

Filed June 6, 1961

CARD PRINTING AND PUNCHING DEVICE

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FIG. 1. 2803

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FIG. 3.

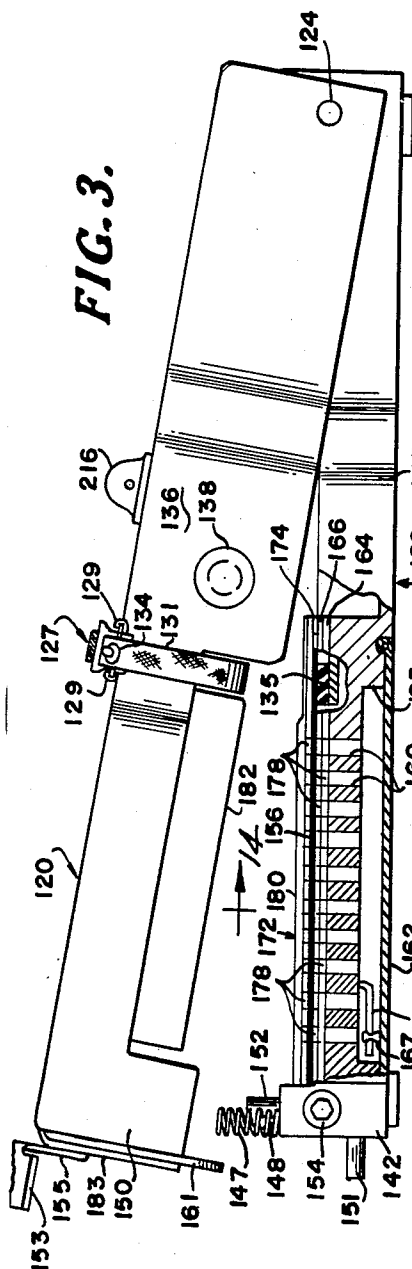


FIG. 16.

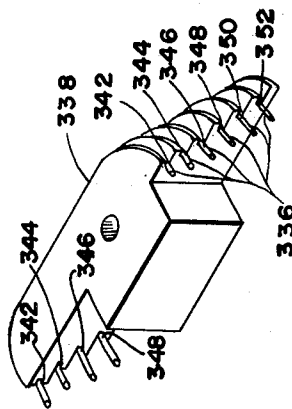
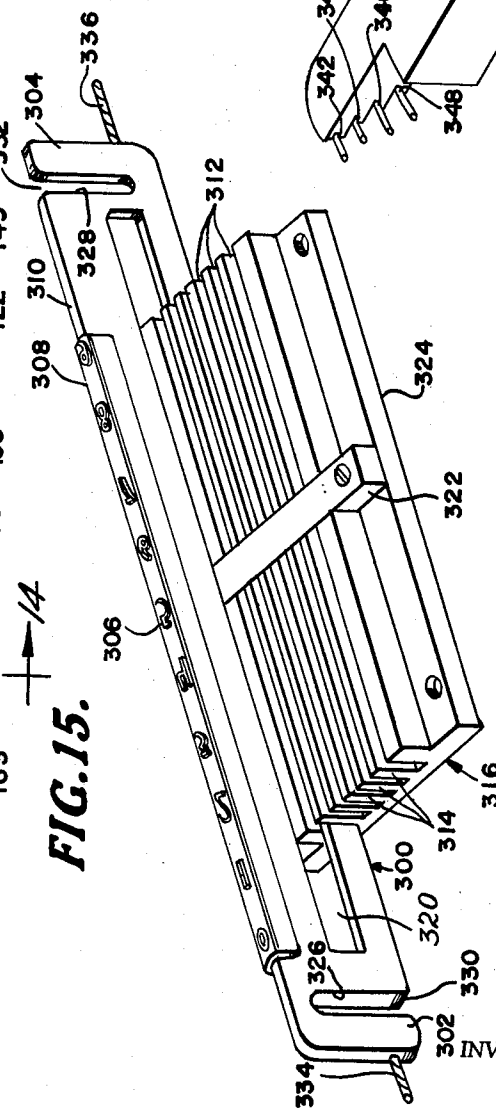


FIG. 15.



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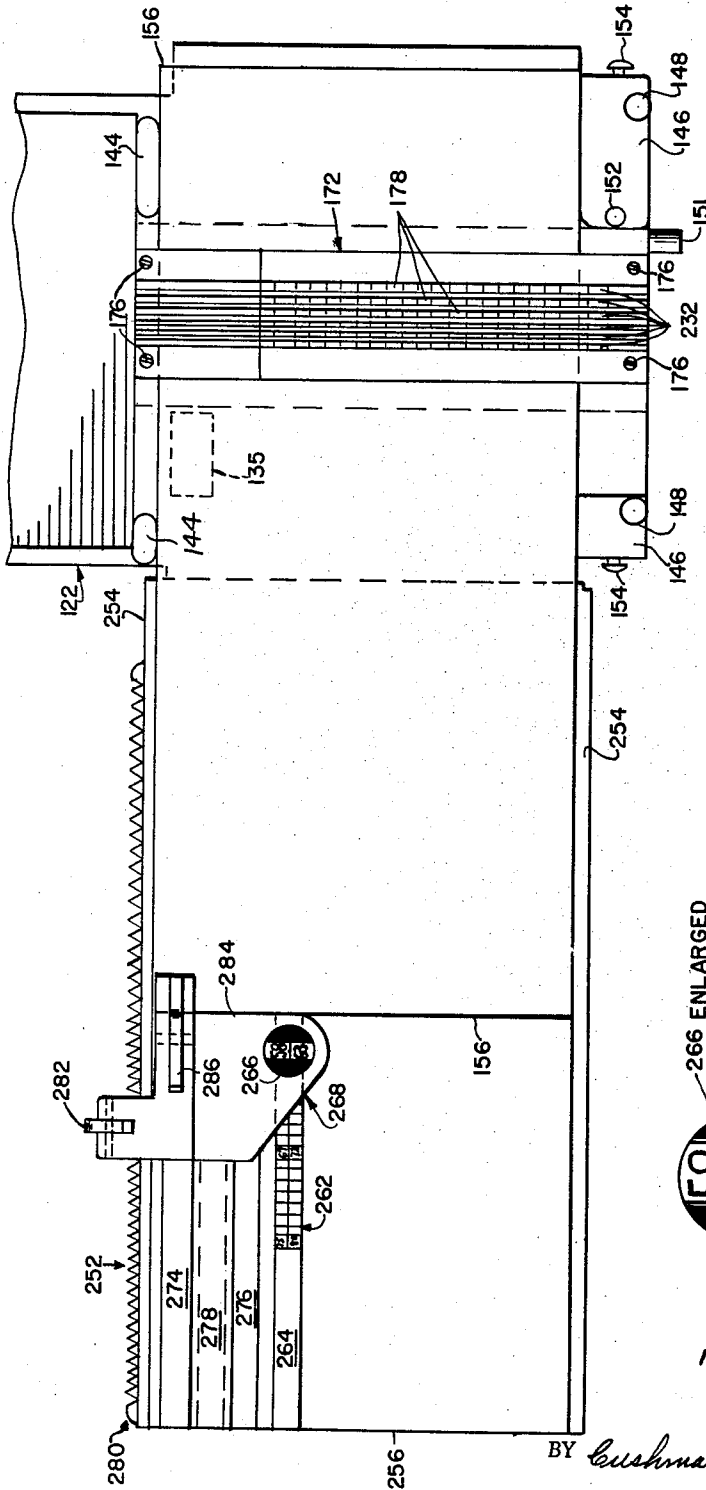


FIG. 4A.

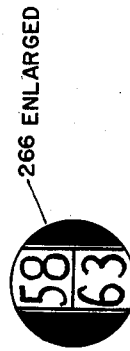


FIG. 4C.

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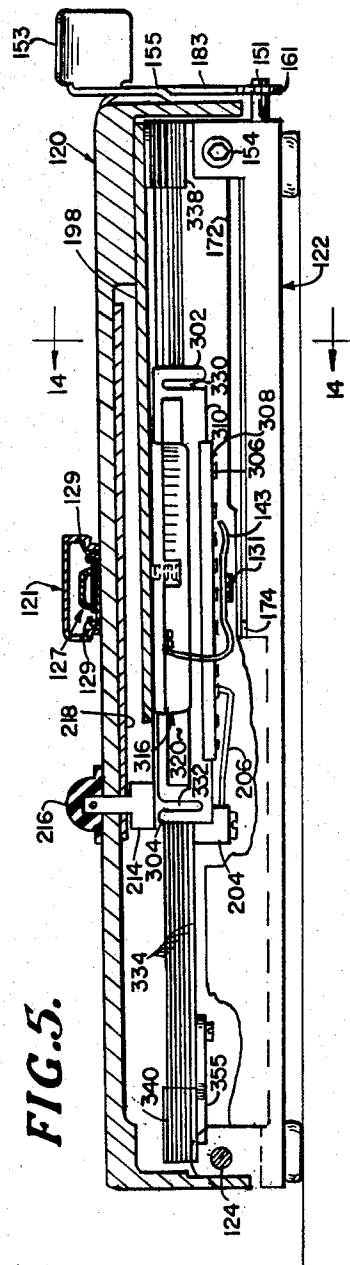
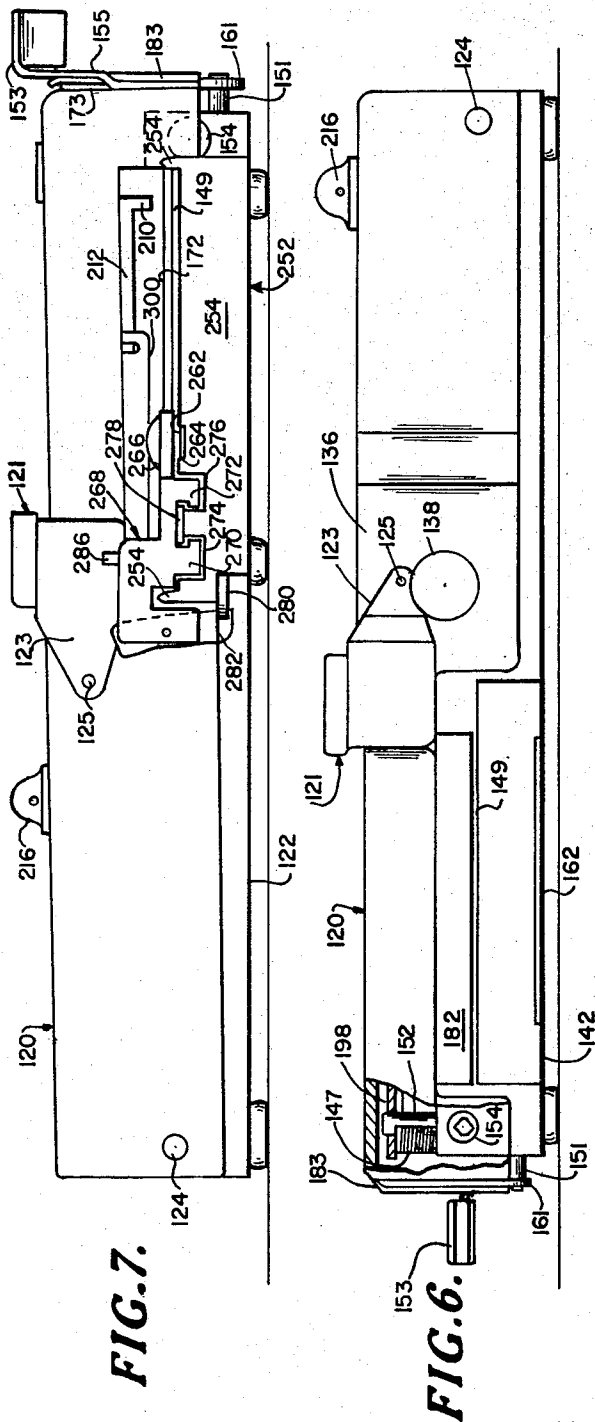
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CARD PRINTING AND PUNCHING DEVICE

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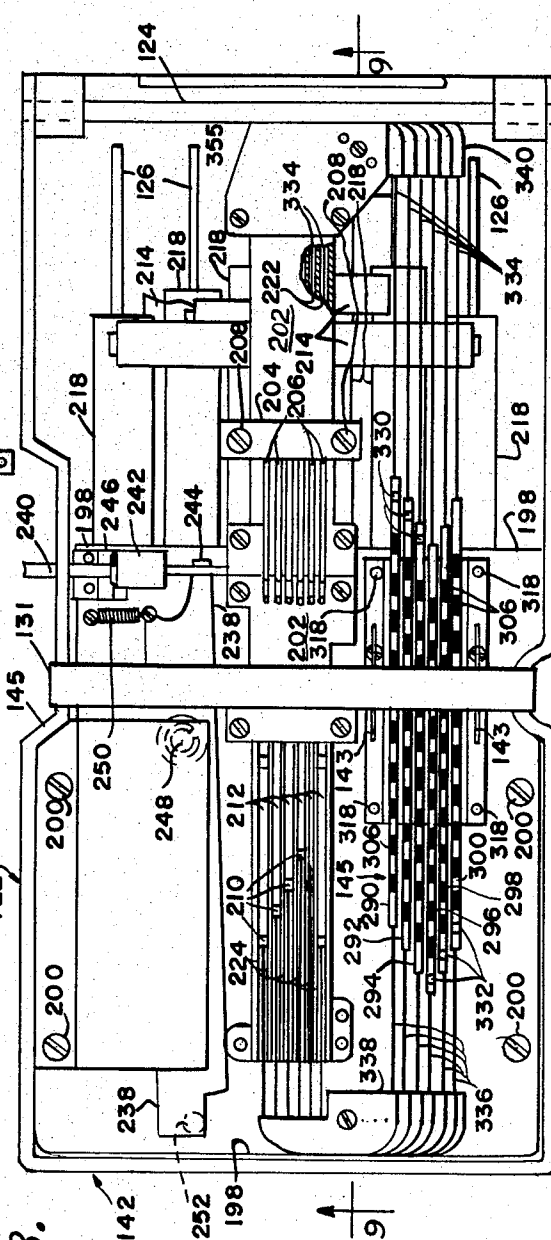
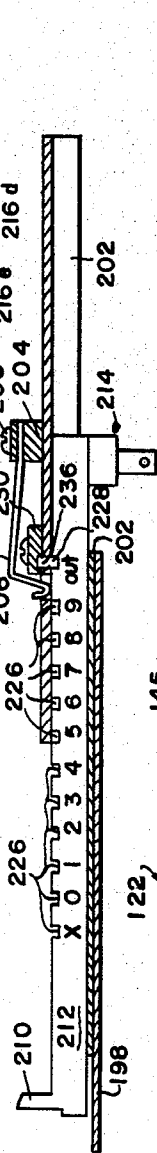
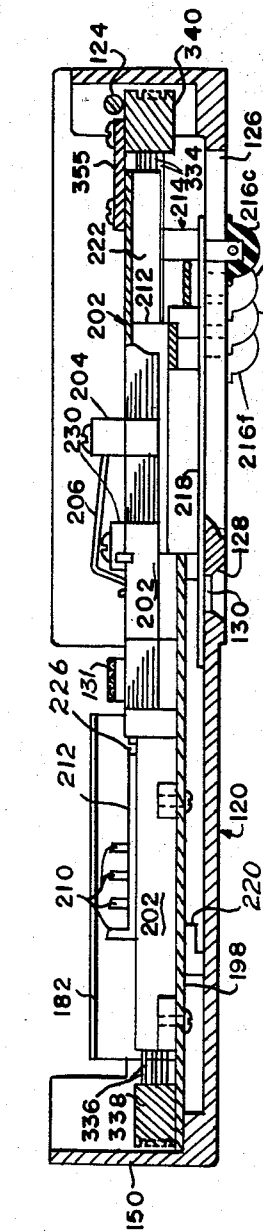
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CARD PRINTING AND PUNCHING DEVICE

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FIG. 11.

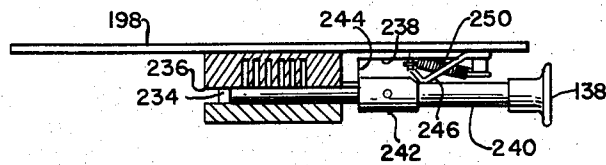


FIG. 12.

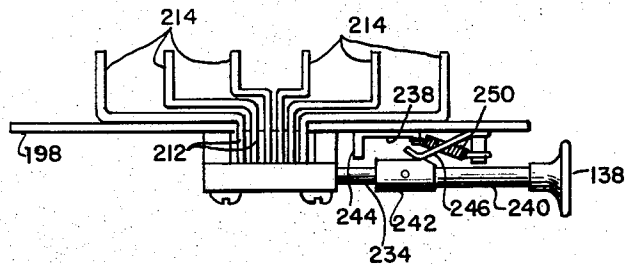
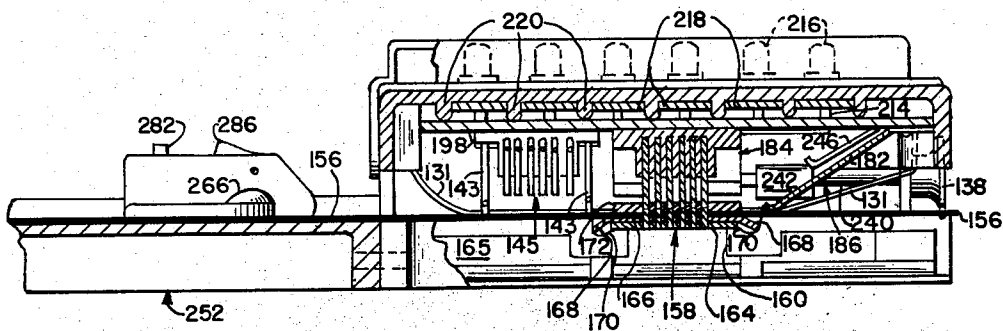


FIG. 14.



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FIG. 13.

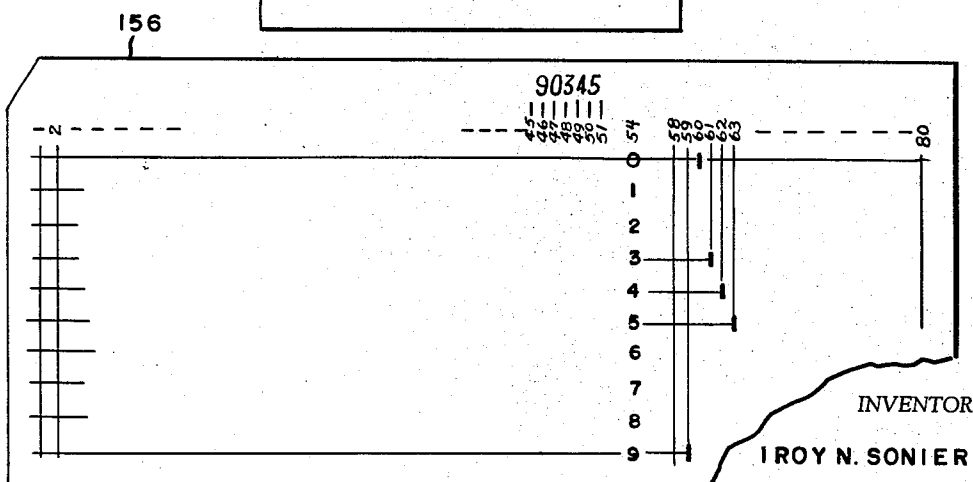
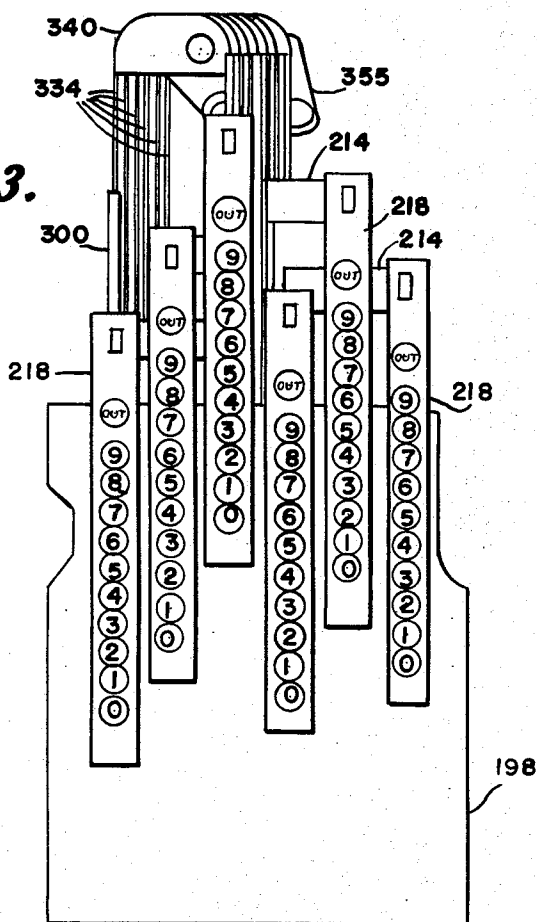


FIG. 4B

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CARD PRINTING AND PUNCHING DEVICE

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Filed June 6, 1961, Ser. No. 115,110

30 Claims. (Cl. 101-19)

This invention relates to a printing device, especially a printing device in combination with punching apparatus, for effecting print, and when desired, punch operations on paper-like or card material such as standard business record cards.

Reference may be made to my Patent 2,913,049 relative to certain features of the card punching apparatus described herein.

Business record cards have become extremely popular as a means for storing information not only in a compact form but which may be conveniently read by mechanical, electrical, or optical devices. Generally speaking, an aperture in such a card in a predetermined position thereon refers to the storage of a given bit of information, while the absence of such an aperture in that predetermined position may mean that no information has been stored in that position on the card, or in combination with other apertured and/or apertureless areas in the card provides in a coded sense, an indication of the storage of a predetermined number of bits of information. One object of the present invention is to print on a business record card indicia, such as numbers, corresponding to the indicia which one wishes to store in the card.

Another object of the invention is the provision of apparatus for simultaneously printing and punching the same numbers onto a given card, with the further provision of means for predetermining what those numbers shall be.

Still a further object is the provision of means in conjunction with a punching and/or printing device, for accurately positioning a card therein to any one or more of its predetermined columns, so that the printed and punched numbers will be accurately related to given columns in the card.

Other objects of the invention will become apparent to those of ordinary skill in the art by reference to the following detailed description of the exemplary embodiment of the apparatus, and the appended claims. The various features of the exemplary embodiment according to this invention may be best understood with reference to the following drawings wherein:

FIGURE 1 is a plan view of the device;

FIGURE 2 is a front side elevational view of the device in FIGURE 1 with the ribbon dust cover open;

FIGURE 3 is a right side elevational view of the device showing the top and base members in an unlatched position with the ribbon dust cover removed;

FIGURE 4 is a plan view of the top of the base member of the device;

FIGURE 4A is a view similar to that shown in FIGURE 4 but with a card inserted;

FIGURE 4B illustrates a card of the particular type around which the exemplary device described herein is constructed;

FIGURE 4C is an enlargement of a portion of FIGURE 4A.

FIGURE 5 is a longitudinal cross-section view taken substantially along line 5-5 of FIGURE 1;

FIGURE 6 is a right side elevational view showing the device in a punch and print position;

FIGURE 7 is a left side elevational view showing the device in a non-punching and printing position;

FIGURE 8 is a bottom plan view of the device, partially in section;

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FIGURE 9 is a cross-sectional view taken along the line 9-9 of FIGURE 8;

FIGURE 10 is an elevational view of one of the punch slides partially assembled;

FIGURE 11 is a side elevational view of the positive locking means;

FIGURE 12 is a further side elevational view of the locking means assembled with the punch slides;

FIGURE 13 illustrates parts of the device assembled;

FIGURE 14 is a cross-sectional view taken along line 14-14 of FIGURES 3 and 5;

FIGURE 15 illustrates one of the print bars assembled with its guide block; and

FIGURE 16 illustrates one of the wire guide blocks.

The card punching and printing device of the present invention, illustrated in FIGURES 1 through 16 in which like elements are given the same number, comprises a substantially rectangular top member 120 (FIGURE 1) of metal or plastic, and a base member 122 (FIGURE 2) connected to the upper end of the top member as by hinge pin 124 (FIGURE 3) or the like. Base member 122 is somewhat smaller in dimension than the top member 120 so as to fit within the sides of the top member when the device is in a normal position (FIGURE 7) or in a card punching and printing position (FIGURE 6).

A series of parallel slots 126 (FIGURE 1) are disposed within the rearward portion of top member 120 and extend longitudinally from the uppermost portion to the middle of the top member. A transverse groove 128 having a plurality of equally spaced apertures 130 therein is located adjacent the lower end of the slots 126, and the apertures are spaced so as to be in exact alignment with the slots 126. The purpose of the parallel slots and the apertures in the transverse groove will be discussed more fully below.

A ribbon dust cover 121 shown closed in FIGURES 1 and 5-7 has two side arms 123 pivoted on opposite sides of top member 120 at points 125 (FIGURES 6 and 7) whereby it may be opened (by counterclockwise rotation in FIGURE 7) to the position shown in FIGURE 2 for access to a ribbon mover 127. This mover may be manually slid in its channel tracks 129 between the left and right ends thereof, so that ribbon 131, connected at opposite ends to the mover by ribbon eyelets 132 and 134 hooked respectively over two mover hooks 133, can be moved without any indexing. Ribbon 131 loops down the sides of and through the mid-section of top member 120 as shown in FIGURES 3, 8 and 14 so as to be positioned over platen 135 (FIGURES 4, 4A) disposed in the base member 122. Within mover 127 is a spring 137 that operates at its opposite ends respectively on members 139 and 141, which are slidable relative to one another and which respectively carry the two hooks 133, to bias those hooks toward each other. The ribbon eyelets may be thereby hooked thereover, with the ribbon being kept under desired tension by spring 137 in conjunction with the two springs 143 (FIGURES 5 and 8). These springs are disposed on opposite sides of the group 145 of print bars and have another purpose of keeping the ribbon normally spaced from the print bars to prevent wear and tear on the ribbon when its position is changed with respect to a point on platen 135 to any one of an infinite number of positions between predetermined limits determined by the left and right extremes that mover 127 can be moved within its tracks 129.

In FIGURE 4, it will be noted that there is an elongated recess 145 along the right hand side of base member 122. This is so the right hand side of top member 120 (FIGURE 1) can have an elongated recess 136 disposed substantially at its midpoint in order to receive knob 138 of the control means to be described. The

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knob 138 as shown in full lines in FIGURES 1 and 2 is substantially within the recess 136 when the control means is in a slide locking position during which time, only, can printing and punching operations be performed. The recess 136 also provides for ready access to the knob 138 so that an operator may unlock the punch slides by pulling the knob to the right. When knob 138 is pulled all the way out as shown in dotted lines in FIGURE 2, no printing or punching can take place but a determination of the indicia or numbers to be later printed and punched out, when the knob 138 is again pushed in all the way, can then be made. The upper surface 140 of the forward portion of top member 120 may be reserved for a name plate or the like and may include a verifier for readily comparing the respective indicia punched into a card with that indicated in apertures 130.

As shown in FIGURES 4 and 4A the forward portion 142 of base member 122 is provided with two card guide elements 144 at the uppermost portion thereof and is similarly provided with two card positioning guides 146 at the lowermost portion thereof. Two studs 148 extending upwardly respectively from the two forward card guides 146 are for the purpose of carrying and orienting respective coil springs 147 (FIGURE 3). These springs extend further upwards and against an interior surface in top member 120 for biasing the unhinged end 150 thereof away from the front portion 142 of the base member sufficiently to keep open space 149 (FIGURES 6 and 7) into which a card 156 (FIGURE 4A) may be inserted even though the top and base members are latched together as below described relative to FIGURE 2. As shown in FIGURES 3 and 4 for example, stud 151 protrudes forwardly from the base member and, as will be later apparent, acts as a latching pin. The stud 152 extending upwardly from the lower right card guide 146 is adapted to cooperate with the control means so as to permit or prevent any relative movement between the top and base members as will be described in detail below.

Inwardly and outwardly adjustable, screw threaded studs 154 are located on either side of the lower end of base member 122 in order to properly adjust the base member laterally with respect to the top member and properly align the associated dies carried by each.

Card 156 shown in FIGURES 4A and 4B may be of the well known IBM business record type, which has 80 transverse columns and at least 10 longitudinal rows the discrete intersections of which represent, in each column, sequentially from the upper of the 10 rows downward, the number 0 through 9. Usually each of the 800 such intersections has pre-printed thereat, on an unused card, a respective one of those numbers 0-9. There is also generally pre-printed on such a card, in line with each column and from left to right, a different number from 1 through 80 for visually differentiating the 80 different columns. Though desirable, neither the pre-printing of the intersection digits nor columnar number designations is required on a card to use it with the present invention. Above the upper or "0" row on such a card is space for two more rows, sometimes designated the 11th and 12th rows and used for various purposes in different situations. This is the space or area on which the device herein described in detail prints numbers, for example substantially along the upper or 12th row, that respectively from left to right correspond to the numbers of the intersections punched out at the same time.

As will later be more apparent, the six knobs or buttons generally designated 216 in FIGURE 1 may be positioned to index in each of apertures 130 any one of the ten different numbers 0-9 and also the indication "Out." The latter indication means that no aperture is to be punched nor any number printed on the card for the respective column. Button 216a is so positioned, while buttons 216b-f are positioned to index, respectively, in the second, third, etc., apertures the numbers 9, 0, 3, 4, 5.

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If a card is inserted, then, and indexed (in a manner later described) for a punch-print operation relative to its columns 58-63, after the operation is accomplished there will be no aperture punched in column 58 but the 9, 0, 3, 4, 5 intersections of columns 59-63 respectively will contain apertures (the blackened rectangles in FIGURE 4B), and along the 12th row will be printed the number 90345. The digits of this printed number, due to lateral displacement of the printing bars and punches as later described in detail, appear 13 columns to the left of the column in which the respective digit was punched out, making the printed number in this instance in line with columns 46-50.

Of course such a lateral displacement is only exemplary, since it is to be understood that this invention encompasses any desired lateral displacement including none. Furthermore, though IBM type cards have been referred to and the description proceeds relative thereto with the punching of rectangular apertures, the invention is broader than that since it may be adapted to any size card and to punch square, round, oval, or any other configuration apertures.

Disposed centrally within the forward portion 142 (FIGURE 4) of base member 122 and extending parallel to the sides thereof, is a first set of female cutting dies 158 adapted to cooperate with a second set of male cutting dies mounted on the top member as later described.

Referring to FIGURES 3, 4, and 14, the first set of female cutting dies 158 is disposed above a plurality of apertures 160 within the base element 122. Beneath the apertures 160 of the base portion, is a hinged plate 162 (FIGURE 3) which serves as a receptacle for the portions punched from each card. Spring fingers 163 extending from the forward portion of the base member 122 toward the rearward portion thereof within the recess 165 of the base member are adapted to engage uprising detents 167 secured to the hinged plate 162 to retain the plate in a closed position. After a suitable period of use, the operator need only pull downwardly on any exposed edge of the hinged plate to release the studs from the spring fingers to remove the punched out portions previously dropped onto the plate.

The female cutting dies 158 comprise, as shown best in FIGURES 3 and 14, a backing member 164 which is mounted upon base member 122 and a spring steel cutting die plate 166 supported by the backing plate. The spring steel cutting die plate 166 is provided with longitudinally extending and downwardly diverging portions 168 which fit into the longitudinal grooves 170 of base member 122 to reinforce or stiffen the cutting plate during the removal of any male die (later described) from a cutting plate die aperture. A stripper plate 172 is disposed directly above the cutting die plate 166 and is spaced apart therefrom as by the washers 174 (FIGURE 3) or the like to provide for the insertion of the card 156 to be punched between the cutting plate and the stripper plate. The backing plate, cutting plate, spacing washers and stripper plate are secured to the base member as by the screws 176 (FIGURE 4) located at each corner. Each of the aforementioned elements of the set of female cutting dies is provided with a series of columns of die apertures 178, preferably ten in number, there being preferably six of said columns of die apertures. The apertures of each element are in exact alignment with the apertures of each of the other elements so as to provide a single cutting die for each aperture, with the apertures in the spring steel plate 166 being slightly smaller than those in the backing and stripper plates to effect a highly accurate and clear-cut aperture in the card. A series of parallel ribs 180, integrally extending upwardly from the base of stripper plate 172 to the upper surface thereof and running longitudinally along the stripper plate, and disposed between each of the columns of female dies and serve as guides to prevent any lateral movement of the punches or male dies (described below) rela-

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tive to the female dies as the former move along respective columns of the latter. Preferably, the stripper plate is made of a different metal (for example, brass) than that of the male dies (for example, steel) so as to reduce the possibility of bonding or binding between any male die and the stripper plate as the male dies move therealong.

Disposed within the top member 120 are a card tension guide 182, the second set of male dies and associated guides, indicated generally as 184, and the control mechanism indicated generally as 186. The card tension guide 182 is of spring steel secured to the forward portion of the right underside of top member 120 and extending downwardly and inwardly therefrom. As shown in FIGURE 14, the card tension device is adapted to guide card 156 underneath the stripper plate, and during a punching operation, to press against the card to help maintain the card in a substantially horizontal position and prevent any buckling of the card during the punching operation.

Before detailing the male die and guide apparatus 184 and control mechanism 186, reference is made to FIGURE 2 for describing the latching apparatus and means to move the male and female dies, as well as the print bars and platen, all as will later be more apparent, relatively toward each other. To accomplish a print-punch operation, downward pressure is put on a handle 153 (FIGURES 1 and 2) connected to lever 155 which is pivoted on a stud or pin 157 disposed in and extending forwardly of the front side of the housing or top member 120. The right end 159 of the lever is coupled by a latch 161 to pin 151 forwardly extending from base 122. At its lower hook end, latch 161 rotatably hooks pin 151. At its upper hook end, it does likewise as to lever end 159, but the fit therebetween is not exact. That is, the outer configuration of lever end 159 is not exactly the same as the inner configuration of hook 169, there being a small space (not shown) between the two in the area of 171 when lug 173 is rotated sufficiently counterclockwise about its set screw 175 pivot point so as not to interfere with lever 155. When such is the case, the maximum separation distance of top and base members 120 and 122, biased apart as will be recalled by coil springs 147 disposed on studs 148 (FIGURES 4 and 6), is determined by the configurations of lever end 159 and hook 171. With the configurations shown they will contact each other at points 177 and 179 when adjusting lug 173 is not pivoted clockwise sufficiently to limit the upward movement of the left arm of lever 155 to the extreme thereof allowed by the contacts makeable at points 177 and 179. Within limits, then, any desired separation of the top and bottom members—and as will later appear more apparent, of the male and female punching dies, as well as of the print bars and platen—can be obtained by appropriate setting of adjusting lug 173. Three screws 181 attach a cover 183 over the latching mechanism, with spring 185 being wrapped around a collar on the upper right screw and operating against lug 173 to push against the right side of latch 161 and aid in reducing the amount of pressure necessary against handle 153 to effect a print-punch operation.

Referring to FIGURES 8, 9 and 10, the male set of dies and associated slides and upper guides are carried by the mounting plate 198 which is secured to the underside of the forward part of the top member 120 as by screws 200 or the like, the upper two of which in FIGURE 8 also serve to secure the card tension device 182 mentioned above. A die slide guide block 202 is disposed centrally to the underside of top member 120 and extends longitudinally therein. Detent block 204 carrying a plurality of detent springs 206 is secured to the die slide guide block 202 as by the screws 208.

The male set of dies comprises six male cutting dies 210 integrally formed respectively with the notched slides 212. The die slides are adapted to slide within respective columns in the die slide guide block 202 to respective registration positions of the male dies with any female

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die 178 (FIGURE 4) in respective columns thereof within base member 122. As shown in FIGURES 10 and 12, an angled die slide extension 214 is secured to the rearward end of each of the die slides 212. The upper portion of the angled die slide extensions are adapted to be received by the parallel slots 126 of the top member 120 and extend therethrough. Knobs or buttons 216 (FIGURES 1 and 9) are suitably secured to the uppermost portion of the angled die slide extensions 214 and slidably engage the upper surface of top member 120. A respective longitudinally extending slide strip 218 (FIGURES 8 and 13) is secured to the upper portion of the angled extensions 214 of the die slides and is adapted to slide between the underside of top member 120 and plate 198. The slide strips are guided by longitudinally and downwardly extending projections 220 of top member 120 as shown in FIGURE 14. As shown in FIGURE 13, each slide strip 218 has indicia inscribed on its upper face in the form of encircled numbers 0 through 9 and the phrase "Out," one of which shows through a respective aperture 130 (FIGURE 1). The encircled numbers on the strips 218 are so positioned thereon that when any given one of those numbers on one of the strips shows through a respective aperture 130 with its circle substantially concentric with the aperture, the associated male die 210 is indexed to a punching position relative to one of the female dies 178 (FIGURE 4) and during an ensuing punching operation the correspondingly numbered intersection of the card in the respective column gets punched out. However, when "Out" appears through a window 130, no aperture will be punched in a card for the corresponding column, since at that time the respective male die is out of registration with any row of the card. Instead, that male die will, when the punching handle 153 (FIGURE 1) is pressed, go into the respective one of the out-of-registration apertures 232 (FIGURE 4). When the male dies are all in an out-of-registration position, if an operator inadvertently presses handle 153, no aperture will be made in an inserted card in view of the fact that the out-of-registration apertures 232 are all forward of the lower or front edge of the card (FIGURE 4A).

The die slide guide block 202 is provided at its rearward end with a plurality of longitudinally extending grooves 222 within which slide the die slides 212. The forward end of the die slide guide block 202 is similarly provided with a plurality of longitudinally extending grooves 224 within which slide the die slides 212 and respective cutting die 210 as the dies are moved toward an exact registration position with respect to the first set of dies. Preferably the die slides and cutting dies are made of steel whereas the entire die slide guide block is made of brass. The reason for the die slides and die slide guides being of different metals is to reduce the possibility of bonding or binding of the slides and the guides as the slides move along the guides.

As previously mentioned, detent block 204 having a plurality of detent springs 206 is secured to the die slide guide block 202 (FIGURE 10). The detent springs 206 are adapted to cooperate with any of the notches 226 of the die slides 212 in order to place the associated cutting die 210 of each slide 212 substantially in any exact registration position with any of the female cutting dies 178 (FIGURE 4) disposed within an associated column thereof in base member 122. As will be noted in FIGURE 10, there are 11 notches 226 designated X and 0 through 9 of equal width and equal spacing and a 12th notch 228 of the same width but spaced from the No. 9 notch about one and a half times the spacing of the other notches, corresponding respectively to the indicia spacing on the top of slide strips 218 (FIGURE 13). The slide 212 in FIGURE 10 is shown in the position in which punch 210 will be pressed into one of the out-of-registration apertures 232 (FIGURE 4). In this position, spring

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206 is not in any of the slide notches, but notch 228 is in alignment with a slot 236 which goes all the way across the die slide guide block 202 and which is closed on top (in the FIGURE 10) view by a capping block 230. As will be later apparent a rectangular pin cooperates with apertures 236 and 228 to positively lock the slide and punch in an out-of-registration position.

When the No. 9 notch in FIGURE 10 is in alignment with slot 236, the male die or punch 210 is in position to punch an aperture at the ninth row intersection of a given card column. Spring 206 helps index the slide and male die to that punching position by cooperating at that time with the No. 8 notch; and similarly on down the line until the No. 0 notch is aligned with slot 236 by the aid of spring 206 cooperating with notch X, effecting proper indexing of male die 210 to a 0 punching position.

The control mechanism (FIGURES 8, 11, and 12) indicated generally as 186 in FIGURE 14, includes a locking pin or blade 234 which is adapted to slide within longitudinal slot 236 of the die slide guide block, and a safety interlock lever 238. The slot 236 is so positioned that when the detent springs 206 are respectively in engagement with any notch in the die slides, the blade 234, will be able to move transversely within the slot 236 and one of the notches 226 and 228 in each slide, and positively lock each of the die slides in its exact registration position by engaging the notch in the slide immediately adjacent to the notch engaged by the detent springs. The locking pin or blade 234 is provided with a knob 138 secured to extension 240 of the pin which extends through the side of the top member 120. An enlarged shoulder portion 242 secured to extension 240 of the pin 234 limits the outward motion of the pin 234 relative to the die slide guide block by hitting against the inward side 241 (FIGURE 8) of the top member 120, and is also adapted upon inward motion of the locking pin to engage an arm or detent 244 of the pivoted safety interlock lever or blocking plate 238. During the locking operation, as the pin 234 moves inwardly to lock the die slides in any exact registration position, shoulder 242 rides over the pressure spring 246 and the forward end of the shoulder engages detent 244. Continual inward motion of the pin 234 and shoulder 242, through the action of the detent 244, causes the blocking plate 238 to pivot about its pivot 248 (FIGURE 8) against the spring 250 so that the forward end uncovers the aperture 251 at the forward end of the top member 120 only when all slides are locked. The spring 250 urges the blocking lever 238 back to its blocking position upon disengagement of the shoulder 242 of the pin 234 from the detent 244 which is as soon as the pin unlocks the first (lowermost in FIGURE 8) slide.

It will be readily seen that when all of the male dies are locked in any of their respective detented positions and aperture 251 in the top member is uncovered, the device is ready to punch any number on a card as the stud 152 (FIGURES 4 and 6) may now fit into the aperture 251 upon sufficient relative movement between the top member 120 and base member 122 to effect die mating. On the other hand, when any one of the male dies is unlocked, aperture 251 is at least partially blocked so that stud 152 cannot be received thereby. The male dies are thereby protected from damage by inadvertent relative movement of the top and base members 120, 122 toward each other since such relative movement cannot then be sufficient to cause any male die to enter any die aperture even in the stripper plate 172 or to touch any surface area between the stripper plate die apertures.

Reference is now made again to FIGURES 1, 4, 4A and 7 to explain the way in which a card, specifically an 80 column 12 row card like that in FIGURE 4B, is properly positioned to punch out any one of the digits 0-9 in any one of the 80 columns on the card. The card positioning apparatus generally designated 252 operates mainly to determine the longitudinal position of card 156 though

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the upstanding outer edges 254 of tray 256 operate in conjunction with the card edge guides 144 and 146 to keep the card "square" and otherwise properly aligned in its transverse direction so that its columns will be parallel to the columns of apertures 178. As shown in FIGURE 4A, card 156 slips under the stripper plate 172 and across the rest of the punching device onto the top surface 258 (FIGURE 7) of the tray which is secured to the punching device by three screws 260 (FIGURE 4).

To determine accurately the position of a card to a desired set of six columns to be punched, a metal strip 262 containing an upper row of inscribed numbers within contiguous rectangles and a lower row of inscribed numbers within other contiguous rectangles is secured in any desired manner in groove 264. The upper and lower leftmost numbers are 75 and 80 respectively; those next on the right are 74/79; then 73/78, 72/77, etc., dropping down one number on the top and bottom for each step rightwardly. At the right end of strip 262 appears the column indicators 21/26. Successive sets of upper and lower rectangles correspond to successive sets of six columns, with the center-to-center distance between contiguous sets being the same as that distance between adjacent columns on the card. As will be appreciated from FIGURE 4B, the columns on a card are quite close together, being normally in the order of $1\frac{1}{2}$ per inch. Therefore, the numbers on strip 262 are accordingly quite small and difficult to read with ease. Consequently, instead of a pointer or the like, which could be used to designate the instant set of numbers corresponding to the first and last of the six card columns to be punched, a dome-shaped magnifying glass 266 with its bottom blackened except for a strip the width of a set of number rectangles is employed. As shown in the enlargement in FIGURE 4C, the pair of numbers becomes readily readable.

Magnifier 266 is movable along strip 262 by carrier 268, which, as best seen in FIGURE 7, has two downwardly projecting hook members 270 and 272 that respectively ride in channels 274 and 276 partially covered by strip 278 which prevents the carrier from being removed from the tray except via its left end. The magnifier 266 is indexed to any one of the sets of upper and lower numbers on strip 262 by the indexing of carrier 268 with the aid of a rack 280 of sharp teeth affixed to the back underside of tray 256 and a pivoted detent 282. This detent fits the V-shaped grooves between the rack teeth and is spring biased thereinto but manually movable out of engagement with the teeth so that carrier 268 can be slid along the tray.

The right edge 284 of carrier 282 forms an abutment for card 156 (FIGURE 4A). To so abut the card, slight pressure is put on the left end of pivoted lever 286 to raise its downward projection 288 (FIGURE 2) so that the card can slide all the way to abutment 284. Due to biasing, release of lever 286 causes its projection 288 to move against the card and hold it there during a punching operation.

Though not shown, card positioning apparatus like 252 may be placed on the right side of the main punching device to effect accurate positioning of cards from column 1 through column 20 or more.

Reference is now made to the printing mechanism incorporated in the device. The group 145 of print bars shown in FIGURE 8 consists of six print bars 290, 292, 294, 296, 298, and 300, each of which is similar to each other and like print bar 300 shown in FIGURE 15 together with two L-shaped projections 302 and 304 disposed on opposite ends of the print bar. Each bar carries its own indicia 306, comprising a set of numerals 0-9, disposed in relief on a U-shaped member 308 crimped or otherwise secured to the upper edge of supporting body 310 of the respective print bar. The different print bars are adapted to slide longitudinally in respective grooves 312 formed by ribs 314 in a guide block

316 which may be secured at its four corners by screws 318 (FIGURE 8) to plate 198. As shown in FIGURE 15, each bar has a longitudinal aperture 320 which cooperates with a cross bar 322 secured to the lower plate 324 of the guide block to prevent the bars from moving up or down.

The L-shaped projections 302 and 304 operatively connected to each print bar, as by being integrally formed with the respective print bar support ends 326 and 328, and making therewith a U-shaped configuration, provide means for adjusting the width of slots 330 and 332 since the outer legs of each adjuster is bendable in either direction along the longitudinal axis of the respective print bar. To the outer leg of each adjuster on each end of each print bar there is connected a respective flexible cable or wire 334 and 336, preferably of the twisted-strand type. As will be noted in FIGURE 8, wires 336 are looped around a guide block 338 and are respectively connected to the forward ends of the punch slides 212. Similarly, at the rearward end of the device, wires 334 are looped around another guide block 340 and respectively connect to the rear ends of slides 212.

Each of the guide blocks 338 and 340 are constructed similar to each other and like the one shown in FIGURE 16. As is apparent in FIGURE 16, opposite sides of the guide block are in the form of stair steps sloping in the same direction, with each step riser having a respective channel or groove 342, 344, 348, 350, 352, wherein the respective wires may be slid and whereby they may each effectively cross one another without interference therebetween. It will be noted that the uppermost one of wires 336 in FIGURE 16 is on the outside of the group of wires on the left side of the figure, but on the inside thereof on the right side of the figure. The reverse is true for the lowermost one of the wires 336, with inbetween wires likewise changing position in the relative entering and exiting positions on the guide block.

This feature allows the print bars and punch slides to be respectively associated so that, with reference to FIGURE 8, the upper slide and bar are connected at their adjacent forward ends by the upper one of the wires 336 and at their adjacent rearward ends by the upper one of the wires 334, the lowermost slide 212 and print bar 300 being connected by the lowermost one of wires 336 at their forward ends and by the lowermost one of wires 334 at their rearward ends, etc. Each print bar therefore moves in unison with a respective punch slide, when the latter is moved by a knob 216, but in an opposite direction, and consequently, as previously indicated, in reference to FIGURE 4B, the numbers printed at the top of the card are in the same order from left to right as the numbers punched out during any given print-punch operation. That is, when the lever handle 153 of FIGURE 1 is pressed while control knob 138 is pushed all the way in as shown in FIGURE 1, the numbers which then appear in apertures 130 will be printed at the top of the card so as to appear in the same order as the numbers appear in those apertures, and at the same time those same numbers will be punched out in the respective columns to which the card is set by the card positioning apparatus 252. The indicia 306 (FIGURE 15) on the different punch bars, during such an operation, moves down against ribbon 131 (FIGURE 8) which presses against the card at points thereof which are backed up by platen 135 (FIGURE 4A). The platen may be of conventional material for platens generally, may be spring loaded, if desired, by means not shown.

It will be noted from FIGURE 8 that guide blocks 338 and 340 are respectively attached to plate 198 and the rearward end of the punch slide guide block 202 by plate 355 and form for the respective groups of wire loops fixed points separated a greater distance than the

points of maximum longitudinal movement in both directions of either the slides 212 or print bars 145.

The wires 334 and 336 are preferably of steel with the guide blocks 338 and 340 being preferably at least partially of different material, for example the guide blocks may be completely formed of hard plastic, or they may be made of alternate layers of brass and steel with the lands of the stair steps thereof being brass.

As previously indicated in reference to FIGURE 15, the indicia carrying member 308 is crimped or otherwise secured to the support member 310 of the print bar. Since the support member 310 is longer than the indicia carrying member 308, there is room to adjust the latter along the length of the former in order to at least approximate a proper positioning of each indicia carrying member relative to those of the other five print bars. However, once the indicia carrying member is secured to the support member, it can no longer be moved lengthwise of the print bar. For this reason and in order to effect complete alignment of all numbers printed at any one time, adjusters 302 and 304 are provided.

It will be noted that the slots 330 and 332 in FIGURE 15 open in opposite directions. As shown in FIGURE 8, the forward slots 332 of print bars 296, 298, and 300 open upwardly in that figure, while the rear slots 330 of print bars 290, 292, and 294 open upward, it being understood that the slots at the opposite ends of each print bar open in opposite directions. For purposes of minutely shifting any print bar so that its indicia will be aligned with that of every other print bar, it is not essential to have the slots 330 and 332 opening in opposite directions at opposite ends of any of the print bars, nor is it essential that the three highest order print bars have their forward slots open upwardly in FIGURE 8 while the three lower order print bar forward slots open downwardly. The opening of the slots for any given print bar may be in the same direction and the indicia thereon can be satisfactorily aligned with those on other print bars by binding the outer legs of the adjusters in opposite directions. Also, adjacent bars may have their corresponding slots in the same or opposite directions as desired.

The reason slots 330 and 332 preferably open in opposite directions at opposite ends of respective print bars, is that the point of connection of wires 334 and 336 can then be such that there is greater flexibility at one end of the print bar in adjusting the wire tension. For example, if wire 334 in FIGURE 15, after it had been connected both to adjuster 302 and the end of the respective punch slide, were too slack, then adjuster 302 could be bent inwardly along the longitudinal axis of the print bar to tighten wire 334. If in the execution of this procedure print bar 300 actually moves leftwardly in FIGURE 15, which may or may not occur according to the instant circumstances, so as to cause its indicia 306 to be out of alignment with the indicia on other print bars, then the outer leg of adjuster 304 could be bent along the longitudinal axis of the print bar to move the indicia back into alignment. With wire 336 being connected at the bottom of the L forming adjuster 304, whereas wire 334 is connected at the top of the L form adjuster 306, adjuster 304 would need to be moved considerably more, relatively speaking, than adjuster 302 to effect the desired compensation since the leverage advantages are different for the different adjusters. However, slots 330 and 332 are wide enough initially so that the amount of adjustment necessary either to just adjust the alignment of the indicia, or additionally adjust the wire tension, is available.

Preferably, each loop of wire is connected at points on its respective punch slide and print bar that will maintain the wire substantially level throughout its length, i.e., substantially in a plane that fully includes the respective groove in the associated guide block 338 or 340 for that

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wire. Further, preferably, the three lowermost wires in the sets of wires 334 and 336 in FIGURE 8, i.e., the ones connected to the adjusters of print bars 296, 298, and 300, are all connected thereto at points below the center of the outer arm of the adjusters, while those connected to the print bars 294, 292, and 290 are connected above the centers of their adjusters. In this manner none of the corresponding wires 334 and 336 connect to the center of the adjusters at opposite ends of any of the print bars, giving the differential leverage effect and consequent advantages thereof indicated above.

Thus it is apparent that there is provided by this invention a device in which the various objects and advantages herein set forth are successfully achieved.

Modifications of this invention not described herein will become apparent to those of ordinary skill in the art after reading this disclosure. Therefore, it is intended that the matter contained in the foregoing description and the accompanying drawings being interpreted as illustrative and not limitative, the scope of the invention being defined in the appended claims.

What is claimed is:

1. A card printing device comprising a platen, printing means spaced from said platen, said printing means and said platen being relatively movable toward each other, said printing means including at least one print bar bearing a plurality of indicia spaced along its length and being lengthwise movable relative to said platen so that any one of said indicia can be positioned in given registration with respect to the platen for printing of the so registered indicia on a card inserted between the platen and printing means when the platen and printing means are relatively moved toward each other, means for moving said bar lengthwise for indexing any desired one of said indicia to a printing position and including a separate slide for each print bar lengthwise movable relative to said bar and indexable to a plurality of positions, and coupling means connecting said slide to said print bar for unison movement, said coupling means including means for independently adjusting said bar relative to said indexed slide for accurate registration relative to a print point.

2. A device as in claim 1 and further including means for positively locking said bar at any one of the indexed indicia printing positions, and said adjusting means is operative to effect said accurate registration during said locking.

3. A device as in claim 2 including means for moving said platen and printing means toward one another sufficiently to effect printing only when said locking means locks said bar with a said indicium in printing position.

4. A card printing device comprising a platen, printing means spaced from said platen but relatively movable toward each other and including at least one print bar bearing a plurality of indicia spaced along its length and lengthwise movable relative to said platen so that any one of said indicia can be positioned in given registration with respect to the platen for printing of the so registered indicia on a card inserted between the platen and printing means when the platen and printing means are relatively moved toward each other, means for moving said bar lengthwise for indexing any desired one of said indicia to a printing position, and means operatively connected to said bar for adjusting an indexed indicium to effect accurate registration thereof, wherein said moving and indexing means includes a slide lengthwise movable and indexable to a plurality of positions and means including said adjusting means for coupling said bar and slide together for unison movement, and wherein said coupling means comprises two loops of wire respectively connected at one end to opposite ends of said slide and said adjusting means comprises on each end of said bar bendable means connected respectively to the other ends of said loops for minutely shifting the longitudinal position of said bar with respect to an indexed position of said slide.

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5. A device as in claim 4 wherein each of said bendable means comprises, on a respective end of said bar, a projection bendable in either direction along the longitudinal axis of said bar.

6. A device as in claim 5 wherein each of said projections is L-shaped with the bottom part of the L being connected with one side of the respective end of said bar so that the side of the L forms a slot with the remainder of that end of the bar.

7. A device as in claim 6 wherein the L-shaped projections at opposite ends of the bar are upside down with respect to each other.

8. A card printing device comprising a platen, printing means spaced from said platen but relatively movable toward each other and including at least one print bar bearing a plurality of indicia spaced along its length and lengthwise movable relative to said platen so that any one of said indicia can be positioned in given registration with respect to the platen for printing of the so registered indicia on a card inserted between the platen and printing means when the platen and printing means are relatively moved toward each other, means for moving said bar lengthwise for indexing any desired one of said indicia to a printing position, and means operatively connected to said bar for adjusting an indexed indicium to effect accurate registration thereof, wherein said lengthwise moving and indexing means includes a slide indexable to a plurality of positions corresponding respectively to said indicia, means for lengthwise moving and indexing said slide, said slide lengthwise moving and indexing means including a second plurality of indicia corresponding respectively to the indicia of the first mentioned plurality thereof and means for registering any one but only one at a time of the said second indicia, and means including said adjusting means for loop coupling the ends of said slide respectively to the adjacent ends of said bar to cause the bar to move in unison with said slide but in a lengthwise direction opposite to that in which the slide is moved to effect indexing of a given second indicium and consequently the corresponding first indicium, said adjusting means being effective to adjust the lengthwise position of said bar without affecting the lengthwise position of said slide.

9. A device as in claim 8 wherein the loop coupling means comprises two wire loops movable about respective fixed points separated a greater distance than the maximum distance between the points of maximum longitudinal movement in both directions of the ends of either said slide or bar, said bar and slide having their longitudinal axes substantially parallel, said wire loops being connected at one end respectively to opposite ends of said slide, said adjusting means comprising on each end of said bar a projection forming with its respective bar end a U-shaped configuration with the outer leg of the U being bendable in either direction along the longitudinal axis of said bar and connected to the other end of one of said wire loops.

10. A device as in claim 8 and further including a male die coupled to said slide and a plurality of female dies to which said male die is registered, respectively, upon indexing of said second indicia for punching, when said platen and printing means are moved toward each other to effect printing on a card therebetween of a given first indicium, an aperture in that card in a position corresponding to the substantially simultaneously printed indicium.

11. A card printing device comprising a platen printing means spaced from said platen but relatively movable toward each other and including at least one print bar bearing a plurality of indicia spaced along its length and lengthwise movable relative to said platen so that any one of said indicia can be positioned in given registration with respect to the platen for printing of the so registered indicia on a card inserted between the platen and printing means when the platen and printing means are relatively moved toward each other, means for moving said bar

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lengthwise for indexing any desired one of said indicia to a printing position, and means operatively connected to said bar for adjusting an indexed indicium to effect accurate registration thereof, including a first member for holding said platen, a second member for holding said printing means, and means, including means for maintaining said platen and printing means normally apart, for relatively moving said platen and printing means toward each other for printing purposes and then back away from each other a predetermined distance comprising a lever pivoted on one of said members, a latch pin mounted on the other said member, a latch rotatably hooking at its opposite ends one end of said lever and said pin respectively, and means operative relatively to one end of said lever for determining said predetermined distance.

12. A device as in claim 11 wherein said latch includes means predetermining the maximum distance the platen and printing means are normally apart and said predetermined distance determining means operates on the arm of said lever opposite to the end to which said latch is coupled to limit the distance the platen and printing means are normally apart to a distance less than said maximum distance.

13. In a device for placing indicia in or on a card and which includes a plurality of indicia placing means independently movable in respective columns in a given plane to any one of a plurality of registration positions relative to means for receiving said indicia placing means disposed in a second plane normally spaced from said given plane for producing a space for receiving a card in or on which indicia is to be placed when said given and second planes are moved sufficiently toward each other, the improvement comprising means for indexing a card laterally with respect to said columns and including a card receiving tray having along its length means for indicating sets of card columns with each set being coextensive in the number of columns it indicates with the number of the first mentioned columns, means operatively connected to said tray and slidable along said indicating sets for selecting a given one thereof and providing an adjustable abutment for said card to position the selected columns of said card in registry respectively with said first columns, and means coupled to said slidable means for releasably holding a card at any selected set of columns.

14. A device as in claim 13 wherein the last mentioned means includes means for releasably holding a card abutted against said slidable means and means for releasably holding said slidable means in any one of a plurality of positions related respectively to said sets, and including magnifying means on said slidable means for enlarging the set indications to which the slidable means is instantly positioned.

15. A card punching and printing device including a set of first punching dies arranged in columns in a given plane, each column having a predetermined number of said dies, a set of second punching dies disposed in a second plane, each of said second dies cooperating with one of said columns of first dies and providing a mate therefor for card punching purposes, means for independently moving each of said second dies in said second plane along its cooperating column of first dies to registration with any one of said first dies, the sets of first and second dies being normally spaced apart but relatively movable toward one another at least the distance necessary to effect mating between any registered first and second die, said means comprising slides respectively secured to said second dies and adapted for sliding motion relative to said columns of first dies, means for effectively guiding said second dies to substantially prevent lateral movement thereof relative to said columns of first dies, means for positioning a card in a predetermined relation relative to the column direction of said first dies whereby apertures may be punched in different columns of said card in positions respectively designating different indicia, a platen disposed in a plane movable with and substantially fixedly related and par-

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allel to said second plane, printing means disposed in a plane fixedly related to said given plane and movable therewith and including a plurality of longitudinally movable print bars respectively associated with said slides, each of said bars having spaced along its length configurations of the different indicia which may be represented by differently positioned card apertures effected by a respective second die, means for coupling each print bar to its said respectively associated slide to cause the former to move longitudinally in unison with the latter and effect printing on the card of the same indicium as that punched into the card by the respective second die upon mating with one of its associated first dies, and control means comprising means for releasably locking each of said slides and its respective print bar respectively in a second die registration position relative to any of the respectively associated first dies and a printing position relative to said platen, and means cooperating with the last mentioned means for preventing relative movement of said given and second planes toward each other at least to the extent of the distance necessary to effect printing and mating of any first and second die but only during the time any second die and its respective print bar are effectively unlocked so as to be longitudinally movable as aforesaid.

16. A device as in claim 15 and further including means for adjusting each print bar in its longitudinal position while its respective slide is locked as aforesaid to effect accurate alignment of indicia printed on a card at one time.

17. A device as in claim 15 wherein the said printing means includes an ink ribbon having an operative length a plurality of times longer than the transverse distance encompassed by said print bars and movable transversely thereof to any one of an infinite number of positions within the limits of said length.

18. A device as in claim 15 wherein said slide and print bar coupling means comprises means for loop coupling both ends of each slide to the adjacent ends of its said respectively associated print bar to cause unison movement thereof in opposite longitudinal directions.

19. A device as in claim 18 wherein the loop coupling means at each end of each coupled slide and bar includes means for adjusting each print bar in its longitudinal position while its respective slide is locked as aforesaid to effect accurate row alignment of indicia printed on a card at one time.

20. A device as in claim 19 wherein the longitudinal axes of said print bars and slides are all movable in respective substantially parallel columns with the bar columns being grouped and laterally spaced from the group of slide columns and with each respectively associated bar and slide being in the same numbered column of its respective group when the columns of each group are counted in the same transverse direction, wherein each said loop coupling means comprises a wire loop movable about a fixed point with the fixed points for opposite ends of a said loop coupled bar and slide being separated a greater distance than the maximum possible distance from the point of maximum movement in one direction of one end of the respective slide or bar to the point of maximum movement in the other direction of the other end thereof, the two wire loops for each respectively associated bar and slide being connected at one end respectively to opposite ends of that slide, said adjusting means comprising on each end of each bar a projection forming with the respective bar end a U-shaped configuration with the outer leg of each U being bendable in either direction along the longitudinal axis of the respective bar and being connected to the other end of the wire loop that is connected to the adjacent end of the respectively associated slide.

21. A device as in claim 20 wherein the U-shaped configurations at opposite ends of each bar are upside down relative to each other.

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22. A device as in claim 20 including a pair of wire guiding blocks disposed to form the said fixed points for said wire loops, each block comprising a plurality of grooves in which respective ones of said wire loops may move with each groove being on a different level and having its respective ends substantially in alignment with the longitudinal axes respectively of the respectively associated bar and slide to which its wire loop is coupled.

23. A device as in claim 15 wherein said control means includes means for causing said printing means and second dies to move, only when all said slides and print bars are locked as aforesaid, relatively toward said platen and first dies respectively to effect printing and punching.

24. A device as in claim 15 including a first member for holding said platen and first dies, a second member for holding said printing means, slides, and second dies, and means, including means for maintaining said first and second members normally apart, for relatively moving the platen and printing means and also the first and second dies toward each other to effect printing and punching and then back away from each other a predetermined distance comprising a lever pivoted on said second member, a latch pin mounted on said first member, a latch rotatably hooking at its opposite ends said pin and one end of said lever respectively, and means operatively related to one end of said lever for determining said predetermined distance.

25. A device as in claim 15 and further comprising means for indexing a card laterally with respect to said columns and including a card receiving tray having along its length means for indicating sets of card columns with each set being coextensive in the number of columns it indicates with the number of the first mentioned columns means operatively connected to said tray and slidable along said indicating sets for selecting a given one thereof and providing an adjustable abutment for said card to position the selected columns of said card in registry respectively with said first columns, and means coupled to said slidable means for releasably holding a card at any selected set of columns.

26. A device as in claim 25 wherein the last mentioned means includes means for releasably holding a card abutted against said slidable means and means for releasably holding said slidable means in any one of a plurality of positions related respectively to said sets, and including magnifying means on said slidable means for enlarging the set indications to which the slidable means is instantly positioned.

27. A device as in claim 26 including a first member for holding said platen and first dies, a second member for holding said printing means, slides, and second dies, and means, including means for maintaining said first and second members normally apart, for relatively moving the platen and printing means and also the first and second dies toward each other to effect printing and punching and then back away from each other a predetermined distance comprising a lever pivoted on said second member, a latch pin mounted on said first member, a latch rotatably hooking at its opposite ends said pin and one end of said lever respectively, and means operatively related to one end of said lever for determining said predetermined distance.

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28. A device as in claim 26 wherein said slide and print bar coupling means comprises means for loop coupling both ends of each slide to the adjacent ends of its said respectively associated print bar to cause unison movement thereof in opposite longitudinal directions.

29. A card printing device comprising a platen, printing means spaced from said platen, said printing means and said platen being relatively movable toward each other, said printing means including at least two print bars, each bar bearing a plurality of indicia spaced along its length and being lengthwise movable relative to said platen so that any one of said indicia can be positioned in given registration with respect to the platen for printing of the so registered indicia on a card inserted between the platen and printing means when the platen and printing means are relatively moved toward each other, means for independently moving each said bar lengthwise for indexing any desired one of said indicia thereon to a printing position and including a separate slide for each print bar lengthwise movable relative to the respective said bar and indexable to a plurality of positions, and coupling means for each said slide and respective bar connecting same for unison movement, each said coupling means including means for independently adjusting the respective print bar relative to the indexed slide coupled thereto for accurate registration relative to a print point and for transverse alignment of indexed indicia.

30. In a device for placing indicia in or on a card and which includes a plurality of indicia placing means independently movable in a first member in respective columns in a given plane to any one of a plurality of registration positions relative to means for receiving said indicia placing means disposed in a second member in a second plane normally spaced from said given plane for producing a space for receiving a card in or on which indicia is to be placed when said given and second planes are moved sufficiently toward each other, the improvement of means, including means for maintaining said first and second members normally apart, for relatively moving said first and second members toward each other for indicia placing purposes and then back away from each other a predetermined distance, comprising: a lever mounted on one of said members, a latch pin mounted on the other said member, a latch rotatably hooking at its opposite ends one end of said lever and said pin respectively, and means operative relative to one end of said lever for determining said predetermined distance.

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