Sept. 11, 1956 T. F. SMUSZ 2,762,434

PUNCHING AND NOTCHING MACHINE

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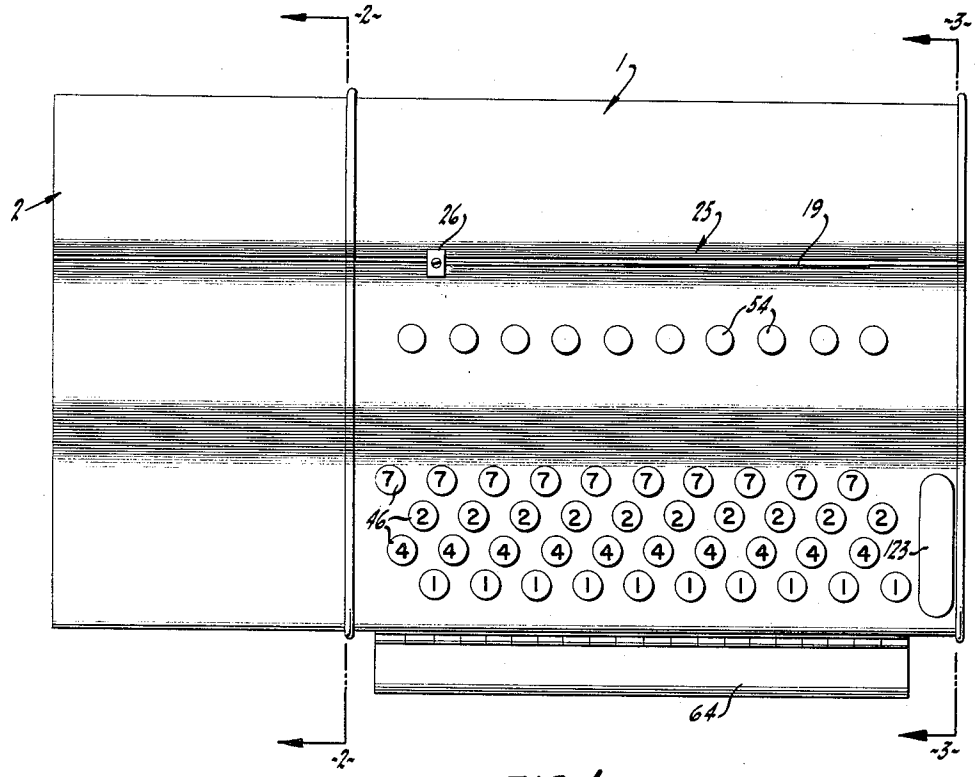


FIG. 1

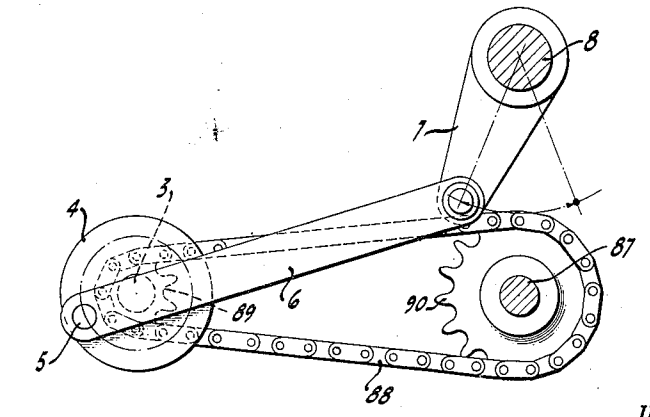


FIG. 2

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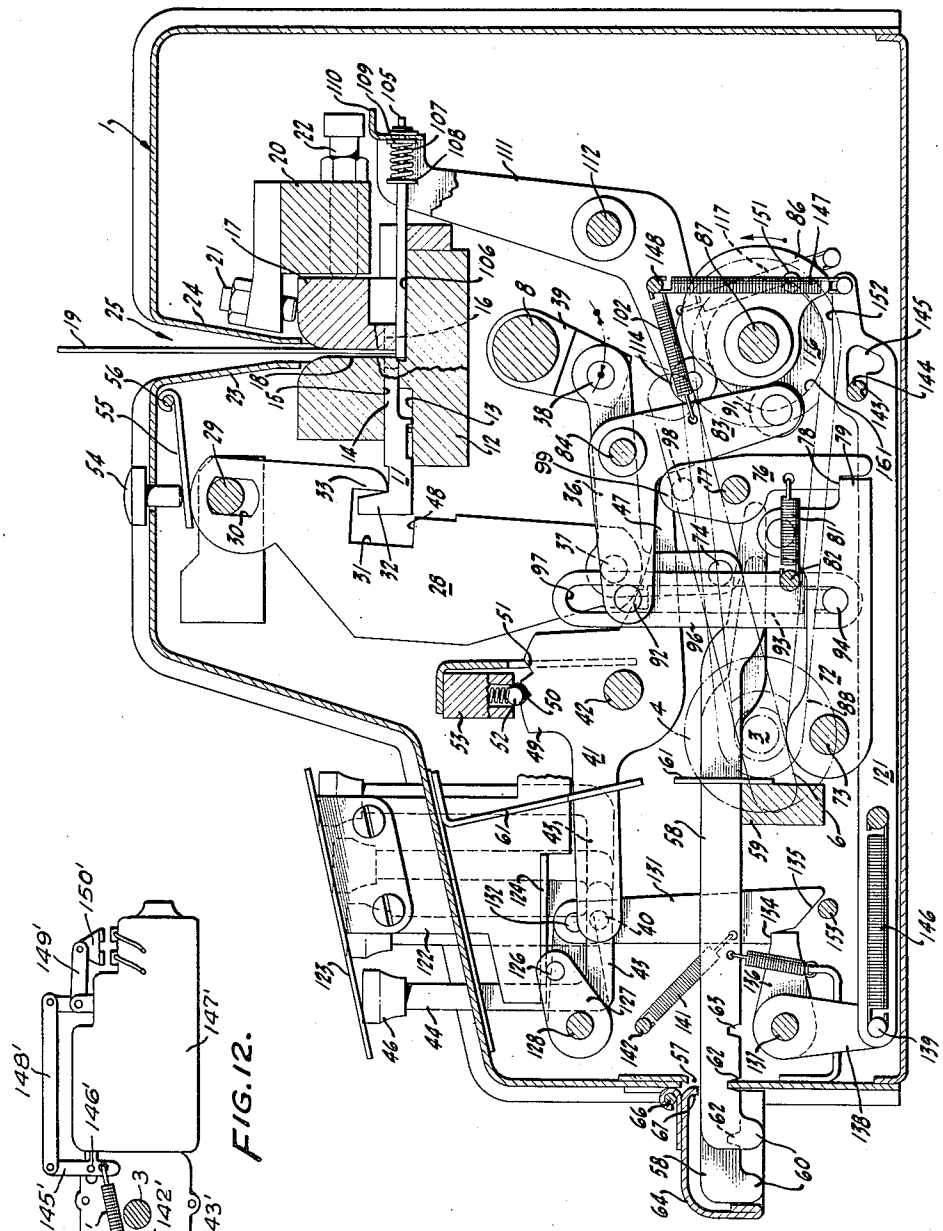


FIG. 3.

FIG. 12.

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FIG. 4

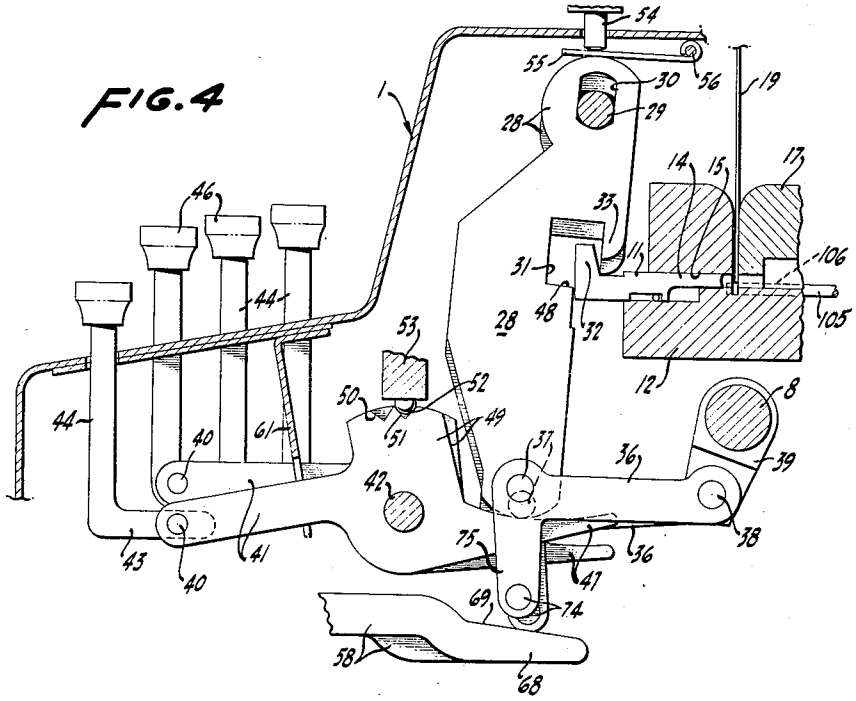
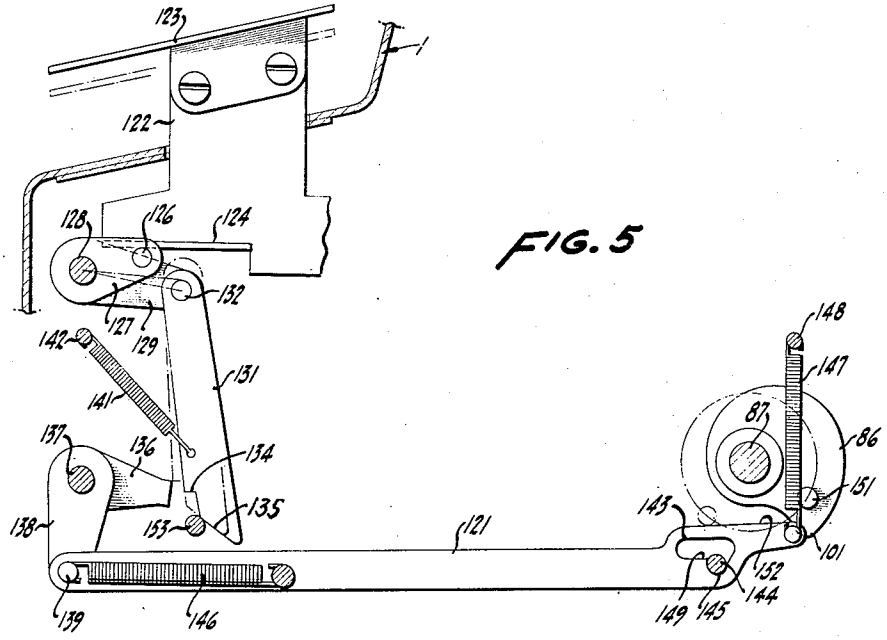


FIG. 5



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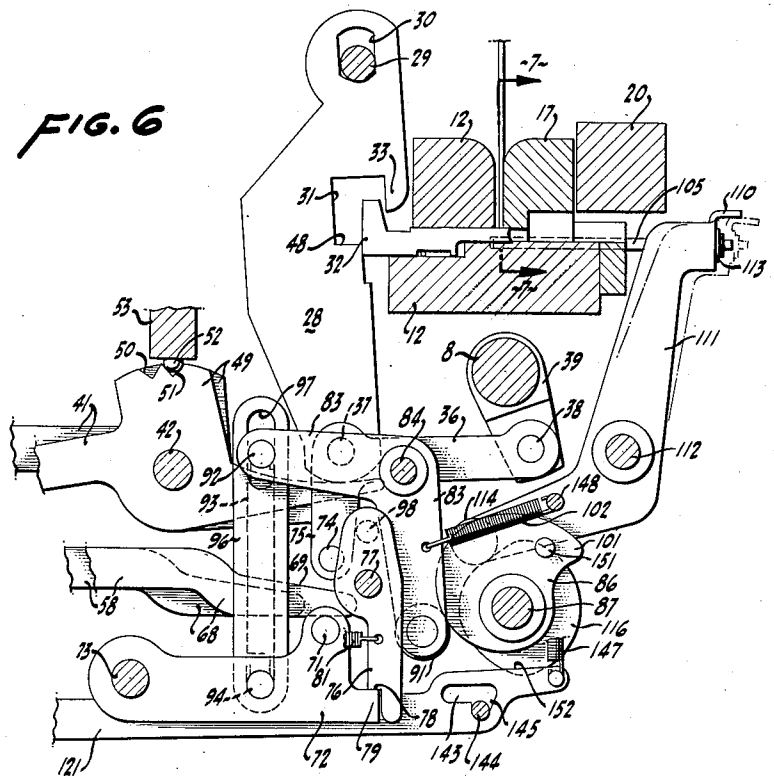
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FIG. 6



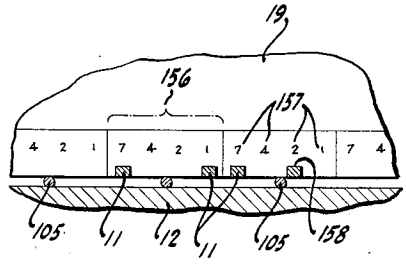


FIG. 7

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FIG. 8

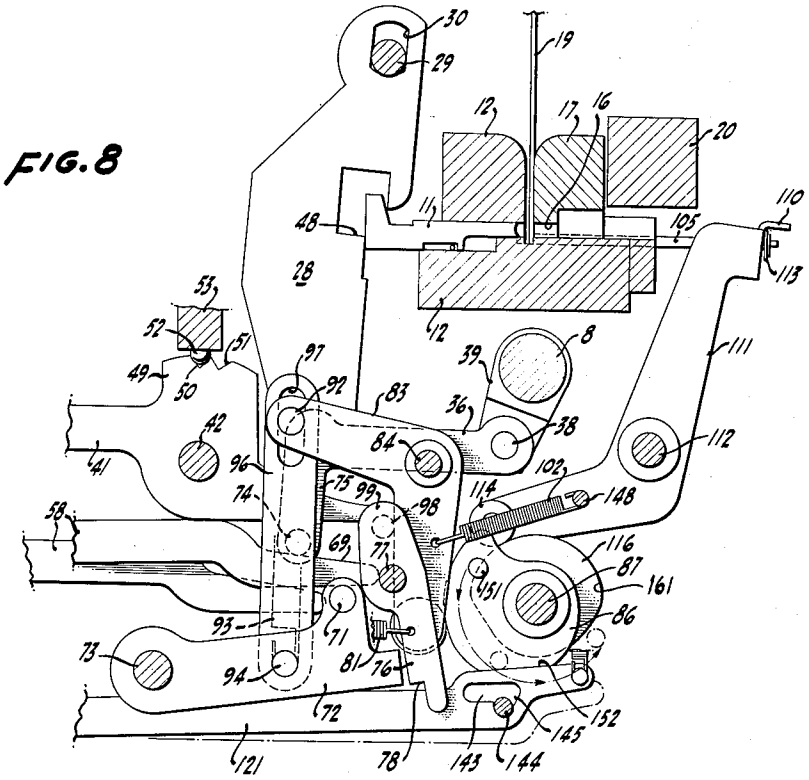
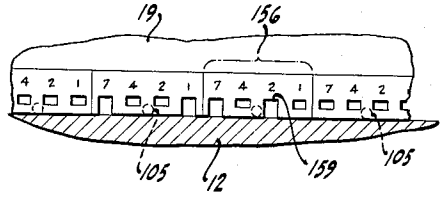


FIG. 9



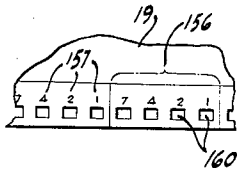


FIG. 10

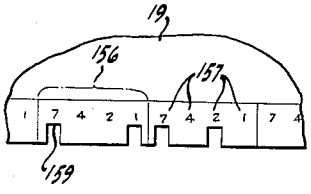


FIG. 11

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United States Patent Office 2,762,434 Patented Sept. 11, 1956

2,762,434

PUNCHING AND NOTCHING MACHINE

Teddy F. Smusz, Athens, Ohio, assignor, by mesne assignments, to Royal McBee Corporation, a corporation of New York

Application December 4, 1953, Serial No. 396,140

8 Claims. (Cl. 164—112)

This invention relates to machines for punching and notching edge portions of record cards whereby the cards may be coded for classification, sorting and other purposes.

The invention particularly relates to a machine of the character disclosed in Patent No. 2,035,777, dated March 31, 1936, and involves improvements thereon whereby a single set of punches may be operated selectively to cut apertures, or coding notches, or both, in the course of a complete cutting cycle.

It is among the objects of the present invention to provide a card notching and punching machine operable through a two stroke cycle for punching notches and/or apertures in coding relation along an edge of a card.

Another object is to provide a card notching and punching machine provided with means whereby the position of a card may be shifted between successive strokes of a two stroke cycle for cutting away portions of a card in different relationship to the edge of the card.

Another object is to provide a machine of the character described, provided with a single set of punches, arranged to be independently activated for operation to cut notches, or to punch apertures, or to cut both notches and apertures along an edge of a card in predetermined arrangement.

A further object is to provide a machine in which provision is made for activating selected punches for operation through a two stroke cycle for cutting notches in edge portions of a card, and also with separate means for activating other punches for operation through a one stroke cutting cycle, coincident with one of the cutting strokes of the two stroke cycle, for punching apertures in spaced relation to the card edge.

A further object is to provide card supporting means associated with a plurality of punches for initially holding a card in raised cutting position relative to the punches, and for automatically withdrawing the supporting means to permit the card to drop to a lower position between successive cutting strokes of the punches.

It is also among the objects of the invention to provide improved features of construction, arrangement and operation, adapted to simplify the construction and operation of the device, and to provide a machine of highly dependable and efficient character.

The invention has other objects and features of advantage, some of which with the foregoing will be explained in the following description of that form of the invention illustrated in the drawings. It is to be understood that the invention is not limited to the embodiment shown in the drawings as it may be otherwise embodied within the definition of the appended claims.

In the drawings:

Fig. 1 is a plan view of a machine embodying the present invention.

Fig. 2 is a detail view showing the relationship of the main drive connections of the machine as viewed in the direction indicated by the line 2—2 of Fig. 1.

Fig. 3 is a transverse sectional view, the plane of the section being indicated by the line 3—3 of Fig. 1.

Fig. 4 is a fragmental sectional view showing the manner in which selected punches are activated for notch cutting operation.

Fig. 5 is a fragmental sectional view showing the relationship of the parts operable for controlling the motor drive connections.

Fig. 6 is a fragmental sectional view showing the relationship of the punch activating and actuating means and related parts as positioned near the end of the first cutting stroke of a notch cutting cycle.

Fig. 7 is a fragmental sectional view showing the manner in which a card is cut by the first cutting stroke, the plane of the section being indicated by the line 7—7 of Fig. 6.

Fig. 8 is a view similar to Fig. 6, but showing the parts in the positions occupied at the start of the second cutting stroke of a cycle.

Fig. 9 is a fragmental sectional view, similar to Fig. 7, but showing the manner in which the card is cut by punches activated for operation during the second cutting stroke of a cycle.

Fig. 10 is a fragmental view of a portion of a card showing the manner in which apertures may be punched therein without notching.

Fig. 11 is a fragmental view of a portion of a card having coding notches cut therein without apertures.

Fig. 12 is a schematic illustration of how oscillation of one shaft controls rotation of another.

In terms of broad inclusion, the notching and punching machine of the present invention comprises a plurality of punches mounted in association with a die provided with means for supporting a card in position to be cut by selected punches. Provision is made for activating selected punches for operation through a two stroke cycle to cut notches in the edge of a card, the position of the card being shifted between successive strokes of the cycle so that, on the first stroke, the activated punches each cut a shallow notch in the edge of the card, and at the second stroke cut the notch to a greater depth after the card has been shifted to its second cutting position. Provision is also made for activating other punches independently of the first activating means, for selective operation through a single cutting cycle coincident with the second stroke of the two stroke notch cutting cycle of operation. The punches activated by the second activating means are operable to punch apertures in the card at points where punches are not activated for the notching operation. The mechanism is motor driven through a full cutting cycle in substantially the manner illustrated and described in the above mentioned Patent No. 2,035,777, provision being made for operating the motor drive through the two full cutting strokes of the two stroke cycle, herein contemplated, and for interrupting the operation at the completion of the second stroke.

In terms of greater detail, the machine of the present invention comprises a main housing designated in general by the numeral 1, substantially enclosing the punch mechanism and the means for selectively activating and operating the punches. Upon one end of the main housing 1 there is mounted a motor drive housing 2, constituting an extension of the main housing, and enclosing a motor and motor control mechanism of the character illustrated and described in Patent No. 2,035,777. Since the motor and the switch mechanism by which the motor is energized to operate the punch mechanism through a cycle of operation, and by which the operation of the motor is interrupted at the completion of the cycle, has been fully disclosed in said patent, a detailed description of such mechanism is herein unnecessary and has been omitted.

For purposes of the present invention, the motor drive unit includes a main motor driven shaft 3 on which is secured a crank plate 4 provided with a crank pin 5. A connecting link 6 is rotatably connected to the crank pin 5 at one end. At its opposite end the link 6 is connected to a crank arm 7, secured to a crank shaft 8 extending longitudinally across the main housing 1 with the ends of the shaft 8 journalled in the ends of the main housing 1, in any suitable manner. Switch control mechanism is mounted in association with the main motor driven shaft 3 as disclosed in Patent No. 2,035,777 to interrupt the operation of the motor drive upon the completion of a prescribed cycle of cutting operation. In the present invention the cycle comprises two cutting strokes of the crank arm 7 and two full rotations of the main shaft 3, as opposed to a single stroke operation as described in said patent.

A plurality of punches designated in general by the numeral 11 are slidably mounted for reciprocating movement within a die member 12 mounted in longitudinally extending position between the ends of the main housing 1. The punches 11 are slidably movable in openings 13 formed in the die 12. Reduced extensions 14 upon the inner ends of the punches 11 extend through corresponding guide openings 15 in the die, and into corresponding openings 16 in a die plate 17 forming a part of the die assembly. The die plate 17 is spaced from the main body of the die 12 to provide a slot 18 into which a card 19 may be introduced and positioned to be cut through by the punches 11.

The die plate 17 is originally correctly positioned in aligned condition with respect to the die 12 by screws 21 and 22 mounted in association with a die reinforcing bar 20 mounted in association with the die. The slot 18 of the die assembly is positioned in vertical alignment with an inwardly extending chute formed by flanges 23 and 24 converging downwardly from the top of the housing 1 toward the die assembly. The chute, which is designated in general by the numeral 25, extends longitudinally across the motor drive housing 2 as well as the main housing 1, as best indicated in Fig. 1 of the drawings. A stop 26 is slidably mounted within the chute 25, and is adjustably secured at any desired position along the chute to provide an abutment defining the cutting position of a card with respect to the length of the chute 25 and die 12.

The punches 11 are actuated by punch bars 28 mounted for pivotal movement, and for limited vertical sliding movement, upon a punch bar mounting shaft 29 extending longitudinally between the ends of the main housing 1, parallel to the die assembly 12 and in a position above and slightly forwardly therefrom. The mounting rod 29 extends through elongated openings 30 in the upper ends of the bars 28 so that the bars may rock freely, in planes normal to the die assembly in line with the punches 11 with which they are associated, whether in raised or lowered position.

Each punch bar 28 is provided with a recess 31 shaped to admit the forward end of the associated punch 11 including an upwardly extending finger 32 extending upwardly at the forward end of the punch. A lip 33 is formed upon the inner edge of each punch bar 28, in downwardly projecting position over the upper portion of the recess 31, to overhang the finger 32 of the associated punch. The recesses 31 are so shaped that, when the punch bars hang in their normal lowermost position upon the mounting rod 29, as shown in Fig. 3 of the drawings, the bar 28 may swing over the punch 11 without imparting movement to the punch. The bars 28 are held by gravity in a normal inactive position wherein each is free to oscillate upon the mounting rod 29, the end of the associated punch being received within the recess 31 as the bars oscillate from and to their inactive position.

The punch bars 28 are independently oscillated upon

the mounting rod 29 by means of connecting links 36 pivotally connected at one end to a pivot pin 37, carried by the corresponding bars 28. At the opposite end the connecting links 36 are pivoted upon a pivot pin 38 carried by a corresponding crank arm 39 secured to the main crank shaft 8.

The punch bars 28 are arranged to be selectively activated for card notching operation by means of key levers 41 mounted upon a pivot rod 42 which extends in fixed position between the ends of the main housing 1. At its outer end, each key lever 41 is provided with a stud 40 pivotally engaging a lateral extension 43 upon the lower end of an actuating key 44 extending upwardly through the top of the main housing 1 and provided with a button 46 by which the key 44 may be moved to and from punch activating position. At its inner end, each key lever 41 is provided with a pointed extension 47, the upper edge of which is shaped to engage the lower end of the corresponding punch bar 28 and act as a cam for raising the punch bar to an activated position as indicated in Fig. 4 of the drawings. In its activated position, the punch bar 28 is raised to a point such that the shoulder 48 formed by the recess 31 is raised above the bottom of the corresponding punch 11 and into alignment with the front edge of the punch. The upward movement is limited by the bottom of the slot 30 as it is moved against the mounting rod 29.

An upwardly extending lug 49 is formed upon each key lever 41 to extend upwardly above the pivot rod 42, and is provided with notches 50 and 51 arranged to engage a spring detent 52 for resisting displacement of the key lever from one position to another. The detents 52 are mounted in a bar 53 extending longitudinally of the main housing 1 in spaced parallel relation to the lever mounting rod 42.

In Fig. 4, the nearest punch bar 28 is shown in its activated position as effected by depression of the nearest key lever 41 and its actuating key 44. The other punch bars, key levers, and keys are indicated in their normal inactive position. A separate key lever 41 and actuating key 44 is provided for each punch 11 and punch bar 28. For the coding system illustrated, the keys 44 are arranged in groups of four, each group being operable to code notch a corresponding coding area of a card 19. Ten groups of the keys are illustrated, but the number of groups and the arrangement of keys may of course be varied to meet varying requirements. Indicia, as for example the numerals 1, 2, 4 and 7, may be applied to the key buttons 46 so that each may be clearly identified with the punch controlled thereby. Once set, the key levers 41 and punch bars 28 remain in activated position until purposely returned to inactive position. For that purpose, a release button 54 is mounted over each group of keys 44. The release buttons are operable through openings in the top of the main housing 1, and engage return plates 55 pivoted, as at 56, on the underside of the housing top to extend between the release buttons 54 and the upper ends of punch bars 28. Downward pressure applied to a button 54 will force any activated punch bars downwardly until the upper ends of the openings 30 seat on the mounting bars 29. Downward movement of a punch bar 28 causes pivotal movement of its key lever 41 against the resistance of its detent 52, thereby causing the key lever and its actuating key to be restored to normal inactive position, as indicated in Fig. 3 of the drawings.

The punch bars 28 are also arranged to be selectively activated for aperture punching operation independently of their activation by the key levers 41 and keys 44. For this purpose, a punch control slide 58 is mounted in association with each punch bar 28. The slides 58 rest upon a cross bar 59 extending between the ends of the main housing 1, and are movable longitudinally and upwardly relative thereto in slots formed in a guide comb 61 secured to the bar 59. The outer end of each

slide 58 extends outwardly through a slot 57 in the front of the main housing 1, and is provided with a depending lug 60 providing a finger hold by which the slides may be readily moved to and from punch activating position. Notches 62 and 63 are formed in the lower edge of each slide 58 to engage the edge of the housing 1 over which the slides project as they extend through the slot 57, said notches defining the activating and inactive positions of the slides respectively. A cover 64 is pivoted upon the front of the housing 1, immediately over the slot 57 through which the slides 8 extend, upon a pivot rod 66. A downwardly depending flange 67 is formed on the inner side of the cover to provide a stop limiting upward movement of the slides 58, and preventing displacement thereof from their activating or inactive positions while the cover is in its normal shielding position indicated in Fig. 3 of the drawings.

The inner end of each slide 58 is provided with a pointed and downwardly offset extension 68, the upper edge 69 of which provides a suitable surface for lifting the punch bar 28 associated therewith to activated position. The under edge of each extension 68 is movable to engage the bail rod 71 mounted upon bail arms 72 pivoted upon a shaft 73 extending between the ends of the main housing 1. The inclined upper edge 69 of each extension 68 is arranged to engage a stud 74 secured upon the lower end of an extension 75 projecting downwardly from the connecting link 36 by which the corresponding punch bar 28 is connected to its crank 39.

The free end of one of the bail arms 72 is normally engaged (as shown in Fig. 3) by a latch member 76 pivoted upon a stud 77 secured to the adjacent end of the housing 1. The latch member 76 is provided with a shoulder 78 normally urged into seated engagement with a projection 79 upon the inner end of the associated bail arm 72 by means of a tension spring 81, one end of which is anchored to a fixed stud 82 secured to the housing, and the other to the latch member.

Movement of the bail arm 72, and the latch member 76 associated therewith, is controlled by a bell crank 83 mounted upon a stud 84 secured to the housing 1 in association with the arm 72 and its associated latch member 76. The bell crank 83 in turn is controlled and actuated by means of a timing cam 86 secured in association therewith upon a timing shaft 87 journaled in the ends of the main housing 1. The timing shaft 87 is motor driven from the main motor drive shaft 3 by a chain 88 engaging sprockets 89 and 90 secured upon the shafts 3 and 87 respectively. The sprockets 89 and 90 are arranged to drive the timing shaft 87 at one half the speed of the motor drive shaft 3, so that two full rotations of the shaft 3 will be necessary to cause one complete revolution of the timing shaft 87.

One arm of the bell crank 83 is provided with a cam engaging roller 91 positioned in engagement with the timing cam 86. The other end of the bell crank 83 is provided with a stud 92. A tension spring 93 is anchored at one end to the crank stud 92, and at its other end to a stud 94 on the bail arm 72 associated therewith. A link 96 is connected at its lower end to the stud 94, and at its upper end to the stud 92. The upper end of the connecting link 96 is provided with an elongated stud engaging slot 97 for engaging the crank stud 92. The spring 93 is operable to apply an upward pull against the boil arm 72. The engagement of the stud 92 with slot 97 of link 96 limits the relative movement of the bail arm 72 and bell crank 83, and permits independent movement of the arm 72 when released by the latch member 76.

The bell crank 83 is arranged to engage a stud 98 secured upon an upwardly extending arm 99 carried by latch 76. As the bell crank 86 is swung to its extreme limit of movement in a clockwise direction, the depending arm engages the stud 98 and displaces the latch 76 sufficiently to cause the shoulder 78 to disengage the bail arm 72. When so released, the tension of the spring 93 causes the arm 72 and bail rod 71 to swing upwardly. Activated slides 58 are thereby swung upwardly to apply upward pressure against the adjacent stud 74, and thereby raise the corresponding connecting links 36, and the punch bars 28 attached thereto, to the raised activated position shown in Fig. 8. The cam 86 is timed with respect to the oscillation of the crank shaft 8 and cranks 39 so that the bail arms will be released by the latch member 76 in time to permit the selected hole punching punches to be actuated coincidentally with the cutting movement of the punches activated for notch cutting operation as they are moved to make the second cutting stroke of a two stroke notching cycle.

As the high point 101 of the cam 86 clears the roller 91, the bell crank 83 is moved in a counterclockwise direction, as viewed in Fig. 3 of the drawing, by a tension spring 102. This movement of the bell crank forces the stud 92 to the bottom of the slot 97 in the link 96, and thereafter forces the bail arms 72 downwardly to a position where the latch member 76 will be moved by the spring 81 to again engage the extension 79 under the shoulder 78 of the latch member. Since the timing shaft 87 and timing cam 86 are rotated at only half the speed of the crank shaft 8, the latch member 76 will be moved to release the bail arms 72 and elevate punch bars 28, which have been selectively activated for hole punching, for cutting movement only during alternate strokes of the cranks 39.

The several punches 11 are positioned in alignment and are operable to cut away portions of the card 19 placed in cutting position within the slot 18 at points equally spaced along the lower edge of the card. In order that the same punches may be operated both to notch the edges of the cards, and to form apertures through the card at points spaced from the edge of the card, provision has been made for permitting the position of the card to be shifted between the first and second strokes of each notch cutting cycle. For this purpose, a plurality of card supporting pins 105 are slidably mounted in guide openings 106 formed in the rearward side of the die 12 and the die plate 17. The pins are arranged to normally extend from the back of the die assembly across the notch 18 to points between adjacent punches 11.

The support pins 105 are normally urged toward their advanced position crossing the slot 18 by springs 107 mounted over the outwardly extending ends of the rods between a washer 108 secured to each pin, and a washer 109 slidably engaging the pin and seating against the inner side of an actuating bar 110 extending laterally from the upper end of a bell crank 111 pivotally mounted upon a card positioner shaft 112. The outer ends of the card supporting pins 105 extend through the bar 110, and a retaining washer 113 is secured to the outwardly extending end of each pin 105. The bell crank 111 is provided with an arm on which is mounted a roller 114 engaging a cam 116 secured to the timing shaft 87. The bell crank 111 is normally urged in a counterclockwise direction, as viewed in Fig. 3, to hold the roller 114 in engagement with the cam 116 by tension spring 117.

The cam 116 is so shaped that, for the major portion of each two stroke cycle of the timing shaft 87, the pins 105 will be moved outwardly to clear the slot 118, as shown in Fig. 8 of the drawings. During the remainder of the rotation of the cam 116, the bell cranks 111 are moved to urge the pins 105 to card supporting position crossing the slot 18, as shown in Figs. 3 and 6 of the drawings. The pins 105 are axially movable outwardly relative to the bell crank 111 against the resistance of the springs 107, so that they may be held in displaced position by the card 19 without injury to the card until the card can be removed. The support pins 105 are spaced at intervals along the length of the die assembly

12 to provide support for cards of various length placed in the slot at any desired point along its length.

During the initial stroke of the two stroke notch cutting cycle, the support pins are advanced to cross the slot 18 and support the card 19 in an elevated position such that activated punches 11 will notch the lower edge of the card to a depth equal to the thickness of the punches. As the punches 11 are withdrawn after the first cutting stroke thereof, the support pins 105 are retracted so that the card 19 may be pressed downwardly to the bottom of the slot 18 for exposing different areas of the card to the cutters. The diameter of the pins 105 substantially equals the vertical dimension of the punches 14 so that, on the second cutting stroke, each of the punches activated for notching operation will cut away an area in alignment with the initially cut notch so that the depth of the notch will be doubled. Punches activated for punching apertures, but not activated for notching, are actuated only after the support pins are withdrawn, and hence punch holes spaced from the lower edge of the card.

The switch mechanism for controlling the motor drive of Patent No. 2,035,777 operates to interrupt the rotation of the main motor drive shaft after one full revolution of the shaft which is all that is required to complete the one stroke cutting cycle as contemplated by that patent. Since the present machine contemplates a two stroke notch cutting cycle, it is necessary for the main drive shaft 3 to make two full revolutions in order to oscillate the cranks 39 to move activated punches through two cutting strokes for each complete notch cutting cycle. To maintain the motor in operation through two revolutions of the main drive shaft 3, and to interrupt the operation upon completion of the second stroke of each notch cutting cycle, the machine of the present invention is provided with a cycle control slide 121 operating in conjunction with the motor control switch by which the machine is manually energized for notching and punching successive cards as they are placed in the slot 18. This mechanism includes a motor control bar 122 slidably mounted at one end of the housing 1, and provided with a cap 123 secured to the upper end thereof in line with the banks of keys 7.

The motor bar 122 is provided with an inturned flange 124 which engages a stud 126 upon the outer end of a crank arm 127 secured to a motor control shaft 128 journaled in the ends of the main housing 1. Latch actuating arm 129 is secured to the end of the shaft 128 and is provided with latch member 131 pivotally secured to the arm by means of stud 132. The lower end of the latch member 131 is provided with actuating shoulder 134 and latch displacing cam surface 135. The shoulder 134 is arranged to normally engage the end of crank arm 136 secured to a shaft 137 connected to the motor control switch. Also secured to the shaft 137 as depicted in Fig. 12, is a crank arm 137' carrying at its other end a pin 138' received in a slot 139' formed in a link 140'. The link is connected at its opposite end by means of a pin 141' to a clutch trip arm 142' carried by a clutch trip shaft 143' projecting from a gear housing 151', and to a spring 144' whose other end is received by one end of a lever 145' mounted on a pin 146' supported by the motor housing 147'. The other end of the lever 145' is connected by a link 148' with a bell crank 149' whose opposite end actuates a motor switch 150'. Accordingly, when the shaft 137 is oscillated, the clutch is tripped and the motor switch is closed, the slot 139' permitting the shaft 137 to assume its initial position even though the machine has not completed its cycle. A downwardly extending motor control arm 138 is secured to the shaft 137, and is provided with a stud 139 pivotally connecting the cycle control slide 121 to the control arm. A tension spring 141 anchored upon a stud 142 secured to the housing 1 is secured to the latch member 131, and normally urges the latch member 131 into latching engagement with the crank arm 136, as shown in Fig. 3 of the drawings. The inner end of the control slide 121 is provided with a longitudinally disposed slot 143 slidably engaging a stud 144 secured to the adjacent end of the housing 1. At the inner end of the slot 143, an offset recess 145 is provided to receive the stud 144 and to provide a detent against which the slide may be held. A tension spring 146 is anchored at one end to the housing 1, and at the other to the stud 139 carried by the control arm 138. The spring 146 normally urges the slide 121 toward the right as shown in Fig. 3 of the drawings. A tension spring 147 is connected at one end to the extreme inner end of the control slide 121 and at the other to an anchor pin 148, for normally urging the inner end of the slide upwardly against the stud 144.

When the motor bar 122 is pressed down, the flange 124 exerts a downward pressure upon the stud 126, and thereby swings the crank arm 127 downwardly in a clockwise direction, as viewed in Figs. 3 and 5. This movement of the crank 127 is accompanied by a corresponding movement of the arm 129, thereby causing the latch members 131 to impart a corresponding pivotal movement to the crank arm 136 by reason of the engagement of shoulder 134 with the end of said crank arm to rotate the shaft 137 clockwise to close the motor control switch and energize the motor. At the same time a corresponding movement is imparted to the control arm 138 through the rotation of the shaft 137, thereby moving the cycle control slide 121 against the tension of the spring 146 until the shoulder 149 adjacent the recess 145 clears the stud 144, and permits the slide to be moved upwardly by the spring 147 to the latched position indicated in Fig. 5 of the drawings.

The slide 121 remains in the latched position and thereby retains the control arm 138 and the shaft 137 connected thereto in their circuit closing positions until the slide is released by the action of the cam 86. Such release is caused by a stud 151 secured upon the cam 86 for movement against the upper edge 152 of the slide arm 121. The stud 151 is so positioned upon the cam 86 that it will engage the slide 121 and cause release thereof after the drive motor has started the second revolution of the two stroke cycle through which the crank arm 39 and crank shaft 8 are moved to impart notch cutting movement to selected punches 11. Once started, the motor continues its rotation until it has completed the full 360° of movement necessary to actuate the punches through a cutting stroke. Since the cam 86 rotates at only half the speed of the motor shaft 3, the slide 121 will hold the control arm 138 in circuit closing position as the motor drive completes its first rotation for moving the punches on the first cutting stroke of their cycle, and the motor will remain energized for initiating the second cutting stroke, regardless of whether the motor bar is held down or released.

The initial downward movement of the motor bar to initiate a card cutting cycle, causes the cam edge 135 of the latch member 131 to engage a fixed stud 153 so positioned on the housing 1 that the latch member 131 will be swung out of engagement with the arm 136 substantially at the same time the stud 144 is engaged by the recess 145. Thereafter it is immaterial whether the motor bar is held down or not, because the circuit will be kept closed until the motor has completed a second complete revolution and the control slide 121, the motor control arm 138 and the shaft 137 have been released to normal starting position. In event the operator should fail to release the motor bar, the latch member 131 will remain inactive, and the mechanism cannot be started along a second cycle until the motor bar is returned to its initial starting position.

In operation, a card 19 provided with coding areas 156, which in turn are subdivided into sections separately designated by indicia 157, is placed in cutting position

in the slot **18**. When first inserted, the card will rest upon the supporting pins **105**, with the lower edge of the card aligned with the lower edges of the several punches **11**. The stop **26** is secured in adjusted position along the chute **25** so that the card may be positioned with the subdivisions of the coding areas accurately aligned with the punches **11**. The stop **26** may of course be moved to any position along the chute **25** to accommodate cards of various length so as to align desired coding areas with desired groups of punches.

Before a card is placed in position, or after it is so placed but before the mechanism is set into operation, selected punch activating keys **44** are pressed downwardly to activate those punches and punch bars which are operable to notch the card at desired coding points along its edge. As illustrated, the keys of each group correspond to the digits **1**, **2**, **4** and **7** which comprise the indicia **157** for each coding area of the card. By depressing desired keys in each group, any digit can be coded in any coding area along the edge of the card, by cutting notches at properly selected points. At the same time, apertures may be punched out of the card in any of the sections of the several coding areas which are not to be notched. This is accomplished by raising the cover **64** and pressing inwardly the control levers **58** corresponding to the positions where apertures are to be cut. All or any desired number of the slides **58** may be moved to activating position, as the movement of a slide **58** to activating position for punching an aperture will have no effect on the operation of punches which have previously been activated for the notching operation.

After the desired punches **11** and punch bars **28** have been activated for notching or punching apertures in the card, and the card has been placed in punching position, the motor bar **122** is pressed down to initiate the cutting cycle. As the motor bar **122** is depressed, motor shaft **3** will be energized and set into motion, and connecting rod **6** will be moved to impart an oscillating movement to the crank shaft **8**. At the same time, timing shaft **87** with the cams **86** and **116** carried thereby, will be rotated at half the speed of the motor shaft **3**. As the cranks **39** swing from left to right, as viewed in Fig. 3 of the drawings, those punch bars **28** which have been activated by movement by a key **44** to the raised position shown in Fig. 4, will be swung from left to right through a corresponding movement. The shoulder provided at the lower edge of the recess **31** in each activated bar **28** will press against its punch **14** and advance it along its cutting stroke to cut out a notch in the edge of the card to a depth equal to the depths of the die, as illustrated in Fig. 7 of the drawings. During this first cutting stroke of the cycle, only those punches and punch bars which have been activated by the depression of keys **44** will be moved through the cutting stroke to the position indicated in Fig. 6 of the drawings.

After completion of the initial cutting stroke, and as the punches and punch bars are restored to starting position, the high area **161** of the cam **116** will engage the roller **114** and displace the bell crank **111** in a clockwise direction sufficiently to move the card supporting pins **105** from under the card, thereby permitting the card to be moved down to the bottom of the slot **18** as shown in Fig. 8 of the drawings.

At the same time, the cam **86** is moved to begin clockwise displacement of the bell crank **83**. Displacement of the crank **83** by the cam **86** does not immediately affect punch bars **28** activated for cutting apertures because the stud **92** is free to move upwardly along the slot **97** of the connecting link **96**. However, before the second cutting stroke is started, the depending arm of the bell crank **83** is advanced against the stud **98** and displaces the latch shoulder **78** from the end of the bail arm **72**. As soon as the bail arms **72** are released, they are swung upwardly by the spring **93**. The bail rod **71** is carried upwardly with the arms and displaces activated slides **58**, which in turn exert lifting pressure against the studs **74** carried by the connecting rod extensions **75**. This action causes the punch bars **28**, to which the displaced connecting rods **36** are pivoted, to be raised to the activated position indicated in Fig. 8 of the drawings. When now the cranks **39** are oscillated through the second cutting stroke of the notching cycle, all of the activated punch bars **28** will be swung against their respective punches **14**, and will force those punches through the card.

Punches activated by the keys **44** are operated to cut shallow notches **158** by the first stroke of the notching cycle, and by the second stroke cut the same areas to a greater depth, as indicated at **159**, due to the lowering of the card between the cutting cycles. The punches and punch bars **28** activated by the slides **58**, which were inactive during the first cutting stroke, are moved by the second stroke to cut apertures **160** spaced from the edge of the card as indicated in Fig. 10 of the drawings. When certain selected punches have been activated by the keys **44** and other selected punches have been activated by the slides **58**, the edge of the card will be both notched and punched as indicated in Fig. 9. If only the slides **58** are utilized for activating punches **14** and punch bars **28**, without depressing any of the punch keys **44**, the edge of the card will be punched with apertures only, as indicated in Fig. 10 of the drawings. If none of the slides **58** are activated, only notches **159** will be cut at selected points, as illustrated in Fig. 11 of the drawings.

As the second cutting stroke of the notching cycle is completed, the high point of the cam **86** passes the roller **91** on the bell crank **83**, and permits it to swing back to starting position. This moves the stud **92** downwardly to the bottom of the slot **97** of the link **96** and thereafter causes the bail arms **72** to be depressed by the link **96** to the normal starting position. At the same time, the depending arm of the crank **83** disengages the stud **98** and permits the latch arm **76** to be swung back into locking engagement with the end of the bail arms **72**. Shortly thereafter, at a moment marking the end of the two stroke cycle, the stud **151** is moved onto the upper edge **152** of the control slide **121** and depresses the slide out of engagement with the retaining lug **144**. The slide **121** is immediately returned to its starting position by the spring **146**, and the control arm **138** is thereby moved to motor circuit breaking position.

Near the end of the second stroke of the cutting cycle, the low area of the cam **116** is moved under the roller **114** of crank **111**, which is then moved by spring **117** to relieve the displacing pressure from the card supporting pins **105**. This movement of the crank **11** permits the pins **105** to be urged toward their card supporting position by the springs **107**. Until the card **19** is removed from the slot **18**, the pins **105** will bear against the card without marring it. When the card is withdrawn from the slot, the pins spring into position across the bottom of the slot to support the next card in elevated starting position.

The activated punches and punch bars remain activated until manually restored to inactive position. This permits a number of cards to be coded alike without resetting various keys and slides. When the coding is to be changed, the release buttons **54** corresponding to groups of punch keys which have previously been activated, are pressed downwardly to restore the punch bars **28** to their normal inactive position. This movement causes the key levers **41** to be swung about the pivot rod **42** past the detent **52**, and the keys **44** associated therewith are returned to normal raised position. A single release button **54** is provided for each group of four keys **44** by which the punches for a single coding area are activated. Punches and punch levers activated by the slide bars **58** for cutting apertures may be restored

to inactive position by raising the cover 64 and withdrawing the activated slides 58 to normal inactive position.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A card notching and punching machine comprising a card support, a plurality of punches having a path of movement adjacent said card support, said punches being operable to cut away portions of a card positioned upon the support, means for selectively activating desired punches for operation through a two stroke cycle to cut notches in the card, means for selectively activating other punches for operation during the second stroke only of the two stroke cycle, means for actuating the activated punches through cutting strokes in conformity with their selective activation, and means for shifting said card support away from the path of movement of said punches between strokes.

2. A card notching and punching machine comprising a card support, a plurality of punches having a path of movement adjacent said card support, said punches being operable to cut away portions of a card positioned upon the support, means for selectively activating desired punches for notching an edge of the card, means for selectively activating other punches for cutting apertures spaced from said edge, means for actuating the notching punches through a two stroke notch cutting cycle, means for actuating the aperture cutting punches through a single cutting stroke coincident with the second of the notch cutting strokes, and means for shifting said card support away from the path of movement of said punches between strokes.

3. A card notching and punching machine comprising a card support, a plurality of punches having a path of movement adjacent said card support, said punches being operable to cut away portions of a card positioned upon the support, means for selectively activating desired punches for operation through a two stroke cycle to cut notches in an edge of the card, means for selectively activating other punches for operation coincidentally with the second stroke only of the notch cutting cycle while remaining inactive during the other stroke thereof, and means operating in timed relation to the movement of the punches for automatically displacing portions of the support to permit shifting of the card in a plane normal to the path of movement of the punches between successive strokes of the notch cutting cycle.

4. A card notching and punching machine comprising a card support, a plurality of punches having a path of movement adjacent said card support, said punches being operable to cut away portions along an edge of a card positioned upon the support, means for selectively activating desired punches for operation through a two stroke cutting cycle to cut notches at predetermined points along the card edge, means for selectively activating other punches for operation through one stroke cycle coincident with the second of the notching cutting strokes, motor operated drive means for actuating the selected cutters through their cutting cycles, means movable to permit the position of the card to be shifted away from the path of movement of the punches in a plane normal thereto between successive cutting strokes of the notching punches, and means for automatically interrupting the motor drive after completion of each notching cycle.

5. A card notching and punching machine comprising card supporting means operable to support a card in normal and shifted positions during a cutting operation, a plurality of punches movable to cut through an edge of the card when supported in either position, means for selectively activating desired punches, means for actuating the activated punches through two successive strokes, means operating automatically in timed relation to the punch actuating means automatically shifting the card from normal to shifted position between successive strokes of the activated punches to present different areas of the card to the punches whereby shallow notches cut by the first stroke of the activated punches are cut to greater depth by a second stroke thereof during a two stroke cutting cycle, means for selectively activating other of said punches, and means for actuating said other punches coincidently with the second stroke only of the cycle to cut apertures spaced from the edge of the card in line with the inner ends of the notches.

6. A card notching and punching machine comprising a plurality of punches independently operable to cut away areas along a coding edge of a card, die means associated with the punches, means for selectively actuating the punches through a two stroke cycle, card supporting plungers mounted in connection with the die, plunger actuating means connected by a lost motion connection with the plungers, said plungers being normally spring-biased relative to said plunger actuating means toward an initial card supporting position, cam means operated in timed relation to the operation of the punches for moving said plunger actuating means to move the card supporting plunger to a retracted position releasing the card for movement to a second cutting position offset from the initial position between strokes, said lost motion connection permitting the return of said plunger actuating means to its normal position upon release thereof by said cam without returning said plungers until said card is removed.

7. In a card notching and punching machine provided with a plurality of punches operable to cut through a card supported in cutting position relative thereto, means for selectively activating punches for cutting notches in the card through two strokes of a punching cycle, means for selectively activating other punches for cutting apertures through the card during the second stroke only of the two stroke cycle, motor actuated means for reciprocating the activated punches, a motor control lever mounted in association with the motor actuated means, a latch bar connected to the motor control lever movable to latching position for holding said lever in a motor energizing position, cam means actuated in timed relation to the reciprocation of the punches for releasing the latch and control lever to motor inactivating position upon completion of a two stroke cycle of the notch-cutting punches, card supporting means for initially holding the card in notch cutting position, and means for retracting the supporting means between the first and second strokes of each notch cutting cycle.

8. A card notching and punching machine for coding record cards comprising, a plurality of punches, a plurality of punch actuators each movable from an inactive position to an active position in line with one of said punches, means for actuating said punch actuators through two cycles of operation, means selectively operative to activate each of said punch actuators to cause punching movement of its associated punch during both cycles of operation of said actuators, separate means selectively operative to activate each of said punch actuators to cause punching movement of its associated punch during only the second of the cycles of operation of said actuators, and means for moving said record card in a direction normal to the direction of movement of said punches between the two cycles of said punch actuators.

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