Nov. 4, 1941. T. C. ANDREWS 2,261,710

ELECTRICAL ACTUATING MEANS FOR SERIAL NOTCHING CARDS

Filed Aug. 13, 1940 4 Sheets-Sheet 1

FIG. 1.

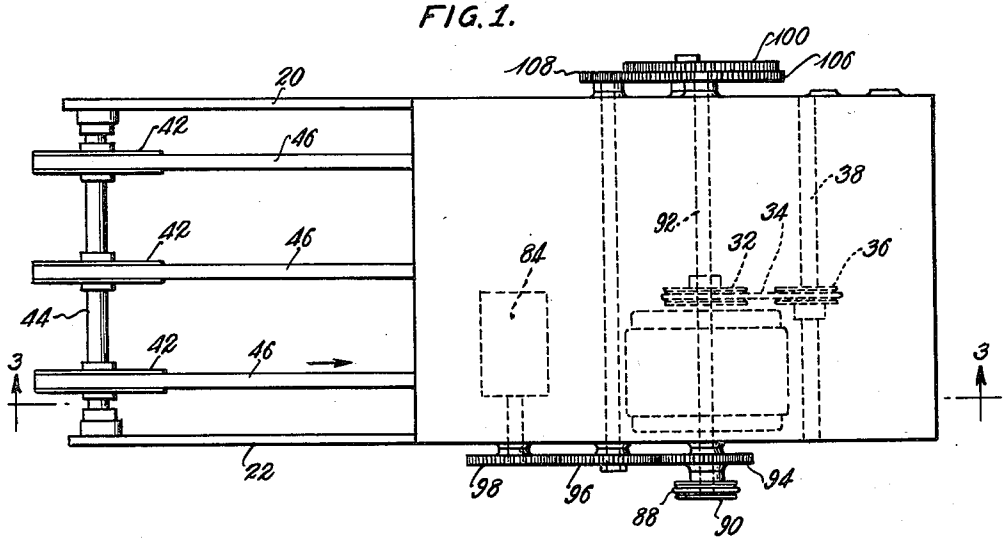
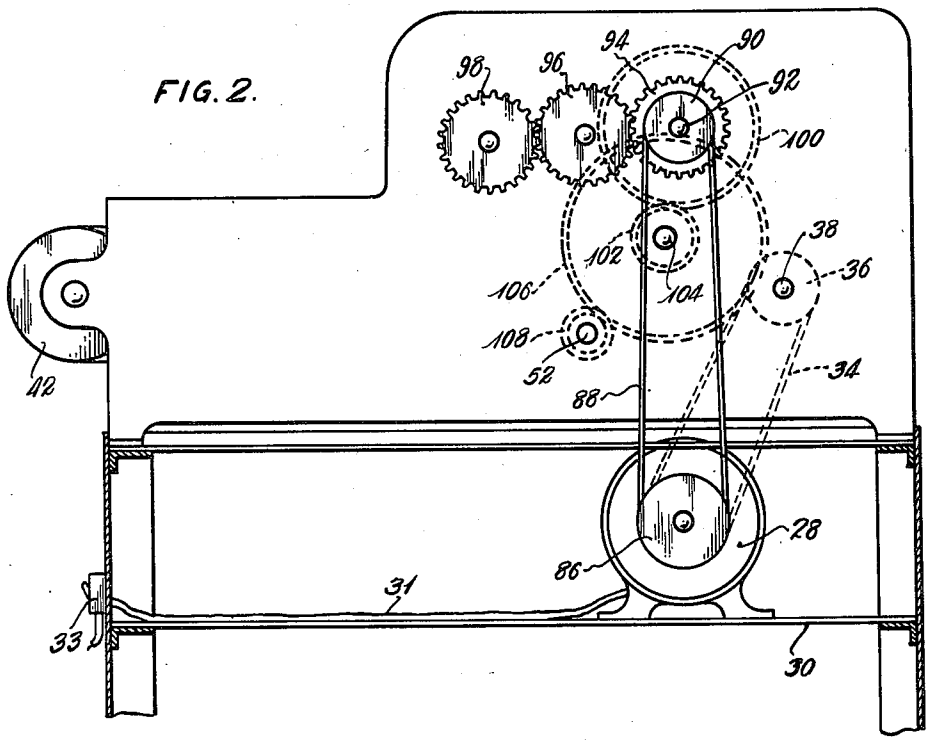


FIG. 2.



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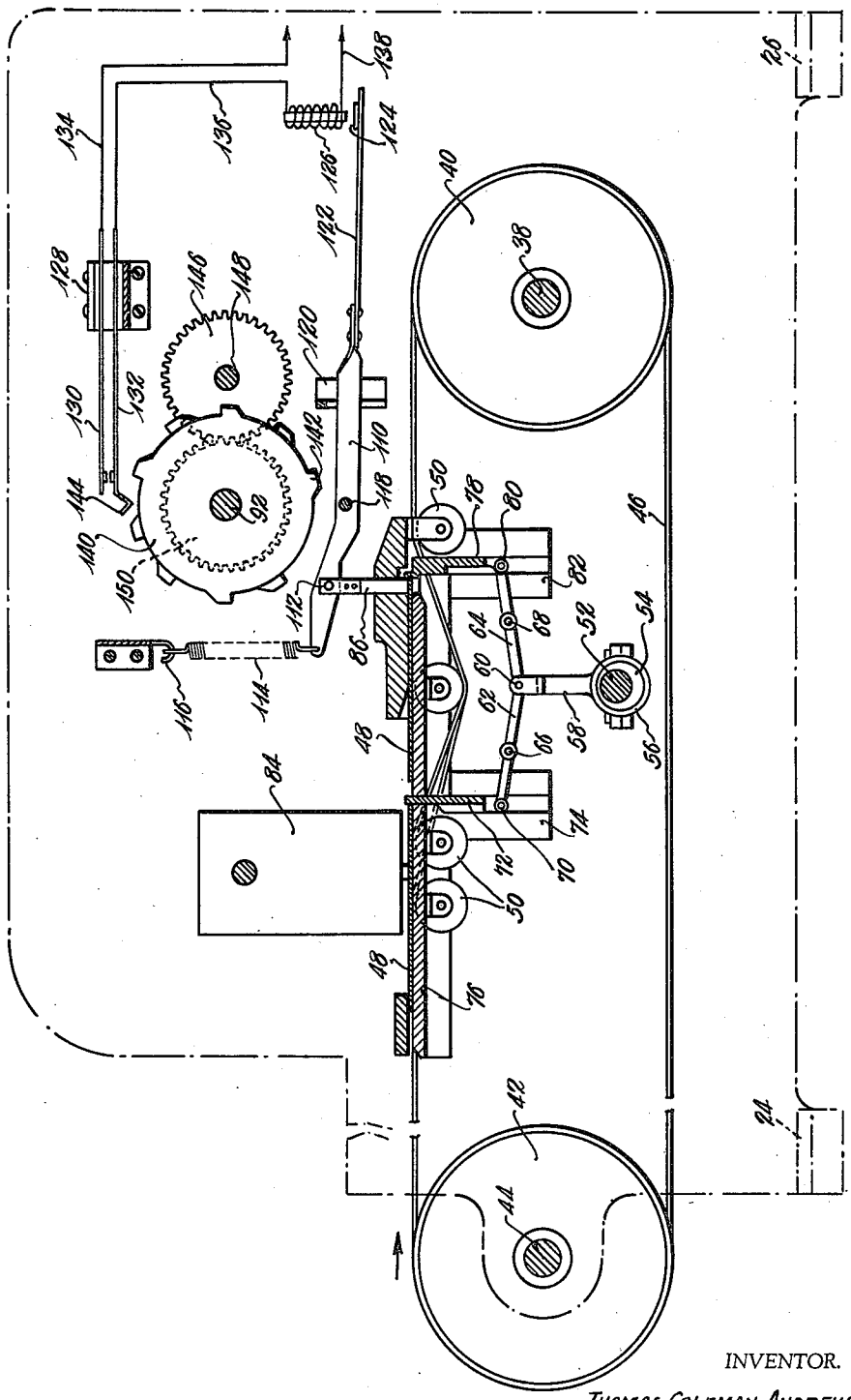


FIG. 3.

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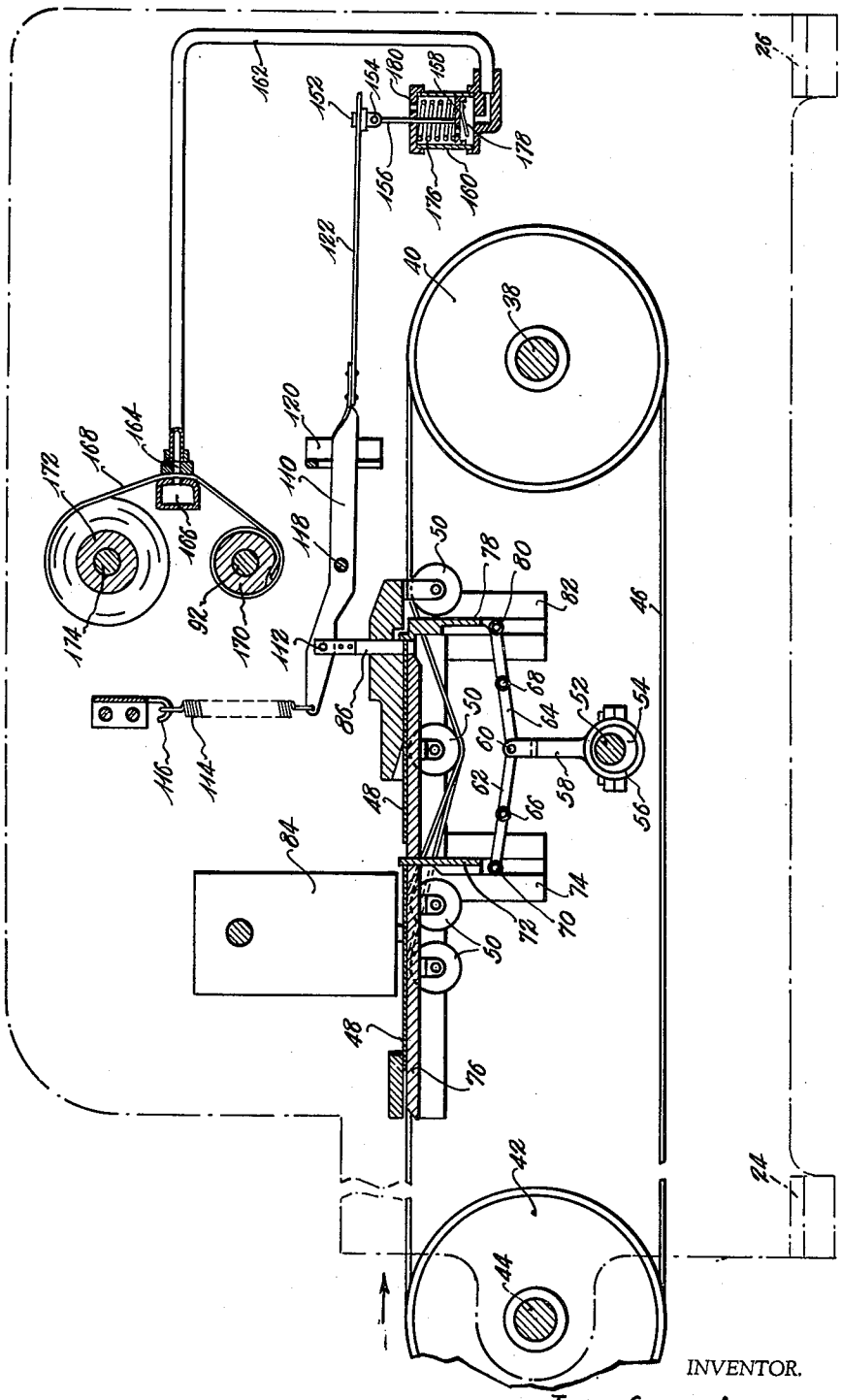


FIG. 4.

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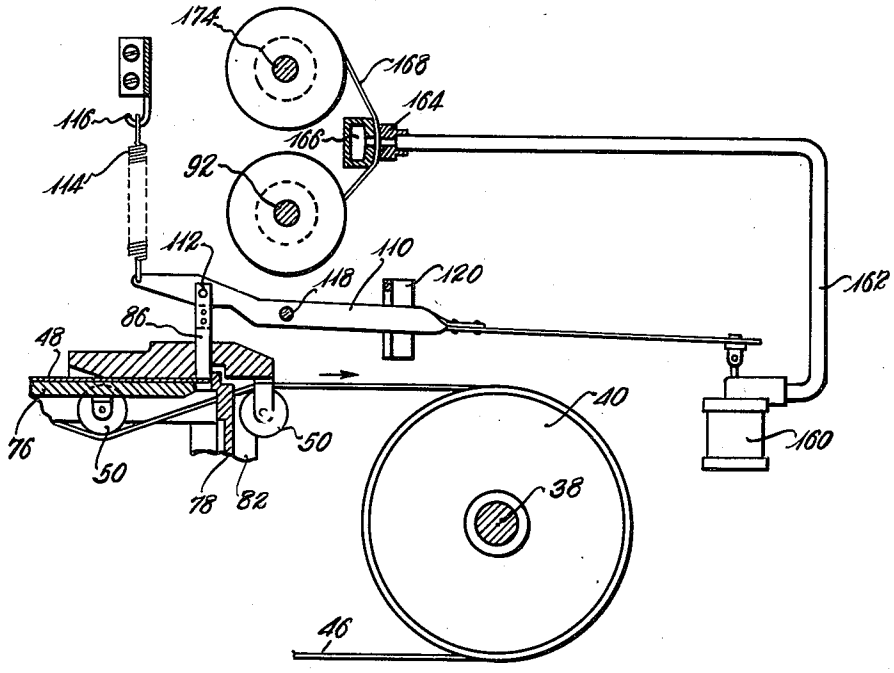
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ELECTRICAL ACTUATING MEANS FOR SERIAL NOTCHING CARDS

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FIG. 5.



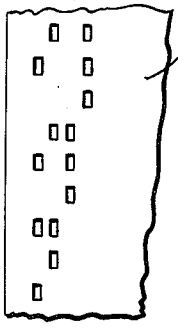


FIG. 6.

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UNITED STATES PATENT OFFICE

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ELECTRICAL ACTUATING MEANS FOR SERIAL NOTCHING CARDS

Thomas Coleman Andrews, Richmond, Va.

Application August 13, 1940, Serial No. 352,456

13 Claims. (Cl. 164—115)

My invention relates to certain improvements in a machine for automatically printing a number upon a sheet or web of material and punching such material to represent a value corresponding to the printed number. In fact, this invention may be said to constitute a continuation-in-part of my copending application Serial No. 256,674, filed on February 16, 1939 now Patent No. 2,211,310, August 13, 1940. As set forth in the said application, such machines are well adapted for operation on a card of the type known in the trade as "Keysort," manufactured and sold by The McBee Company, of Athens, Ohio, under Perkins Patents No. 1,544,172 and No. 1,739,087. Cards of this type are usually manufactured for the trade by printing and punching them with a series of perforations by the aid of which they may be sorted in accordance with their numerical sequence, a particular numerical representation being made by removing a portion of the card between certain of the holes and the adjacent edge or edges of the card as the case may be.

The preformed perforations of these cards may be divided into groups, for example, four of such perforations in each subdivision or group. Such a group will then be utilized to represent each numerical digit, i. e., units, tens, hundreds, thousands, ten thousands, hundred thousands, etc. In each subdivision, the four holes or perforations may represent the values 7, 4, 2 and 1 respectively. The printed and perforated cards are then notched to open one or more of these holes to an adjacent edge for indicating the numerals from 1 to 9 in a manner which will be apparent from the disclosures referred to in the foregoing. Heretofore, cards of this kind have been perforated and printed for distribution and then manually notched by the user, the value of the entire system thus depending largely upon the care and ability of the operator to perform this notching operation correctly.

Whereas the present invention is applicable to cards of the type already described, it is equally suited for use with cards having the punching performed entirely within the bodies thereof and which will thereby avoid the danger of tearing or bending the tongues which are formed where adjacent perforations of the cards are notched. And, as a matter of fact, in its broader aspects, this invention is adapted for punching of various types of materials for more general purposes.

The objects of my invention include the following: to provide a machine to automatically print and notch or punch in proper relation and sequence, cards of the "Keysort" type; the provision of relay or remote means, which may comprise a cam, for energizing the punch control means; the punch control means may be electromagnetic or fluid operated, and the relay or remote means in the form of an electric switch or fluid valve; the fluid operated embodiments may employ liquids, vapors or gases, under suitable pressures either above or below atmospheric pressure, the punch control means is preferably periodic and timed with respect to means for feeding the work to be punched, the punch control means preferably selects and/or actuates the punch or punches in accordance with a predetermined sequence.

With these objects in view, and others which will appear from the hereinafter contained description, the invention consists in certain novel features of construction and combination of parts, the essential elements of which are set forth in the appended claims.

My means of accomplishing the foregoing objects may be more fully comprehended by having reference to the accompanying drawings, which are hereunto annexed and are a part of this specification in which similar reference numerals refer to similar parts throughout.

Fig. 1 is a plan view showing the belt feed and gear train mechanisms for operating my device;

Fig. 2 is an elevation of the structure shown in Fig. 1;

Fig. 3 is an enlarged and somewhat diagrammatic longitudinal section showing one embodiment, taken along line **3—3** of Fig. 1 with the frame outlined in broken lines;

Fig. 4 is a view similar to that shown in Fig. 3, showing a modification;

Fig. 5 is a fragmentary elevation depicting another modification; and

Fig. 6 is a fragmentary plan view showing a control element for use with arrangements such as those shown in Figs. 4 and 5.

As shown in the drawings, my automatic numbering and notching machine is provided with a casing having opposed side frames **20** and **22** which are held in spaced relationship by two straps **24** and **26** attached thereto in any convenient manner. A suitable cover, not shown, may be provided for the mechanism, in which case the cover can rest on a seat suitably fashioned in the side frames and may be fastened thereto. The entire machine may be portable, and, if desired, supported upon a desk or table, or readily stored when not in use.

Operating power is furnished by an electric motor **28**, shown as supported by a shelf **30** under the machine, although, if desired, it may be

mounted elsewhere with respect to the operating mechanism. Conductors 31 are depicted as leading to a switch 33 which is in turn connected to a source of current for supplying the motor.

It will be understood, of course, that other driving means may be employed, if desired.

Feeding mechanism

On one end of the shaft of the motor 28, I mount a pulley 32 over which a belt 34 is trained for transmitting torque to another pulley 36 secured to a feed driving shaft 38. The shaft 38 carries several driving pulleys 40, which in cooperation with a similar number of idler pulleys 42 supported on a shaft 44 drive a like number of narrow feeding belts 46. These belts 46 constitute the carrying means for feeding cards 48 or other work to be printed and notched, to the various positions which they assume in their progress through the machine and delivering them into a suitable container (not shown) when the work has been completed.

The belts 46 are made relatively narrow so that when one of the cards 48 is brought to a position of rest for effecting a numbering or notching operation, the belts will slip beneath it, permitting the card to remain stationary without subjecting it or the belts to undue friction or wear. Under some circumstances, it may be found that the pressure caused by the printing of the numbers on the cards or notching them, tends to interfere with the continuous movement of the belts. In such cases, the belts may be trained over and under idler rollers 50 to reduce friction at the points of dwell and thereby permit continuous rotation. As clearly shown in Figs. 3, 4 and 5 of the drawings, when such rollers are employed, a portion of the die block adjacent to the belts must be cut away. Any two of the belts 46 will provide sufficient frictional engagement to carry the card or other work across the cut-away portion, and accordingly the rollers and belts are so arranged that the desired results are achieved.

Interruption of the feed of the cards or other work occurs at two points in the machine; one below the elements for printing the numbers, and the other below the punches for notching or otherwise punching the card with a representation corresponding to the number applied by the printing elements. The required interruptions may be effected by an eccentric drive such as that shown in the drawings wherein a shaft 52, suitably rotated, has an eccentric 54 secured thereto for cooperation with a strap 56 carried by the end of an eccentric rod 58. The opposite end of the rod 58 is provided with a pin 60, pivotally articulating it to a pair of levers 62 and 64. The levers are provided with pivots 66 and 68 respectively, carried by the side frames. The opposite end of the lever 62 is pivotally connected by a pin 70 to a reciprocating stop 72 which operates in suitable guides 74 to project periodically above the surface of the table 76 into the path of travel of the cards 48 to serve as a temporary abutment therefor, restraining them from further forward movement until the numbering operation has been completed. A similar stop 78 is arranged in a position to serve as a temporary abutment for the cards during the punching operation. This stop 78 is pivotally connected to one end of lever 64 by means of a pin 80, through which the stop is periodically reciprocated in its guides 82 to project above the table 76 into the path of the cards or other work. After a card has received its printed number by the printing mechanism 84, continued rotation of the eccentric 54 will move the stop 72 downwardly and out of the path of travel of the card, which will then be carried forward into position below the punch or punches 86 for the notching of the card. By this time the eccentric will have revolved so as to bring the stop 78 into the path of travel of the card, against which it will be held until the notching operation has been performed, whereupon, continued rotation of the eccentric will move the stop 78 downwardly out of the path of travel of the card which will then be carried on and deposited in a pile or received by a suitable container. It will be clear that the two stops are thus synchronized to move upwardly and downwardly in unison as the eccentric 54 is revolved. The movement of the stops is effected in timed relationship with respect to the numbering mechanism 84 which is driven by a train of gears from the motor 28. The motor shaft carries another pulley 86, which drives through a chain or belt 88, a sprocket or pulley 90 carried by a shaft 92. At one side of the frame, the shaft 92 carries a spur 94 which through similar gears 96 and 98, drives the shaft of the printing and numbering mechanism 84.

The punching mechanism

On the other side of the frame and secured to the shaft 92, a gear 100 is provided which meshes with a gear 102 mounted on a shaft 104 carrying a gear 106 as well. The gear 106 is arranged to mesh with a gear 108 which is secured to the eccentric shaft 52.

As clearly set forth in my Patent No. 2,211,310, a gang of punches 86 will be provided, which in the case of Perkins cards of the type referred to using the 7—4—2—1 system of punching, will be operated in groups of from one to three for representing each digit. As depicted in Figs. 3, 4 and 5 of the drawings, each punch 86 is supported from a punch lever 110 by a pivot pin 112. The punches and their levers are normally maintained out of the path of the work by coil springs 114 suspended from the frame by suitable hooks 116. The lower ends of the springs are flexibly connected to the punch levers at their left ends as viewed in the drawings, and it is necessary to overcome the bias of these springs to displace the punches into the path of the work for completing a punching operation. The punch levers are suitably pivoted, as by a rod 118 mounted in the fame. A punch lever guide 120, which may assume the form of a comb is also supported by the frame. The principal differences of the present invention over that of my copending application reside in the manner of selecting and actuating the punches to operate in the proper sequence.

In the modification shown in Fig. 3 of the drawings, the operation of the punches is controlled electromagnetically. Each punch lever has an extension 122 remote from the spring biased end, and each extension carries an armature 124 under the influence of an electromagnet 126. The winding of each electromagnet is arranged in circuit with a switch 128 having a fixed terminal 130 and a movable arm 132. The fixed terminal is connected with a source of current through a lead 134 and with the winding of the electromagnet through a lead 136. The other end of the winding is connected to the current source by a suitable lead 138.

A cam carrying wheel 140 driven by shaft 92

in synchronism with the printing device and feed mechanism, serves to open and close the switches 128 to complete the circuits of the electromagnets 126 in timed relationship with the other operations and thereby displace the proper punch or punches into the path of the work to punch out the material and represent the values in correspondence with those which have been printed. As will be readily understood from a knowledge of my copending application already alluded to, the numeral "1" will be punched when a single cam 142 on the wheel 140 deflects the contact piece 144 of the arm 132 and completes the circuit of the electromagnet 126 controlling the lever carrying the punch which produces the "1" representation. Similarly, the next cam in order will close only the switch controlling the "2" punch. The next position of the wheel brings two cams into position to close the switches representing "2" and "1." Then the "4" switch will be closed by a single cam. Following this, the cams representing "4" and "1" will close their switches; after which cams "4" and "2" become effective; then the cam for "7"; then "7" and "1"; next "7" and "2"; and finally a blank portion of the wheel comes into position below the switches to represent zero.

By this time, a complete revolution of the wheel 140, in a manner fully disclosed in my copending application, will advance the cam wheel representing the next digit through an angle of 36° so as to represent the next higher numerical value in the progression. This drive is effected by a mutilated gear fully described in my said Patent No. 2,211,310, carried by the wheel 140 in cooperation with a gear 146 carried by a countershaft 148. The gear 146 in turn drives a gear 150 carried by the cam wheel representing the next higher digit, and so on. The cam wheels and their switches may themselves be deemed relays, or they might well control the principal punching magnets through electrical or mechanical relays.

The modification shown in Fig. 4 of the drawings contemplates control of the punches by a preformed pattern produced on or in a web of material. The punches themselves and their operating levers are essentially like those described with reference to Fig. 3. In this case however, the punches and their levers are actuated by compressed air acting upon a piston. The extension 122 of the lever 110 is coupled by a suitable clip 152 and pivot 154 to a rod 156 carrying a piston 158. The piston is received in a cylinder 160, the lower end of which is connected by a fluid line 162 with a port 164 whose communication with a compressed air manifold 166 is controlled by the pre-perforated web 168. The web is wound upon a core 170 carried by the shaft 92 which is synchronized with the feed and numbering mechanisms. The web is unwound from a core 172 which is mounted upon a spindle 174. The piston is biased towards its lower position as shown in the drawings by a coil spring 176. A flap valve 178 is provided in the piston to close when a charge of air is directed against it from the manifold and to open when the supply is cut off. When the piston is forced upwardly to deflect the lever and displace the punch into the path of the work, an aperture 180 in the cylinder casing permits the system to breathe.

The manner in which the control web or relay web may be perforated is illustrated in Fig. 6 of the drawings. The lowermost perforation shown controls the connection between manifold and the fluid line to the piston for actuating the "1" punch. The next perforation controls the "2" punch mechanism. The following two perforations control the "1" and "2" punch mechanisms, and so on. The reels for the pattern web are shown more or less diagrammatically, since it must be remembered that some compensation is necessary for the increasing diameter of the web as it winds about the core 170. Suitable provision may be made by interposing feed rollers to render uniform the speed of the web passing the manifold; or the speed of the shaft 92 may be graduated to suit the increasing diameter; or the spacing of the perforations in the web itself may be varied to the same effect.

The modification shown in Fig. 5 of the drawings is identical with that of Fig. 4 except for the fact that the manifold 166 is connected to a suction line, and accordingly the line 162 is connected to the top of the cylinder 160 instead of to the base thereof. Its mode of operation will be evident to those skilled in the art.

With the modifications of Figs. 4 and 5, the pattern webs and fluid ports may be considered relays for controlling the pistons 158, or alternatively, relays may be interposed if and where desired to give increased power to the punches.

In operation, it will be understood that the printing mechanism will be one number ahead of the punching mechanism where a card is to receive corresponding representations from both mechanisms. This is true because the work is printed and punched in separate, sequential steps.

Having described my invention, what I regard as new and desire to secure by Letters Patent is:

1. In a machine of the class described, work feeding means, a plurality of punches, means normally maintaining said punches out of the path of the work, punch control means for producing displacement of certain punches from their normal position to a position intersecting the path of the work, means to actuate each punch, an electromagnet for each punch adapted to influence each of said punch actuating means, the winding of each magnet arranged in circuit with a switch, and rotating means to close each switch in timed relation with the work feeding means.

2. In a machine of the class described, work feeding means, a plurality of punches, means normally maintaining said punches out of the path of the work, electrical punch control means for producing displacement of certain punches from their normal position to a position intersecting the path of the work, means to actuate each punch, an electromagnet for each punch adapted to influence each of said punch actuating means, the winding of each magnet arranged in circuit with a switch, and rotating means to selectively close certain of said switches, the work feeding means arranged to actuate said rotating means periodically.

3. In a machine of the class described, a plurality of punches, means normally maintaining said punches out of the path of the work, punch control means for producing displacement of certain punches from their normal position to a position intersecting the path of the work, means to actuate each punch, and an electromagnet for each punch adapted to influence each of said punch actuating means, the winding of each magnet arranged in circuit with a switch and rotating cam means to selectively close a plurality of said circuits.

4. In a machine of the class described, a plurality of punches, means normally maintain-

ing them out of the path of the work, punch control means for producing displacement of said punches from their normal position to a position intersecting the path of said work, and relay means for energizing said control means, said relay means comprising a resilient floating punch carrying lever mounted for vertical movement of each punch, an extension on each lever, an armature mounted adjacent the end of said lever, and an electromagnet for each punch and adapted to influence each of said armatures and cause a punch to notch the edge of a card.

5. In a machine of the class described, a plurality of punches, resilient means normally biasing said punches out of the path of the work, punch control means for producing displacement of certain of said punches from their normal position to a position intersecting the path of said work, relay means for energizing said control means, said relay means comprising a resilient floating punch carrying lever mounted for vertical movement of each punch, an extension on each lever, an armature adjacent the end thereof, and an electromagnet for each punch adapted to influence each of said armatures.

6. In a machine of the class described, a plurality of punches, means normally biasing said punches out of the path of the work, punch control means for producing displacement of certain of said punches from their normal position to a position intersecting the path of said work, relay means for energizing said control means, said relay means comprising a resilient floating punch carrying lever mounted for vertical movement of each punch, an extension on each lever, an armature adjacent the end thereof, an electromagnet for each punch adapted to influence each of said armatures, and means to actuate said electromagnets periodically.

7. In a machine of the class described, a plurality of punches, work feeding means, resilient means normally biasing said punches out of the path of the work, electromagnetic punch controlled means for producing displacement of said punches from their normal position to a position intersecting the path of said work, said electromagnetic control means comprising a punch actuating lever mounted for vertical movement for each punch, an armature operatively connected to each lever, an electromagnet for each punch lever adapted to influence the said armature, a circuit for each electromagnet, and a switch in each circuit operated in timed relation with said work feeding means to selectively close a plurality of said switches.

8. In a machine of the class described, a plurality of punches, work feeding means, resilient means normally biasing said punches out of the path of the work, electromagnetic punch control means for producing displacement of said punches from their normal position to a position intersecting the path of said work, said electromagnetic control means comprising a resilient floating punch carrying lever mounted for vertical movement for each punch, an extension on said lever, an armature mounted adjacent the end thereof, and an electromagnet for each punch adapted to influence the said armatures, a circuit for said electromagnetic means, a switch in said circuit operated in timed relation with said work feeding means, and rotating means to actuate certain of said electromagnets periodically.

9. In a machine of the class described, a plurality of punches, work feeding means, resilient means normally biasing said punches out of the path of the work, electromagnetic punch control means for producing displacement of said punches from their normal position to a position intersecting the path of said work, said electromagnetic control means comprising a resilient punch carrying lever mounted for vertical movement for each punch, an extension on each lever, an armature mounted adjacent the end thereof, an electromagnet for each punch adapted to influence each of said armatures, a circuit for each electromagnet, a switch in said circuit operated in timed relation with said work feeding means, a rotating member which operates a plurality of said switches, and means connected to said member and said work feeding means to drive them in timed relation.

10. In a machine of the class described, a plurality of punches, work feeding means, resilient means normally biasing said punches out of the path of the work, electromagnetic punch control means for producing displacement of said punches from their normal position to a position intersecting the path of said work, said electromagnetic control means comprising a resilient floating punch carrying lever mounted for vertical movement of each punch, an extension on said lever, an armature mounted adjacent the end thereof, an electromagnet for each punch adapted to influence the said armatures, a circuit for said electromagnetic means, a switch in said circuit operated in timed relation with said work feeding means, and cam means to selectively actuate said electromagnets periodically.

11. In a machine of the class described, a plurality of punches, a resilient floating punch carrying lever mounted for vertical movement of each punch, means normally maintaining said punches out of the path of the work, fulcrum means for said lever, and an electromagnet arranged for exerting force upon each lever for displacement of certain of said punches from their normal position to a position intersecting the path of said work to thereby notch the edge of a card.

12. In a machine of the class described, a plurality of punches, a resilient floating punch carrying lever mounted for vertical movement for each punch, resilient means normally maintaining said punches out of the path of the work, fulcrum means for said levers, an electromagnet for each lever arranged to exert a force upon each lever for displacement of certain of said punches from their normal position to a position intersecting the path of said work to thereby notch the edge of a card, an electric circuit for each magnet, a switch in each circuit to energize said magnets, and rotating means to selectively close said switches.

13. In a machine of the class described, work feeding means, a plurality of punches, a resilient floating punch carrying lever, mounted for vertical movement of each punch, resilient means normally maintaining said punches out of the path of the work, fulcrum means for said levers, an electromagnet for each lever, an electric circuit for each electromagnet arranged to exert a force upon each lever for displacement of certain of said punches from their normal position to a position intersecting the path of said work to thereby notch the edge of a card, a switch in said circuit to energize said magnets, and rotating means to selectively close said switch periodically in timed relation with said work feeding means.

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