core 176. Frusto-conical plugs 178 being wedgedly inserted into the open ends of the tubular core to support stub shafts 180 by which the roller 114 is supported for rotation either in winding the web as it is produced in the apparatus of FIG. 9 or in unwinding the web for its processing for ultimate use in the arrangement illustrated in FIG. 18. It is recognized that the web 112 may be delivered directly from the perforating and slitting roller 108 to the format printer 148, eliminating thereby the necessity for colling the web on the tubular core 176. It is also recognized that the roller 108 may be arranged to perforate the back of the web 106 without performing any slitting, the cards from such a web being blanked out in a press employing male and female dies after format printing and information recording.

From the foregoing descriptions it will be apparent that the instant invention presents a new and improved laminous structure of the mechanically responsive type and a novel and advantageous belt or web containing separably interconnected, laminous cards, the belt or web of the invention being capable of being handled at high speeds and with great precision. Among the particular advantages of the laminous card and the belt or web of the invention is the resistance of these structures to distortion by curling. As is well known, paper is prone to curl upon being subjected to changes in moisture and/or upon being wound in a coil. A continuous web of laminous cards which is constructed in compliance with features of the present invention includes continuous strips of metal which are disposed at or close to the lateral margins. These continuous metal strips are resistant to flexural distortion and do not change their dimensions upon being exposed to changes in the moisture content of the surrounding air. These strips therefore act to reinforce and preserve the shape of the non-metallic material in which they are embedded. These metal strips, particularly when selected to be steel foil of a Rockwell (30T) hardness of about 75 or greater, develop considerable resistance to curling in wound webs or coils. Furthermore, both the new card and the new web of cards present unique stretch or elongation in the direction of the magnetic strips because the intermediate layer of non-magnetic material which is interjacent the magnetic strips establishes a substantially uniform transverse section in the respective articles and cooperates with the strips to add its own tensile strength and resistance to deformation. In addition, the described continuous lengths of non-magnetic material, when fabricated of paper, possess the grain of the paper running in the direction of the length of the material. This is true because such is the direction in which the paper is initially made. Advantage is taken because of this grain direction in compliance with the present invention in that the individual cards that are cut from the laminated web have the grain of the paper disposed in what is the vertical direction of the card, that is, from the top edge to the bottom edge of the card. Formerly magnetically responsive, business machine cards were fabricated with the grain of the paper running in the transverse direction, the grain in the cards of the prior art encouraging the cards to curl about a vertical axis.

Another special advantage of the laminous cards of the instant invention, particularly that of form of the cards wherein the metal strips are disposed laterally inwardly from the side edges of the card, resides in the convenience in handling these cards as punched cards. Punched cards are frequently "read" electrically or optically and the present invention is read into a reading machine with the top or bottom edge first, the metal strips in the cards are laterally outside of the reading path. When the cards are to be fed into the reading machine side edge first, cards having the metal strips spaced inwardly from the side edges of the card, as for example the card shown herein in FIG. 14, avoid the possibility of misreading that might otherwise occur through accidental contact with an exposed metal edge. Cards of this latter type also avoid cutting the hands of those handling the cards since the cards are conventionally manipulated at their side edges.

While the terms "tabulating card" and "business machine card" are employed in their most precise usage to refer to cards that are adapted for processing by machines, and while the term "index card" is utilized in its most precise sense, to refer to cards that are adapted for processing manually, for purposes of the present invention, these differences reside only in the matter of ultimate use of the article being produced and do not relate to the structure of the card or either its method of manufacture or the apparatus used in its production. Hence, it is to be appreciated that the terms are employed herein as being essentially synonymous.

The invention is claimed as follows:

1. The method of manufacturing magnetically responsive, business machine cards of substantially uniform thickness, which method comprises the steps of: providing a plurality of webs, including a pair of first, relatively wide webs of non-magnetic material of substantially the same width, a pair of second, relatively narrow webs of magnetic material, and a third web of non-magnetic material having a width narrower than that of said first webs, the combined widths of said second and third webs being substantially the same as the widths of said first webs, said second and third webs being of substantially the same thickness; delivering said webs toward a lamintation station with said second webs in laterally spaced relation in substantially the same plane with said third web and with said third web laterally interjacent said second webs, said second and third webs in substantially edge-to-edge relationship being delivered toward said station with said first webs above and below said second and third webs; applying adhesive to interlaminar faces of said webs; urging said webs into intimate contact with each other whereby to join said webs into a unified web; and separating discrete cards from the unified web.

2. The method of manufacturing magnetically responsive, business machine cards of substantially uniform thickness, which method comprises the steps of: providing a plurality of webs, including a pair of first, relatively wide webs of non-magnetic material of substantially the
same width, a pair of second, relatively narrow webs of magnetic material, a third web of non-magnetic material having a width narrower than that of said first webs, and a pair of fourth, relatively narrow webs of non-magnetic material, said second, third and fourth webs being of substantially the same thickness and having a combined width substantially the same as the widths of said first webs; delivering said webs toward a laminating station with said second webs in laterally spaced relation, with said third web laterally interjacent said second web and said fourth webs spaced laterally apart admitting said second and third webs therebetween and with said second and fourth webs in substantially the same plane with said third web, said second, third and fourth webs in substantially edge-to-edge relationship being delivered toward said station with said first webs above and below said second, third and fourth webs; applying adhesive to inter laminar faces of said webs; urging confronting inter laminar faces into contact with each other whereby to join said webs into a unified web; and separating discrete cards from the unified web.

3. The method of manufacturing magnetically responsive, business machine cards of substantially uniform thickness, which method comprises the steps of: providing a plurality of webs, including a pair of first, relatively wide webs of non-magnetic material of substantially the same width, a pair of second, relatively narrow webs of magnetic material, a third web of non-magnetic material having a width narrower than that of said first webs, and a pair of fourth, relatively narrow webs of non-magnetic material, said second, third and fourth webs being of substantially the same thickness and having a combined width substantially the same as the widths of said first webs; delivering said webs toward a laminating station with said second webs in laterally spaced relation, with said third web laterally interjacent said second web, with said fourth webs spaced laterally apart admitting said second and third webs therebetween and with said second and fourth webs in substantially the same plane with said third web, said second, third and fourth webs in substantially edge-to-edge relationship being delivered toward said station with said first webs above and below said second, third and fourth webs; applying adhesive to inter laminar faces of said webs; urging confronting inter laminar faces into contact with each other whereby to join said webs into a unified web; perforating the border portions of said unified web with regularly spaced apertures; cutting away said unified web to provide lines of weakness in said unified web intermediate the border portions containing said apertures, said lines of weakness being arranged to define the distal edges of business machine cards; and separating discrete cards from the unified web.

4. The method according to claim 3 which further comprises cuttably engaging said unified web to provide said lines of weakness in both longitudinal lines and transverse lines and disposing said longitudinal lines in alignment with the material of said fourth webs.

5. The method according to claim 3 which further comprises cuttably engaging said unified web to provide lines of weakness in both longitudinal lines and transverse lines and arranging said transverse lines to include lines completely cutting through said unified web at said second webs.

6. A luminous, magnetically responsive tabulating card of substantially uniform thickness comprising: an intermediate web of non-magnetic material; a pair of outer sheets of non-magnetic material of substantially the same width symmetrically disposed above and below said intermediate sheet in laminated relationship therewith, said intermediate web having a recessed region defining a slot between said outer sheets adjacent an edge thereof; a magnetizable strip substantially filling said slot in substantially edge-to-edge relationship with said intermediate sheet, said strip having a thickness not substantially greater than the thickness of said intermediate sheet and being in substantially the same plane therewith and adhesive bonding means between said sheets and said strip for connecting the same into a unitary structure.

7. A luminous, magnetically responsive card of substantially uniform thickness comprising; a flat intermediate sheet of non-magnetic material having a rectangular outline; a pair of outer sheets of non-magnetic material of substantially the same width symmetrically disposed above and below said intermediate sheet in laminated relationship therewith, said intermediate sheet having a recessed portion defining a slot between said outer sheets adjacent an edge thereof; a magnetizable strip substantially filling said slot in substantially edge-to-edge relationship with said intermediate sheet, said strip having a thickness not substantially greater than the thickness of said intermediate sheet and being in substantially the same plane therewith and adhesive bonding means between said sheets and said strip for connecting the same into a unitary structure.

8. The card defined in claim 7 wherein said strip is of magnetically soft, iron material possessing substantially no magnetic remanence and having a thickness between about 0.001 and about 0.002 inch whereby to provide a substantial mass of magnetizable material within said card.

9. A luminous, magnetically responsive tabulating card of substantially uniform thickness comprising: an intermediate web of non-magnetic material; a pair of outer sheets of non-magnetic material of substantially the same width symmetrically disposed above and below said intermediate web in laminated relationship therewith, said intermediate web having a recessed region defining a slot between said outer sheets adjacent an edge thereof and extending substantially the entire length of said edge; a magnetizable strip substantially filling said slot in substantially edge-to-edge relationship with said intermediate web, said strip having a thickness not substantially greater than the thickness of said intermediate web and being substantially in the same plane therewith; and adhesive bonding means between said sheets, said strips and said strip for connecting the same into a unitary structure.

10. A luminous, magnetically responsive information storage card of substantially uniform thickness comprising: a flat intermediate sheet of non-magnetic material having a rectangular outline; a pair of outer sheets of non-magnetic material of substantially the same width disposed symmetrically above and below said intermediate sheet in laminated relationship therewith, said intermediate sheet having recessed portions defining slots between said outer sheets adjacent opposite edges thereof, each slot extending substantially the entire length of the respective edge; a magnetically soft, iron strip interposed in and substantially filling each slot in substantially edge-to-edge relationship with said intermediate sheet and stiffening said edges of said card, said strip having a thickness substantially equal to that of said intermediate sheet and being substantially the same plane therewith whereby to provide a card of uniform thickness throughout; and adhesive bonding means between said sheets and said strip for connecting the same into a unitary structure.

11. The card defined in claim 10 wherein said strip has a thickness between about 0.001 and about 0.002 inch whereby to provide a substantial mass of magnetizable material within said card.

12. As an article of manufacture, an elongated web comprising a plurality of separable, interconnected business machine cards and including an upper and lower lamina of non-magnetic material of substantially the same width and a medial web between said upper and lower laminae, said medial web being of substantially uniform thickness and comprising a non-magnetic central length, a pair of non-magnetic outer lengths spaced laterally from said central length at the opposite sides thereof, a magnetic
length disposed between said central length and each of said outer lengths and being substantially in the plane of said central length, and adhesive bonding means between said laminae, said web, and said lengths for connecting the same into a unitary structure, said web having lines of weakness intermediate the side portions of said web, said lines of weakness being arranged to define the edges of business machine cards and said lines being rupturable whereby to permit separation of said cards from said web; certain of said lines of weakness traversing said magnetic lengths whereby to include magnetic edge portions in each of said business machine cards.

13. As an article of manufacture, an elongate web comprising a plurality of separable, interconnected business machine cards and including an upper and lower lamina of non-magnetic material of substantially the same width, a lower lamina of non-magnetic material and a medial web between said upper and lower laminae, said medial web being of substantially uniform thickness and comprising a non-magnetic central length, a pair of non-magnetic outer lengths spaced laterally apart from said central length at the opposite sides thereof, a magnetic length disposed between said central length and each of said outer lengths and being substantially in the plane of said central length, and adhesive bonding means between said laminae, said web, and said lengths for connecting the same into a unitary structure, said web having a plurality of aperture means spaced at uniform intervals along the opposite sides thereof to define a registration datum and said web having lines of weakness intermediate the side portions of said web containing said aperture means, said lines of weakness being arranged to define the edges of business machine cards and said lines being rupturable whereby to permit separation of said cards from said web, certain of said lines of weakness traversing said magnetic lengths whereby to include magnetic edge portions in each of said business machine cards.

14. As an article of manufacture, an elongate web comprising a plurality of separable, interconnected business machine cards and including an upper and lower lamina of non-magnetic material of substantially the same width and a medial web of lesser width than said upper and lower laminae, disposed between said upper and lower laminae, said medial web being of substantially uniform thickness and comprising a non-magnetic central length, a pair of magnetic lengths disposed laterally with respect to said central length at the opposite sides thereof and being substantially in the plane of said central length, and adhesive bonding means between said laminae, said web, and said lengths for connecting the same into a unitary structure, said web having registration datum means spaced at uniform intervals along the opposite sides thereof laterally beyond said magnetic lengths.

15. As an article of manufacture, an elongate web comprising a plurality of separable, interconnected business machine cards and including an upper and lower lamina of non-magnetic material of substantially the same width, a lower lamina of non-magnetic material and a medial web between said upper and lower laminae, said medial web being of substantially uniform thickness and comprising a non-magnetic central length, a pair of non-magnetic outer lengths spaced laterally apart from said central length at the opposite sides thereof, a magnetic length disposed between said central length and each of said outer lengths and being substantially in the plane of said central length, and adhesive bonding means between said laminae, said web, and said lengths for connecting the same into a unitary structure, said web having at uniform intervals along the opposite sides thereof a registration datum and said web having lines of weakness intermediate the side portions of said web, said lines of weakness being arranged to define the edges of business machine cards and said lines being rupturable whereby to permit separation of said cards from said web, certain of said lines of weakness traversing said magnetic lengths whereby to include magnetic edge portions in each of said business machine cards.

16. As an article of manufacture, an elongated web comprising a plurality of separable, interconnected business machine cards and including an upper and lower lamina of non-magnetic material of substantially the same width and a medial web between said upper and lower laminae, said medial web being of substantially uniform thickness and comprising a non-magnetic central length, a pair of non-magnetic outer lengths spaced laterally from said central length at the opposite sides thereof, a magnetic length disposed between said central length and each of said outer lengths and being substantially in the plane of said central length, and adhesive bonding means between said laminae, said web, and said lengths for connecting the same into a unitary structure, said web having lines of weakness intermediate the side portions of said web, said lines of weakness being arranged to define the edges of business machine cards and said lines being rupturable whereby to permit separation of said cards from said web, certain of said lines of weakness being disposed laterally with respect to said central length at the opposite sides thereof and being substantially in the plane of said central length, and adhesive bonding means between said laminae, said web, and said lengths for connecting the same into a unitary structure, said web having registration datum means spaced at uniform intervals along the opposite sides thereof laterally beyond said magnetic lengths.

17. As an article of manufacture, an elongate web comprising a plurality of separable, interconnected business machine cards and including an upper and lower lamina of non-magnetic material of substantially the same width and a medial web between said upper and lower laminae, said medial web being of substantially uniform thickness and comprising a non-magnetic central length, a pair of magnetic lengths disposed laterally with respect to said central length at the opposite sides thereof and being substantially in the plane of said central length, and adhesive bonding means between said laminae, said web, and said lengths for connecting the same into a unitary structure, said web having lines of weakness intermediate the side portions of said web, said lines of weakness being arranged to define the edges of business machine cards and said lines being rupturable whereby to permit separation of said cards from said web, certain of said lines of weakness being disposed laterally with respect to said central length at the opposite sides thereof and being substantially in the plane of said central length, and adhesive bonding means between said laminae, said web, and said lengths for connecting the same into a unitary structure, said web having registration datum means spaced at uniform intervals along the opposite sides thereof laterally beyond said magnetic lengths.

18. A card according to claim 6 which further comprises an intermediate strip of non-magnetic material in said slot laterally outwardly of said magnetizable strip and between said outer sheets; and adhesive bonding means between said non-magnetic strip and said sheets.

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