

March 12, 1946.

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APPARATUS FOR CONTROLLING ELECTRICAL CIRCUITS

Filed Aug. 3, 1944

2 Sheets-Sheet 1

FIG. 7.

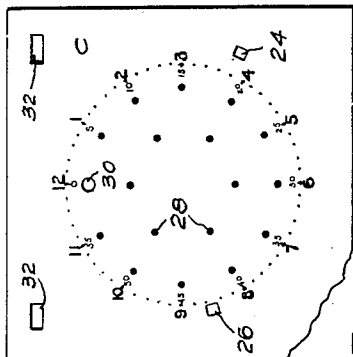


FIG. 8.

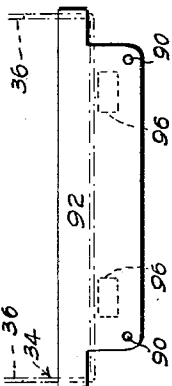


FIG. 9.

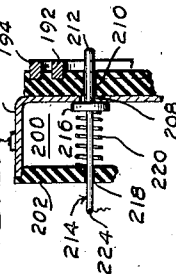


FIG. 1.

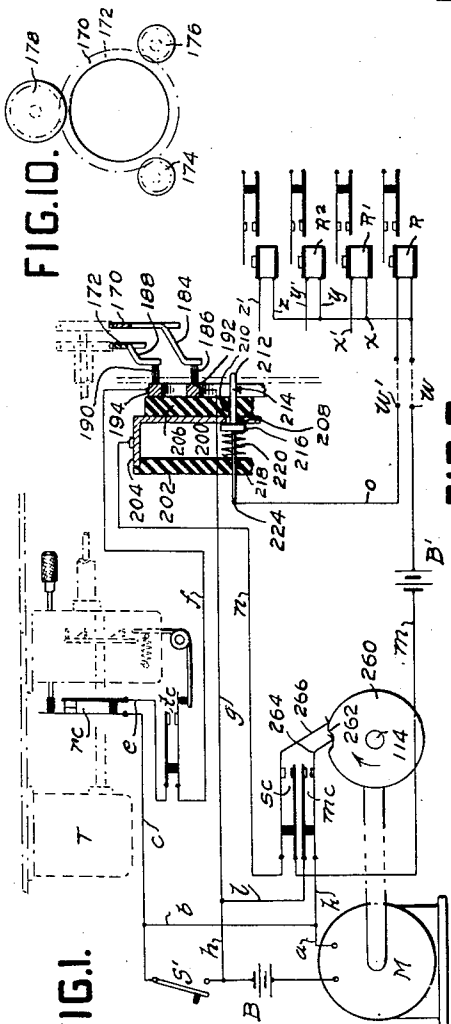
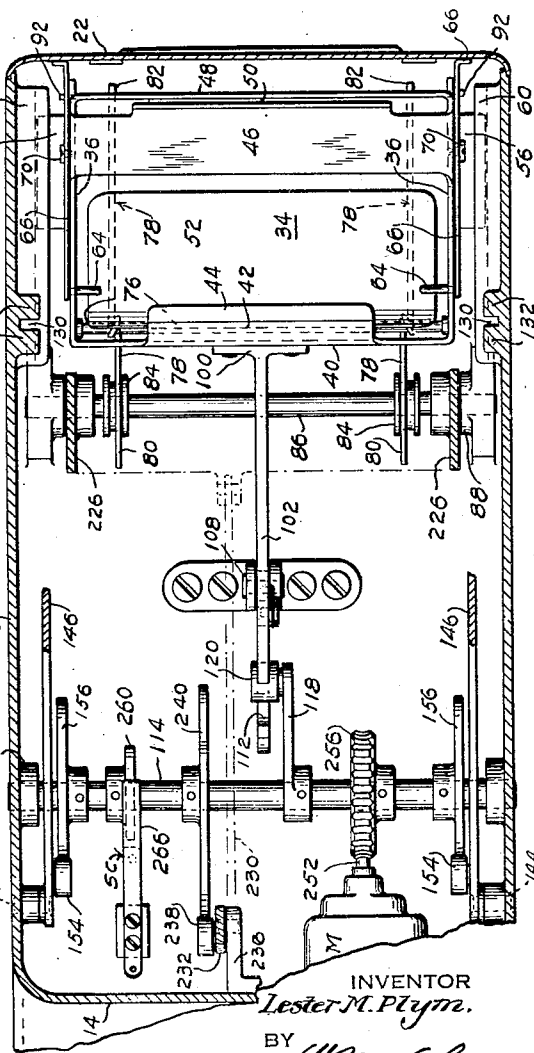


FIG. 3.



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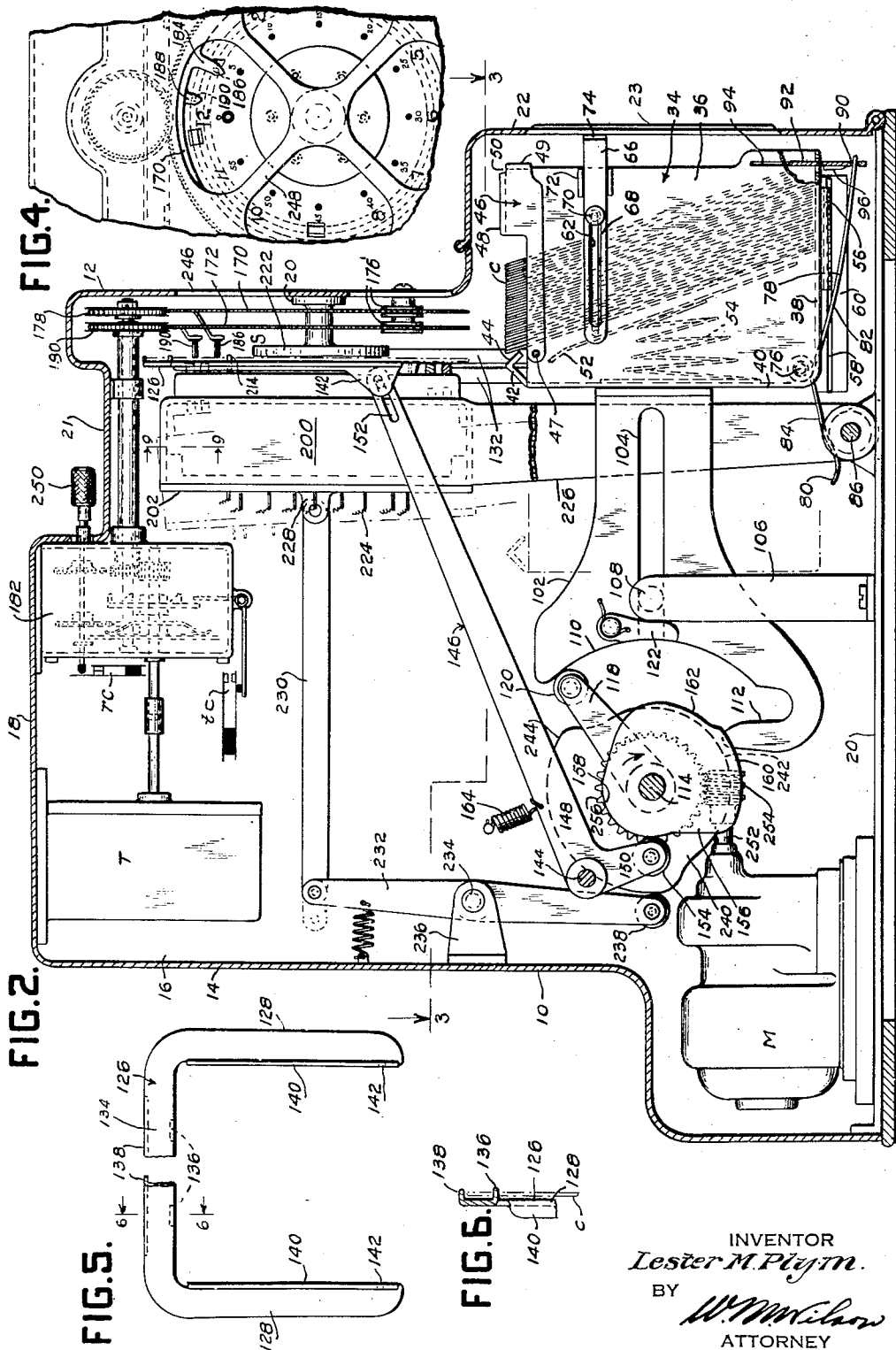
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

2,396,385

APPARATUS FOR CONTROLLING
ELECTRICAL CIRCUITS

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Application August 3, 1944, Serial No. 547,953

3 Claims. (Cl. 161--1)

The present invention relates to improvements in an apparatus for controlling electrical circuits and has particular reference to an apparatus for selectively controlling such circuits in accordance with a predetermined time-work program.

An object of the present invention is to provide an apparatus of this character which is relatively simple in its construction, one which is inexpensive to manufacture, one which is comprised of a minimum number of moving parts and which consequently is unlikely to get out of order, one which is extremely efficient in its use and one which lends itself readily to changes in the program of operations.

Most program machines for controlling electrical circuits according to a predetermined program employ a continuously moving perforated tape or other program bearing media for selectively closing the predetermined work circuits. The present program apparatus may be distinguished from such conventional apparatus in that individual cards are employed for each function. According to the present invention, a large number of these cards are contained in a file within the machine. The cards are readily removable from the file and replaceable therein and the number of cards in the file may be increased at any desired time without interrupting the operation of the machine. Each card is capable of controlling one or more electrical circuits. In the operation of the apparatus, the cards are automatically selected from the front of the file and, after they have served their desired purpose, they are automatically replaced at the rear of the file so that the various card cycles may be repeated continually. Means are provided whereby the card file may be withdrawn from the machine for inspection or for program changes without disturbing the operation of the machine.

The provision of an apparatus of the character set forth above is the principal object of the invention and other objects and advantages thereof will become more readily apparent as the nature of the invention is better understood.

In the accompanying two sheets of drawings forming a part of this specification:

Fig. 1 is a schematic view showing the electrical circuits for the apparatus.

Fig. 2 is a side elevational view of the apparatus with one of the side plates thereof removed to more clearly reveal the nature of the invention.

Fig. 3 is a sectional view taken substantially along the line 3--3 of Fig. 2.

Fig. 4 is a fragmentary end elevational view of the apparatus in the upper regions thereof.

Fig. 5 is a fragmentary front elevational view of a card moving member employed in connection with the present invention.

Fig. 6 is a sectional view taken substantially along the line 6--6 of Fig. 5.

Fig. 7 is a plan view of one of the program control cards.

Fig. 8 is a front elevational view of a card picker employed in connection with the present invention.

Fig. 9 is a sectional view taken substantially along the line 9--9 of Fig. 2.

Fig. 10 is a diagrammatic view showing the manner in which a pair of sensing rings employed in connection with the present invention are supported.

Referring now to the drawings in detail and particularly to Figs. 2 and 3, the apparatus involves in its general organization an outer casing 10 including stepped front and rear walls 12 and 14 respectively, side walls 16, a top wall 18 and a bottom wall or plate 20. The top wall 18 is provided with a relatively shallow longitudinal depressed portion 21 therein, the purpose of which will become apparent presently. The front wall 12 includes a hinged door 22 having a transparent panel 23 therein and by means of which access may be had to the card carrying storage rack in a manner that will be set forth subsequently.

In general, the invention contemplates that each operation of the program and of the circuit for controlling the same shall be represented by a separate independent record medium on which is recorded, by means of perforations, data identifying the operation and data indicative of the time at which the operation is to be effected. Such a record medium is shown in the form of a perforated card C, as shown in Fig. 7. The card C is shown as being provided with a perforation 24 representing hours and a perforation 26 representing minutes, the two perforations 24 and 26 determining the particular time at which a certain operation is to take place. For illustrative purposes, the perforations 24 and 26 shown in the card C of Fig. 7 indicates that a certain operation is to take place at 43 minutes after 3:00 o'clock. The card C is shown as having marked thereon eighteen points of reference 28, one or more of which may have perforations applied thereto as at 30 to permit the closing of a circuit or circuits at the predetermined time represented by the perforations 24 and 26 to perform a particular selected function or functions. To distinguish

the perforations 24 and 26 from the perforations 30, these former perforations are rectilinear in contour, while the latter perforations are circular. The card C is also provided with additional perforations 32 in the form of elongated slots, these latter perforations being provided for the purpose of enabling the card to be automatically manipulated in a manner to be set forth subsequently.

The cards are adapted to be stacked in a storage rack or bin 34 in the order in which the various operations are to take place. For example, if there are one-hundred operations to be effected in the period represented by one cycle of operation of the device, say, over a period of one week, one-hundred cards, one for each operation, would be placed in the rack. A change in the program of operations may be made at any time simply by removing a card or cards or by inserting one or more new cards as required. The function of the remaining cards is not affected by this change. Moreover, no alteration whatsoever is required in the apparatus to accommodate such change or substitution of cards.

The rack 34 is open at its front end and at its top and includes vertical side walls 36, a bottom wall 38 and a rear wall 40. A combined card rest and guide member 42 is formed on the upper edge of the rear wall 40 and is provided with a forwardly and downwardly inclined portion 44 by means of which the cards are guided into the rack. A generally U-shaped tiltable member 46 is pivoted as at 47 to the side walls 36 of the rack adjacent the upper edge thereof and includes a horizontal plate 48 and a vertical plate 49. With the member 46 in the position shown in Fig. 2 the horizontal plate 48 extends across the upper portion of the rack in the forward region thereof, while the vertical plate 49 extends across the rack in the forward upper region thereof and the two plates are separated by a narrow elongated slot or throat 50 through which the individual cards are automatically projected as required. The member 46 is adapted to be manually tilted upwardly to permit ready card rearrangements when the rack 34 is withdrawn from the casing 10.

A pressure plate 52 is disposed within the rack 34 and has associated therewith a coil spring 54 by means of which the stack of cards C is pushed forwardly to align the first card in the stack with the throat 50 immediately prior to withdrawal of this card from the rack. As will appear presently, the pressure plate 52 is adapted to assume a retracted position to loosen the card pack to facilitate replacement of the successive cards during the operation of the apparatus. By means of this pressure plate the rack is designed to accommodate a varying number of cards in the pack.

The rack 34 is horizontally slidable in the casing 10 from the forward position shown in full lines in Fig. 2 to the retracted position shown in dotted lines in this figure. Toward this end, the bottom wall 38 of the rack is formed with a pair of oppositely disposed elongated ears 56 thereon which project into slots 58 formed in a pair of guide members 60. These guide members 60 serve as a support for the rack 34, while at the same time permitting limited shifting movement of the latter.

The side walls 36 of the rack 34 are each formed with a longitudinally extending slot 62 therein, through which slots there project a pair of pins 64 (Fig. 3) carried at the rear end of a slide

member 66. Each slide member 66 is formed with a slot 68 therein through which there projects a stud 70 carried on one side wall 36 of the rack 34. A pair of guide members 72 straddle each of the slide members 66 and thus the latter are movable relative to the rack to extreme positions wherein the stud 70 occupies a position at one or the other end of the slot 68.

The slide members 66 are provided with laterally turned ends 74 which are adapted to bear against the door 22 of the casing 10 when the rack 34 approaches its forward position. In this manner, the slide members 66 occupy the positions shown in Fig. 2 wherein the pins 64 engage the pressure plate 52 and hold the same in a retracted position so that the upper edge of the rearmost card C in the stack may bear against the inclined portion 44 of the member 42. When the rack 34 is moved to its retracted position, the pressure plate 52 operating under the influence of the spring 54 bears against the pins 64 and causes the slide members 66 to yield, thus allowing the stack of cards C to be forced forwardly so that the first card in the stack will become aligned with the throat 50.

A rod 76 (Figs. 2 and 3) extends across the side walls 36 of the rack 34 at the rear lower corner thereof and serves to support thereon a pair of pivotally supported wire springs 78. Each of the springs 78 is formed with a rearwardly extending arm 80 and a forwardly extending arm 82. Each arm 80 is adapted to be guided by a flanged roller 84, the two rollers being mounted on a horizontal shaft 86, the ends of which are supported in bearing members 88 formed in the base plate 20. The forward ends of the arms 82 project through openings 90 formed near the lower edge of a picker plate 92 which extends vertically upwardly through a slot 94 formed in the bottom wall 38 of the rack 34. The arms 82 are also designed for cooperation with the flanged roller 84, the action being such that when the rack 34 is moved to its rearmost position, these latter arms ride upwardly on their respective rollers 84, thus carrying with them the picker member 92 and causing the first card C in the stack to be elevated so that its upper edge projects through the throat 50. When the rack 34 is moved to its foremost position, the arms 80 ride upwardly on their respective rollers 84, thus causing the picker member 92 to be lowered. The picker member 92 is provided with a picker element 96 of a thickness substantially equal to the thickness of a card in order that when the picker element becomes elevated a single card will be operated upon.

A bracket 100 is affixed to the rear wall of the rack 34 and has projecting laterally therefrom a guide plate 102 formed with an open ended, longitudinally extending slot 104 therein. A pair of standards 106 mounted on the base plate 20 at opposite sides thereof serves to support therebetween a horizontal pin 108 which extends through the slot 104 for guiding purposes. The rear end of the guide plate 102 is provided with a curved cam portion 110 and with an upwardly extending hook-shaped finger 112.

Still referring to Figs. 2 and 3, a horizontal shaft 114 extends completely across the casing 10 transversely thereof and is supported in bearings 116 carried by the two side walls 16. An arm 118 is secured to the shaft 114 in the medial regions thereof and the outer end of the arm 118 carries a roller 120 designed for camming engagement with the curved surface 110 of the guide

plate 102 and with the upwardly extending finger 112 formed on this latter plate. The open end of the slot 104 is adapted to be effectively blocked by means of a pivoted spring-pressed link 122 having curved surface 124 formed thereon conforming to the curved surface 110 of the guide plate 102. It will be seen that upon rotation of the shaft 114 in the direction indicated by the arrow in Fig. 2, the roller 120 will engage the curved surface 110 of the guide plate 102 and force this guide plate, together with the rack 34 carried thereby, forwardly to the position shown in full lines. As the shaft continues to rotate, the roller 120 moves downwardly on the curved surface 110 and engages the finger 112 to move the guide plate 102 and rack 34 rearwardly to the dotted line position. During that period of time wherein the roller 120 has moved out of engagement with the finger 112 and has not yet moved into engagement with the curved surface 110, the rack 34 remains stationary in its retracted position, as shown in dotted lines in Fig. 2.

The cards C which are successively withdrawn from the front of the rack 34 are adapted to be moved vertically and brought to an operative position of register at a sensing station S (Fig. 2) and be maintained in such a position of registry for a predetermined length of time until such time as all sensing operations have taken place, after which time they are restored to the rack 34 at the rear thereof. This is made possible, as will appear presently, by virtue of the fact that as the rack 34 approaches its rearward limit of travel the picker 92 is brought into operation to elevate the foremost card in the stack contained within the rack for reception by a card elevator 126, and also by virtue of the fact that during sensing operations the rack 34 is moved forwardly to shift the stack of cards bodily and ultimately bring the stack to a position wherein upon lowering of the elevator the card held thereby will fall into position behind the rearmost card in the stack.

Immediately after these sensing operations are completed, the cards are restored to the rack, as previously described. Toward this end, a card elevator 126 (see also Fig. 5) is movable from the elevated position shown in Fig. 2 in full lines to the lower dotted line position thereof. The elevator 126 is generally of U-shaped design and includes a pair of side members 128 adapted to straddle the rack 34 when the elevator is in its lowermost position. The side members 128 are slidably disposed in a pair of grooves 130 provided in respective vertically extending guide strips 132 formed on the side wall 16 of the casing 10. The elevator 126 also includes a cross piece 134 having formed thereon a pair of fingers or hooks 136 adapted to be received by the slots 32 in the cards C for elevating purposes. A laterally extending flange 138 formed on the cross piece 134 is adapted to overlie the elevated card and assist in moving the same downwardly when the elevator is moved to its lowered position. The side members 128 are provided with reinforcing flanges 140 having ears 142 adjacent their lower ends. A pair of studs 144 project inwardly from each of the side walls 16 of the casing 10 and serve to pivotally support thereon a pair of bell crank levers 146 having long arms 148 and short arms 150. The arms 148 are connected by means of pin and slot connections 152 to the respective ears and the short arms 150 carry cam rollers 154 thereon designed for cooperation with respective cam

members 156 mounted on the shaft 114 and rotatable therewith.

The cam members 156 are identical in design and are similarly oriented on the shaft 114 so that the movements of the bell crank levers 146 will coincide. These cam members are formed with regions 158 of small eccentricity and with regions 160 of relatively larger eccentricity, which taper inwardly as at 162. A pair of springs 164 serve to bias the bell crank levers 146 so that the cam rollers 154 will at all times follow the movements of the cam members 156. It will be seen that when the rollers 154 ride upon the regions 158 of the cam members 156, the elevator 126 will assume its elevated position in the vicinity of the sensing station S, and when the rollers ride upon the regions 160 the elevator 126 will assume its lowermost position to force a card into the rack 34, the inclined surface 44 serving to guide the forward edge of the card into position behind the rearmost card in the stack. When the rollers 154 enter upon the tapered portions 162, the elevator 126 will be raised from its lowermost position a slight distance so that the hooks 136 will be in register with the perforations 32 in the foremost card C in the stack.

The orientation of the cam members 156 on the shaft 114, and their relative positions with respect to the angular position of the arm 118, is such that the elevator 126 will move downwardly immediately prior to rearward movement of the rack 34 and thus the cards C carried thereby will be deposited in the rack behind the rearmost card in the stack. Immediately after the elevator assumes its lowermost position, it is raised a slight distance by virtue of the cam portion 162 to clear the rack while the latter is moved rearwardly. In this position the hooks 136 are aligned with the perforations 32 in the foremost card in the stack. The elevator 126 remains poised in this position until such time as the rack attains its rearmost position and the perforations 32 are engaged by the hooks 136. When this condition has occurred, the rollers 154 ride onto the surface 158 of the cam members 156 and the elevator and its newly acquired card is carried upwardly to the sensing station S.

The sensing instrumentalities in the vicinity of the sensing station S include a sensing mechanism for sensing the perforations 24 and 26 which determine the time at which a particular function is to take place and a separate sensing mechanism for sensing the perforations 30 which determine the particular function to be carried out. The former sensing mechanism comprises a pair of ring-like gears or sensing rings 170 and 172 which are of the freely floating type. These gears 170, 172 are centered between a plurality of flanged supporting gears 174, 176 and 178 in the case of the gear 170; and 174, 176 and 180 in the case of the gear 172; the gears 174 and 176 constituting small idler gears and the gears 178 and 180 constituting driving gears for the gears 170 and 172 respectively. The gears 178 and 180 are adapted to be driven in any suitable manner from a time controlled motor T, which if desired may be a conventional Telechron motor, through a gear reduction device designated in its entirety at 182. The sensing ring 170 (see also Fig. 1) is formed with an inwardly projecting lug 184 having mounted thereon a sensing brush 186, while the sensing ring 172 is provided with a similar inwardly extending lug 188 having mounted thereon a sensing brush 190. The

sensing brushes 186 and 190 are designed for co-operation with a pair of common sensing rings 192 and 194 respectively mounted on a movable sensing unit 200. The sensing brush 186 and its ring 192 are adapted for use in the sensing of the perforations 26 representing time in minutes, while the sensing brush 190 and its sensing ring 194 are designed for use in sensing the perforations 24 which represent time in hours. As will become more readily apparent when the circuit diagram for the apparatus is described, the common rings 192 and 194 are directly connected in an electrical circuit, while the sensing rings 170 and 172 rely for their connection in the circuit upon their electrical contact with the driving gears 178 and 180, which latter gears are electrically connected in the circuit.

The sensing unit 200 is shown in detail in Fig. 1 and includes sensing instrumentalities for sensing the perforations 38 which control the particular program functions of the machine. Toward this end, the unit 200 includes a rear plate 202 of insulating material, a metallic electrically conductive casing 204 of shallow cylindrical cup-shaped design and a front plate 206 of insulating material to which the rings 192 and 194 are secured. A plurality of apertures 208, corresponding in number to the number of positions 28, are formed in the casing 204 and a plurality of bores 210 are formed in the insulating plate 206 in register with the apertures 208. The bores 210 serve to receive therein the forward ends 212 of a plurality of sensing pins 214 having associated therewith contact collars 216. The rear ends of the pins 214 are slidably received in bores 218 provided in the rear insulating plate 202. A spring 220 surrounds each of the pins 214 and bears at one end against the rear plate 202 and at the other end against the collar 216 normally urging the pin forwardly, as shown in Fig. 1, to a position wherein the collar 216 makes electrical contact with the casing 204 to establish an electrical sensing circuit.

A pressure plate 222 of generally circular design is affixed to the front wall 12 of the casing 10 for maintaining the cards C in a sensing position in front of the movable sensing unit 200 when the latter is in its forward position. It will be seen that when a card C is in position between the pressure plate 222 and the unit 200 in proper registry with the latter, such pins 214 as do not encounter apertures in the positions 28 of the card will be maintained in a retracted position wherein the collars 216 thereof are out of electrical contact with the casing 204. When one or more of the pins 214 encounters an aperture in its respective position 28 of the card, the forward end 212 of the pin will project completely through the card and allow the collar 216 to engage the casing 204 to complete an electrical contact. The pins 214 are provided with electrical terminals 224 at the rear of the unit 200.

The sensing unit 200 is carried at the upper end of a pair of oscillatable arms 226 which are pivoted adjacent their lower ends on the shaft 86. An attachment lug 228 is secured to the rear plate 202 and a link 230 serves to connect the attachment lug 228 to the upper end of a rocker arm 232 pivoted medially of its ends at 234 to a bracket 236 affixed to the inside of the rear wall 14 of the casing 10. The lower end of the rocker arm 232 carries a cam roller 238 designed for camming engagement with a cam member 240 (see also Fig. 3) mounted on the shaft 114. The cam member 240 is provided with a region

242 of small eccentricity and with a region 244 of larger eccentricity. Thus it will be seen that when the roller 238 rides upon the region 244 of larger eccentricity, as shown in Fig. 2, the sensing unit 200 will be moved to its foremost position and when the roller 238 rides upon the region 242 of small eccentricity, the sensing unit 200 will be moved to its retracted or rearmost position. The orientation of the cam member 240 upon the shaft 114 and its relative position with respect to the cam 158 is such that the unit 200 will approach and attain its foremost sensing position immediately after the card elevator 126 has arrived at its uppermost position to bring a card C into its operative sensing position. After all sensing operations have taken place, immediately prior to lowering of the elevator 126, the unit 200 is adapted to commence its rearward travel to free the card and allow the same to be moved downwardly to be returned to the rack 34. The front wall 12 of the casing 10 is provided with an opening 246 therein to facilitate inspection of a card undergoing sensing. A transparent spider 248 integrally formed with the front wall 12 spans the opening 246 for the purpose of supporting the pressure plate 222.

The gear reduction device 182 contains conventional gearing mechanism by means of which torque applied by the Telechron motor T is transmitted to the driving gears 178 and 180. The gear reduction device 182 also includes a resetting knob 250 which is disposed within the longitudinal depressed portion 21 of the top wall 18 of the casing 10. During actual resetting operations, a pair of normally closed contacts *rc* are adapted to become open under the influence of the knob 250 to open an electrical circuit for purposes that will be described presently. Additionally, the mechanism contained within the gear reduction device 182 includes mechanism for periodically closing a pair of normally open contacts *tc* regularly at predetermined intervals, as will also subsequently be set forth.

In order to drive the shaft 114, a motor M is mounted upon the base plate 20 and is provided with a motor shaft 252 having a worm 254 thereon which cooperates with a worm gear 256 on the shaft 114. The electric circuit for the motor M remains normally open and is adapted to become closed only when the brushes 186 and 190 fall into register with their respective perforations 24 and 26 on a card C positioned at the sensing station S, as will become apparent during the description of the circuit connections for the apparatus.

Referring now to Fig. 1 wherein the electrical connections for the apparatus are illustrated, the motor M receives its source of energizing current from a battery B or other suitable source of current. When a card C is in position at the sensing station S and the brush 186 representing minutes and the brush 190 representing hours engage their respective contact rings 192 and 194, a normally open circuit is conditioned for subsequent closing thereof at the particular instant of time that the pair of contacts *tc* become momentarily closed under the influence of the mechanism in the gear reduction device 182. This circuit exists from the source B through the motor M, lines *a*, *b*, *c*, the pair of normally closed contacts *rc*, line *e*, the pair of now closed contacts *tc*, line *f*, the common ring 194, brushes 190 and 186 (electrically connected), common ring 192 and lines *g* and *h* to the source. The motor M serves to drive the shaft 114, as previously de-

scribed, and a cam wheel 260 mounted on the shaft 114 is provided with a depression 262 therein which cooperates with a pair of fingers 264 and 266 to permit closing of a pair of normally open motor contacts *mc* and to permit closing of a pair of normally open sensing contacts *sc*. When the finger 264 moves out of register with the cam depression 262 upon commencement of rotation of the cam wheel 260, the pair of normally open motor contacts *mc* become closed to establish a holding circuit for the motor M. This holding circuit exists from the source B through the motor M, line *a*, line *k*, contacts *mc*, line *l*, and line *h* to the source. By means of this circuit, the motor is maintained energized during one complete revolution of the shaft 114.

Upon rotation of the shaft 114 the various mechanical instrumentalities associated with the apparatus go through a complete card cycle, as previously described, during which cycle the sensing unit 200 is brought into operative sensing register with a card C situated at the sensing station S and at this time such sensing pins 214 as encounter perforations 30 in the card C close an electrical circuit by virtue of the fact that the collar 216 makes electrical contact with the casing 204. When this occurs, a work circuit having terminals *w* and *w'* exists from the terminal *w* through a source of current supply B', line *m*, the pair of contacts *sc* (now closed), line *n*, casing 204, collar 216, terminal 224 and line *o* to the terminal *w'*.

In Fig. 1 a single work circuit has been shown in its entirety leading from the terminal *w* to the terminal *w'* through the path just traced. Additional work circuits having terminals *x* and *x'*, *y* and *y'*, *z* and *z'*, etc., are provided for each of the other sensing pins 214 for the selective performance of various program functions. The various terminals *w* and *w'*, *x* and *x'*, etc., may be operatively connected to relays R, R1, R2, etc., these latter relays representing the particular program functions desired.

The circuit for the motor M may be provided with a manually operable switch S' operable upon closing to establish a motor circuit from the motor M through the lines *a* and *b*, switch S', and source B back to the motor. This switch upon becoming closed shunts the pair of contacts *mc* and permits continuous operation of the motor M.

The invention is not to be limited to the exact arrangement of parts shown in the accompanying drawings or described in this specification as various changes in the details of construction may be resorted to without departing from the spirit of the invention. Only insofar as the invention has been particularly pointed out in the accompanying claims is the same to be limited.

What is claimed is:

1. In a program device, in combination, a reciprocable storage rack containing a serially arranged group of pattern cards each of which designates a particular operation of the program and the time at which the operation is to be effected, a reading device, said rack being movable upon reciprocation thereof from an advanced position wherein the first pattern card of the group is

out of alignment with said reading device to a retracted position wherein said card is in alignment with the device, means for reciprocating said rack, means automatically operable upon movement of the rack from its advanced to its retracted position for bodily moving said first card to a position wherein it is offset from the remainder of the group of cards, mechanism for transferring the offset card from the rack to the reading device and for retaining the card in the device until the time indicated by the pattern thereon, means for effecting the operation designated by the card at the time indicated, and means for returning the card to the rack when the latter has been restored to its advanced position.

2. In a program device of the character described, in combination, a reciprocable storage rack having a bottom and adapted to contain a serially arranged group of pattern cards positioned in alignment in face-to-face relationship with the lower edge of each card loosely resting upon said bottom, said rack being movable from an advanced position to a retracted position, means on said rack above the cards providing a throat through which the cards in said group are adapted to be fed one at a time from the forward end of the group, means yieldingly engaging said group of cards when said rack is in its retracted position to shift the group to a position wherein the first card thereof is in alignment with said throat, stationary means positioned adjacent said rack for engaging said yieldable card engaging means when the rack is in its advanced position to render said latter means inoperative, and means operable upon movement of the rack to its retracted position for engaging said first card in the group and feeding the same through said throat.

3. In a program device of the character described, in combination, a reciprocable storage rack having a card supporting bottom and adapted to receive therein a serially arranged group of pattern cards positioned in alignment in face-to-face relationship with the lower edge of each card loosely resting upon said bottom, said rack being movable from an advanced position to a retracted position, means on said rack above the cards providing a throat through which the cards in said group are adapted to be fed upwardly one at a time from the forward end of the group, a pressure plate yieldingly engaging the rearmost card in said group and normally forcing the same forwardly in the rack to cause the entire group of cards to be moved bodily to a position wherein the first card thereof is in alignment with said throat, cam means operable upon movement of the rack to its retracted position for engaging the first card in said group and feeding the same through said throat, and a stationary abutment positioned in the path of movement of said pressure plate for engaging the latter when said rack approaches its advanced position to render the same inoperative.

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