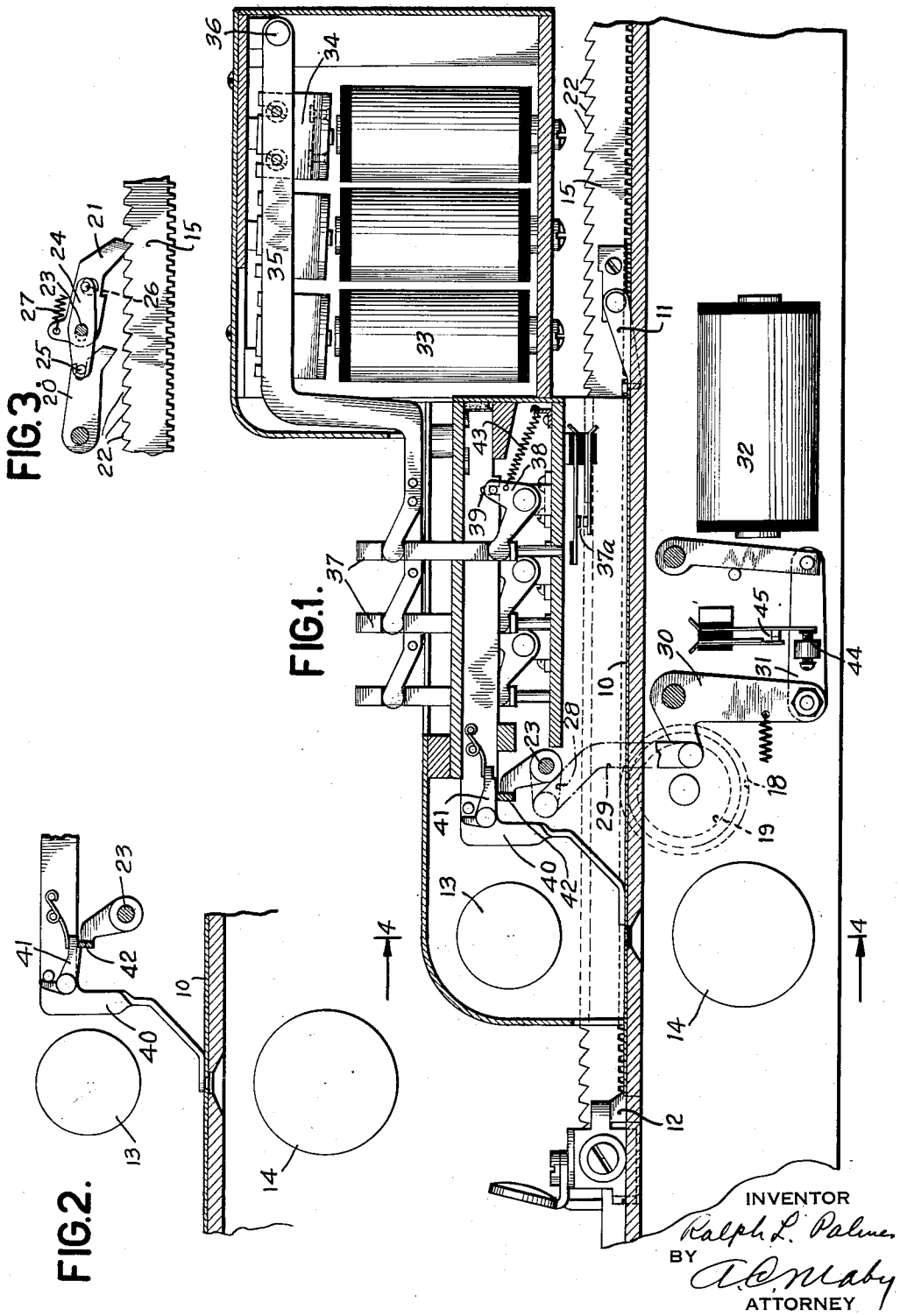
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RECORD VERIFYING MACHINE

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FIG. 4.

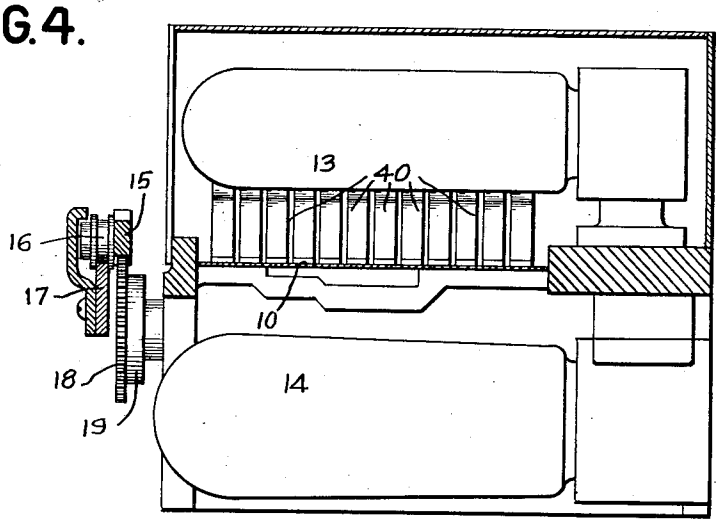
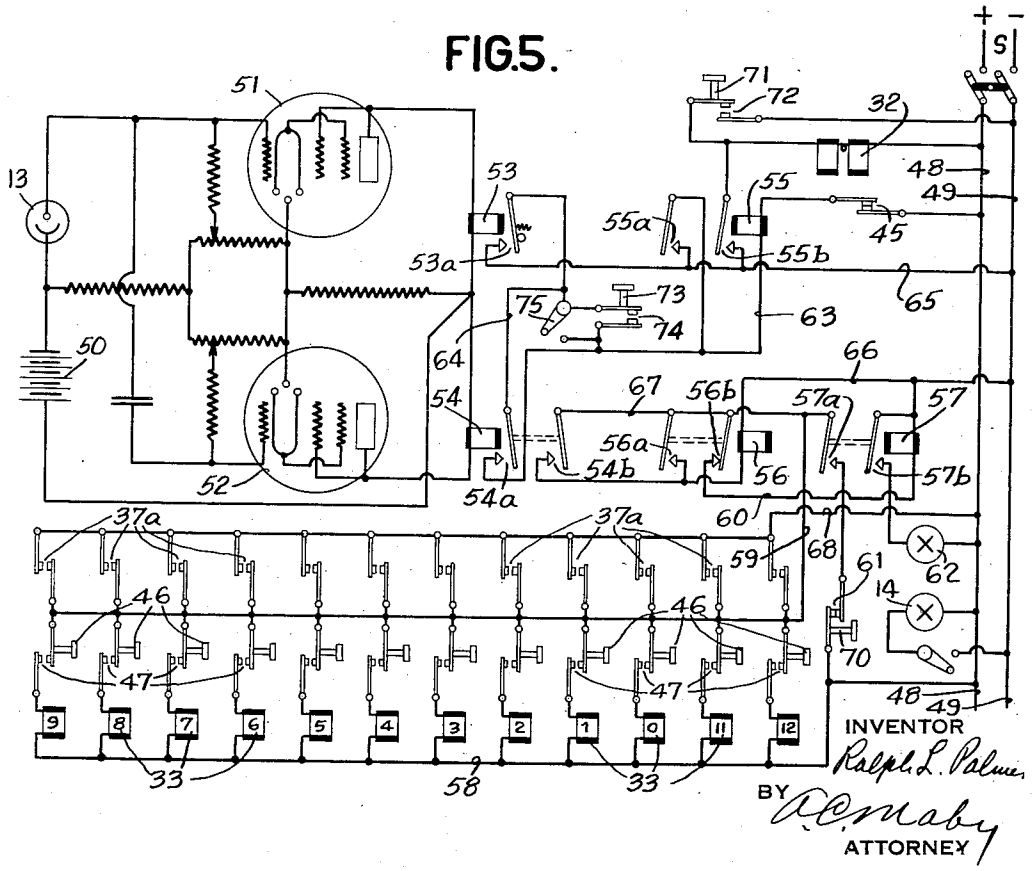


FIG. 5.



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RECORD VERIFYING MACHINE

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8 Claims. (Cl. 73—51)

This invention relates to certain new and useful improvements in verifying machines.

In tabulating machine work, data are tabulated by punching differentially spaced holes on record cards. A machine for carrying out the punching operation may be the Schaaff machine shown in Patent No. 1,134,018. In this machine the punching operation is performed by depressing certain keys. Operators using the machine sometimes depress the wrong key and incorrect data are then recorded on the card in the form of incorrectly located perforations. It has heretofore been found that the punched cards must be checked to determine if any errors have been made. Often this checking is done by a visual inspection of the cards, but this method of checking has been found unsatisfactory as the checker is liable to make the same error that was originally made by the operator who punched the card. Also the visual checking is a tedious and time consuming operation.

The present invention is directed to a machine in which the punched cards may be placed and the errors detected. The operation of checking is exceedingly rapid and the possibility of checkers' errors being identical with punching operators' errors is largely eliminated.

The verifying machine is provided with keys similar to those in the card punching machine and the checker operates the keys just as if a new card were being punched. If a card is correctly punched the record card carriage feeds forward one step for the depression of each key, but if a punch hole is incorrectly spaced in the card, or if a hole is missing, a signal lamp indicates the presence of the error.

Heretofore in verifying machines mechanical and electrical devices have been employed to separately and physically explore each index-point position of a card column in verifying position with a consequent duplication of sensing elements and controlled devices. One of the objects of the present invention is to provide a single light sensitive cell for simultaneously scanning all positions of a card column for determining the correctness of the perforations in said column.

In its preferred form the invention consists of a light sensitive cell which receives light through perforations in the card if such are present or none if the column is blank. A key-controlled shutter is provided for each index-point position of the card columns and each punching position is adapted to be covered by its shutter when the corresponding key is operated, thereby cutting off the light to the cell through the perforation, if one is present. A pair of thermionic tubes is controlled in accordance with the action of the light sensitive cell and each tube controls a relay in such manner that one of the relays is responsive to the absence of light directed against the cell while the other is responsive to a change in the amount of light directed against the cell.

When a perforation is sensed by the cell the first relay will be energized. If the corresponding key is then operated and the light through the perforation cut off by a shutter, the second relay will cause a signal lamp to be momentarily illuminated and then extinguished and the card carriage will escape to the next column.

If the incorrect key is depressed, or if the perforation is in the wrong location the said relay will not be operated, the signal lamp will remain illuminated and escapement of the carriage prevented.

If the perforation is missing and the column incorrectly left blank, the signal lamp will be illuminated upon depression of the key and will remain lighted.

Various other objects and advantages of my invention will be obvious from the following particular description of one form of mechanism embodying the invention or from an inspection of the accompanying drawings, and the invention also constitutes certain new and novel features of the construction and combination of parts hereinafter set forth and claimed.

In the drawings:

Fig. 1 is a central section through the device.

Fig. 2 is a detail of parts in Fig. 1, shown in moved position.

Fig. 3 is a detail of the carriage escapement mechanism.

Fig. 4 is a section taken along lines 4—4 of Fig. 1.

Fig. 5 is a wiring diagram of the electric circuits of the device.

Card feeding mechanism

In the accompanying drawings in Fig. 1, the perforated card 10 is inserted between a card pusher 11 and a forward guide 12 with the first column of the card coinciding with the common center line of light sensitive cell 13 and lamp 14. The filament of lamp 14 lies parallel to the column of index-point positions of the record (see Fig. 4) and the cell 13 is similarly located so that light passing through a perforation in any po-

sition will fall upon the cell at a point above the hole.

The pusher 11 and guide 12 are attached to the carriage rack 15 which is suitably supported and guided by rollers 16 which cooperate with rail structure 17 secured to the frame of the machine. The rack 15 has teeth cut in its lower edge meshing with a gear 18 upon whose axis is mounted a spring barrel 19 which through connection to the gear 18 tends to urge the rack 15 toward the left.

A suitable escapement mechanism including a holding pawl 20 (Fig. 3) and a stepping pawl 21 cooperates with ratchet shaped teeth 22 cut in the upper edge of carriage rack 15 to permit step-by-step advance thereof. The normal position of the pawls 20, 21 is shown in Fig. 3. A shaft 23 when rocked in a counter-clockwise direction will tilt a double-armed lever 24 carried at one end thereof. Lever 24 has a pin 25 in one arm which extends into a notch in pawl 20 and a pin 26 in its other arm which extends into an enlarged opening in pawl 21. As the shaft 23 and lever 24 are rocked, the pin 25 will lower pawl 20 into engagement with a tooth 22 to hold rack 15 in position while pin 26 raises pawl 21 out of cooperation with the bar. Pawl 21 is loosely mounted on shaft 23 with sufficient clearance so that upon return of lever 24 to its initial position, pawl 21 will be drawn slightly to the right by its spring 27 and the next tooth on the rack will engage the end of the pawl.

In Fig. 1 shaft 23 carries an arm 28, connected through link 29, bell crank 30, and link 31 to the armature of escapement magnet 32 in such manner that for each operation of the armature, shaft 23 will be oscillated to permit the card carriage to advance one step and the card columns will thus be successively presented to the analyzing position.

Link 31 carries a screw 44 which is adapted to cause opening of a pair of contacts 45 when the link moves toward the right.

Shutter mechanism

For each index point position there is provided a magnet 33 whose armature 34 is carried by an arm 35 pivoted at 36. The free end of arm 35 has connection with a plunger 37, mounted for vertical movement and in turn, having connection with an arm of a bell crank 38. The other arm of the bell crank 38 has pin and slot connection 39 with a shutter 40 which is suitably mounted for horizontal movement. Energization of a magnet 33 will, through the connection just described, shift its associated shutter 40 toward the left from the position shown in Fig. 1 to that in Fig. 2 where the leading end covers the index-point position of the record column and cuts off the light from lamp 14 at such position. Each shutter 40 carries a spring pressed latch 41 which, when the shutter is advanced, will snap over a bail 42 supported by escapement shaft 23. Rocking of shaft 23 to effect an advance of the carriage will rock bail 23 to release latch 41 and permit shutter 40 to be retracted by its restoring spring 43. A pair of contacts 37*a* is located beneath each plunger 37 and is closed thereby and held closed while shutter 40 remains in advanced position.

Wiring diagram

The various conditions which may exist to affect the operation of the machine will now be explained in connection with the wiring diagram of Fig. 5 in which a plurality of keys 46, one for each index point position, are diagrammatically represented. Each key is adapted to close a pair of contacts 47. Current is supplied to lines 48 and 49 from a suitable source S and a separate battery 50 supplies current for the light sensitive cell and thermionic tubes 51 and 52.

Tube 51 is direct-coupled and adjusted to energize a relay magnet 53 in its plate circuit when a predetermined amount of light falls upon cell 13. That is, when reflected or direct light from extraneous sources, such as through the casing of the machine falls upon the cell 13, relay 53 remains energized. When light from lamp 14 falls upon the cell through perforations in the card, the tube 51 is actuated to cause deenergization of relay 53.

Tube 52 is capacity-coupled and operates independently of the absolute amount of light on the cell 13 but is excited by changes in the amount of light incident upon the cell. A relay 54 is included in the plate circuit of tube 52 and is accordingly energized when a change or decrease in the amount of light on cell 13 occurs.

Specifically, relay 53 is deenergized when light passes through a perforation and is energized when all such light is cut off, either by the shutters or because no perforations are present in the column being analyzed. Relay 54 is energized when the cell 13 is initially activated due to the presence of a perforation and the light is then cut off by the shutter or shutters.

Correct perforations

The manner in which the device functions to verify perforations will now be explained for the condition where the key depressed corresponds to the location of the perforation in the column. Assume that there is a perforation in the "12" index-point position and that the "12" key 46 is depressed. Immediately upon the presentation of the column containing this "12" perforation the relays 53, 54, 55, 56 and 57 will all be deenergized and their related contacts will be in the positions illustrated in Fig. 5.

Relay 53 is deenergized due to the incidence of light from lamp 14 on cell 13 through the "12" hole. The operator then depresses the "12" key 46 and a circuit will be completed from line 48, wire 58, "12" magnet 33, "12" contacts 47, wire 59, normally closed contacts 56*b* of relay magnet 56, wire 60, relay magnet 57, to line 49. Magnet 57 closes its contacts 57*a* to set up a holding circuit from line 48, release key contacts 61, contacts 57*a*, contacts 56*b*, wire 60, magnet 57 to line 49. Magnet 57 also closes its contacts 57*b* to complete a circuit from line 48, signal lamp 62, contacts 57*b* to line 49.

Energization of "12" magnet 33 will advance the "12" shutter 40 to cover the hole in that position and light from lamp 14 will consequently be cut off from cell 13. This change will operate both tubes 51 and 52, to energize both relays 53 and 54 and a circuit will then be traceable as follows: from line 48, contacts 45, relay magnet 55, wire 63, contacts 54*a*, wire 64, contacts 53*a*, wire 65 to line 49. Since the energization of magnet 54 is but momentary, a second pair of contacts is provided as indicated at 54*b* which complete a circuit from line 49, wire 66, relay magnet 56, contacts 54*b*, wire 67, wire 59, "12" contacts 37*a* (latched closed at this time due to the advanced position of "12" shutter 40) wire 68 to line 48.

Magnet 56 closes contacts 56*a* which bridge contacts 54*b* so that the above circuit is held until

contacts 37a are opened under action of the escapement control mechanism.

Magnet 55, energized as traced above closes its contacts 55a to set up its own holding circuit from line 48, contacts 45, magnet 55, wire 63, contacts 55a to line 49. A second pair of contacts 55b completes the escapement magnet circuit as follows: from line 48, magnet 32, contacts 55b, to line 49. The escapement will thereupon operate causing opening of contacts 45 to drop the holding circuit of magnet 55, opening of contacts 37a to drop the holding circuit of magnet 56 and will advance the record one column or step.

The incidental opening of contacts 56b upon energization of magnet 56 will deenergize magnet 57 and it in turn will permit opening of contacts 57b, thus breaking the circuit to signal lamp 62.

Incorrect perforations

Hole in wrong position.—The next column is now in analyzing position and if a perforation is present, relay magnet 53 is deenergized as before and verifying will take place also as before if the corresponding key is depressed. If the hole is punched in a position other than that in which it should occur or if the verifying operator depresses the wrong key, the shutter 40 advanced will not interrupt the light passing through the perforation and magnet 53 will remain deenergized. Depression of a non-corresponding key will complete a circuit as before, energizing magnet 57 to illuminate the signal lamp 62. There will be no escapement action since there has been no interruption in the light to cell 13 and lamp 62 will remain lighted as an indication of an error. The card may then be removed from the machine. Following this, depression of key 70 will open contacts 61 to break the holding circuit through lamp 62 and depression of key 71 will close contacts 72 to energize escapement magnet 32 for the purpose of releasing the latched shutter 40.

If the error was occasioned by the verifying operator due to depression of the wrong key the depression of keys 70 and 71 will advance the card to the next column and verifying may then be continued.

Hole omitted.—If the perforation to be verified has been erroneously omitted, analysis of the column will first cause energization of relay magnet 53 and the subsequent depression of a key 46 will effect the illumination of lamp 62 and the setting up of the holding circuit therefor.

Extra hole.—If in addition to a correctly located perforation there is a superfluous perforation in another index-point position of the same column, the relay magnet 53 will not become energized upon depression of the key corresponding to the correct hole since the cell 13 will still receive light through the extra hole. The escapement circuit traced above, can therefore not be completed, and the lamp 62 will remain illuminated.

Blank columns

To verify a blank column, that is, to ascertain that no perforations have been made in a column that should be unpunched, key 73 is depressed when the blank column is in analyzing position. Since no light is passing through the card, relay magnet 53 is energized and its contacts 53a are closed, and a circuit can therefore be completed from line 48, contacts 45, magnet 55, wire 63, contacts 74 of key 73, contacts 53a, to line 49. The escapement magnet is subsequently energized in the now familiar manner and the card is advanced to the next position.

Automatic column skipping

Frequently where the punched columns to be verified are separated from one another by blank columns and it is not desired to verify such blank columns, closure of a switch 75 will cause the same to be automatically skipped in the following manner. Upon arrival of any blank column in analyzing position, all light from lamp 14 will be cut off from cell 13 and consequently relay magnet 53 will immediately become energized and a circuit completed from line 48, contacts 45, magnet 55, wire 63, switch 75, contacts 53a, to line 49. Magnet 55 will close its points 55b to energize the escapement magnet 32 and the card will thereupon be advanced to the next column. If this column is also blank, the automatic escaping action will be repeated, and will continue until a column is reached in which there is a perforation.

In the preferred form illustrated, keys 46 are arranged for distant control of the machine, that is, they may be located at a point remote from the actual card feeding mechanism. If desired, however, plungers 37 may be provided with suitable buttons at their upper extremities and operated directly. Magnets 33 and contacts 47 may then be dispensed with entirely.

While there has been shown and described and pointed out the fundamental novel features of the invention as applied to a single modification, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention therefore to be limited only as indicated by the scope of the following claims.

What is claimed is as follows:

1. In a verifying machine, means including a light sensitive cell for sensing the index-point positions of a column of a record card, card advancing mechanism, a thermionic tube, direct-coupled to said cell to respond to the incidence of a predetermined amount of light on the cell, a second thermionic tube capacity-coupled to said cell to respond to a change in the amount of light incident upon the cell, verifying keys and means jointly controlled by said tubes and said keys for controlling the operation of said card advancing mechanism.

2. In a record verifying machine, a sensing station with means for sensing the presence of perforations in a record card column presented to said station, a pair of relays, one of said relays being normally energized and the other normally deenergized, means controlled by said sensing means upon sensing a perforation for causing deenergization of said normally energized relay, means for covering the perforation sensed to cause said sensing means to reenergize the normally energized relay and concurrently energize the normally deenergized relay, a magnet and a circuit for operating the same, completed jointly by said relays when both are concurrently energized.

3. The invention set forth in claim 2 in which the energization of the normally deenergized relay is momentary and in which means is provided for maintaining said magnet energized after the momentary energization of said last named relay.

4. The invention set forth in claim 2 in which a signal circuit is provided and completed con-

currently with the operation of said perforation covering means and in which the concurrent operation of said relays causes interruption of said signal circuit.

5. The invention set forth in claim 2 in which means is provided for locking said perforation covering means in operative position and in which means is provided and controlled by said relays for causing unlocking of said covering means.

6. In a record verifying machine, a sensing station including a light sensitive cell and an illuminating lamp, means for presenting a column of a record card to said station whereupon light from the lamp will be reflected upon said cell through a perforation in an index point position of said column, a shutter, means for moving said shutter to cover said perforation and cut off the light passing therethrough, means for latching said shutter in moved position and means controlled by said cell when said light is cut off for causing removal of the column from said sensing station and unlatching of said shutter.

7. In a record verifying machine, a sensing station including a light sensitive cell and an illuminating lamp, means for presenting a record card column to said station whereupon a data designation in an index point position of said column will effect a change in the amount of light reflected by said lamp upon said cell, a shutter, means for moving said shutter to cover said designation, means for latching said shutter in moved position, and means controlled by said cell when said shutter covers the designation for causing removal of the column from said sensing station and unlatching of said shutter.

8. In a record verifying machine, a light sensitive cell for sensing the index point positions of a column of a record card, a plurality of shutters, one for each index point position, means for interposing one or more of said shutters between said cell and said index point positions, a pair of thermionic tubes controlled by said cell, one of said tubes being responsive to the presence or absence of data designations in said positions, the other being momentarily responsive to a change in the amount of light reflected upon the cell, escapement mechanism for the record card and means controlled jointly by said tubes for controlling the operation of said escapement mechanism.

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