Oct. 9, 1934. F. R. JONES 1,976,615

ELECTRIC VERIFYING MACHINE

Filed March 22, 1930 4 Sheets-Sheet 1

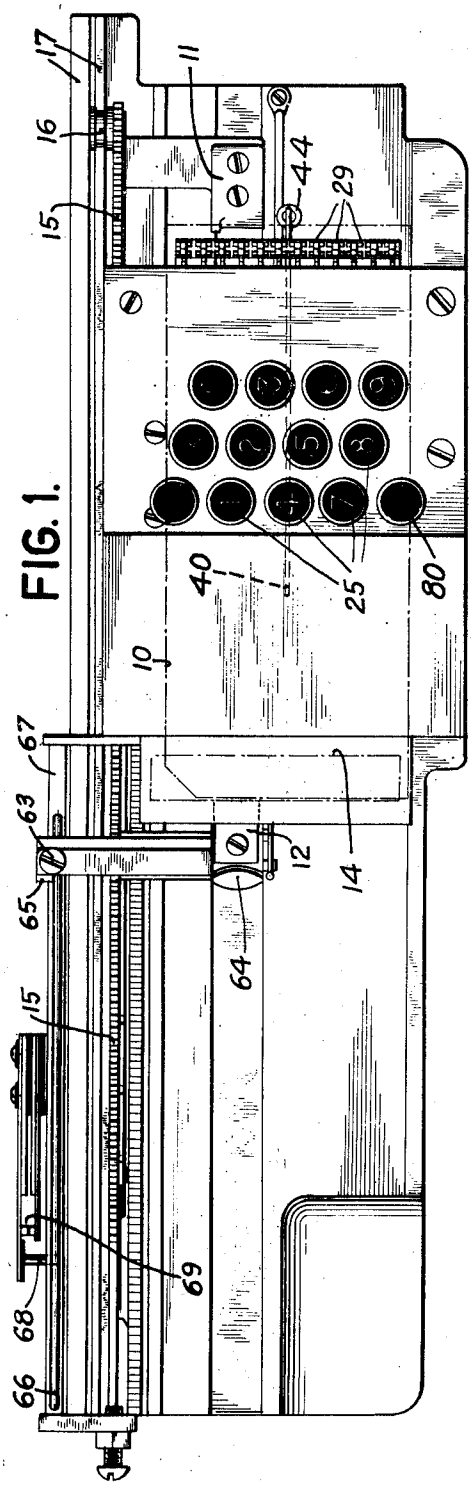


FIG. 1.

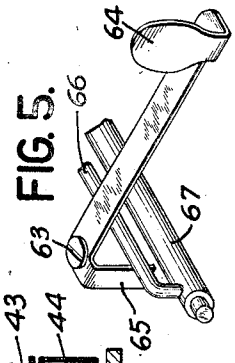


FIG. 5.

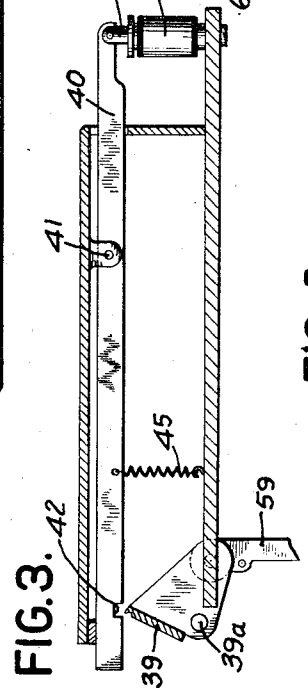


FIG. 3.

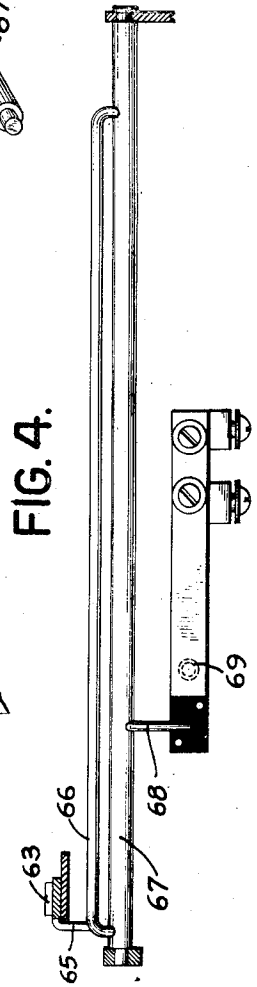


FIG. 4.

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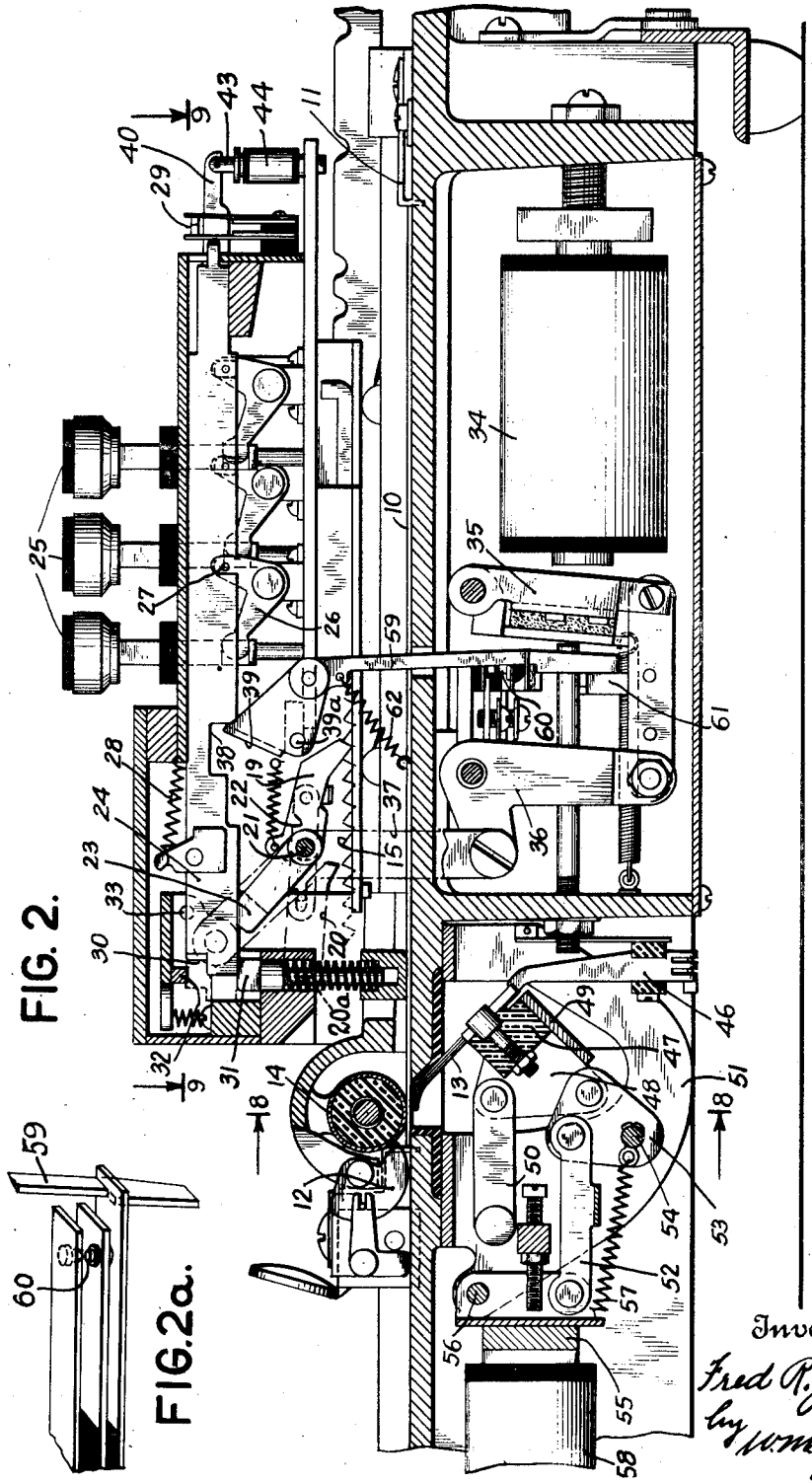


FIG. 2.

FIG. 2a.

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FIG. 6.

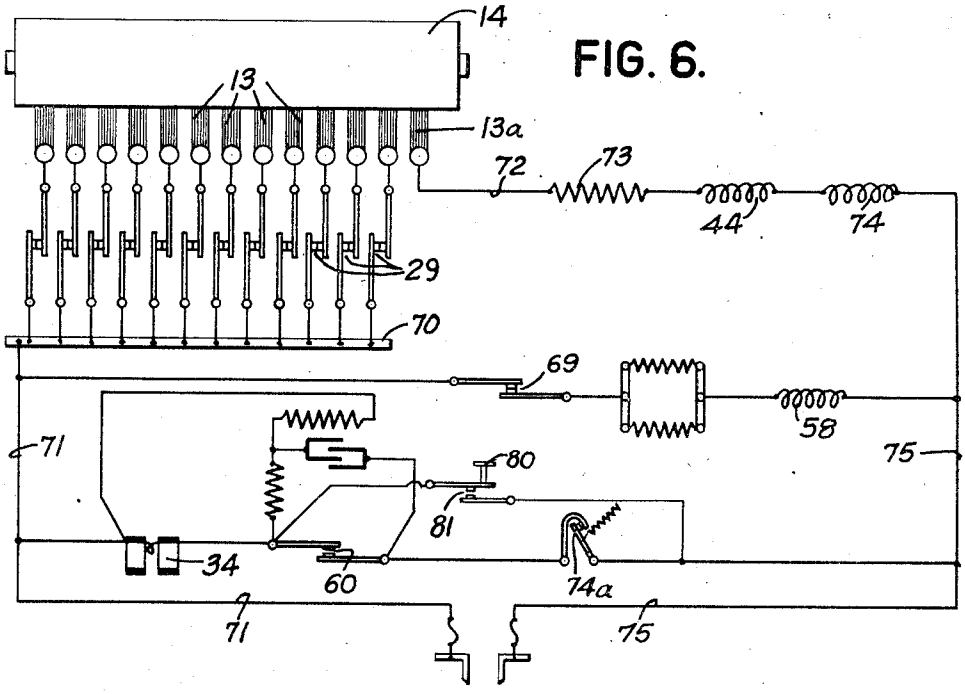
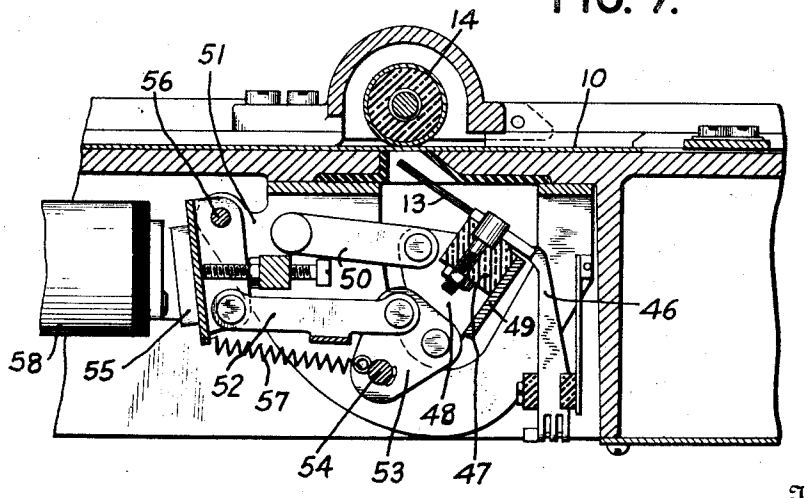


FIG. 7.



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ELECTRIC VERIFYING MACHINE

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FIG. 8.

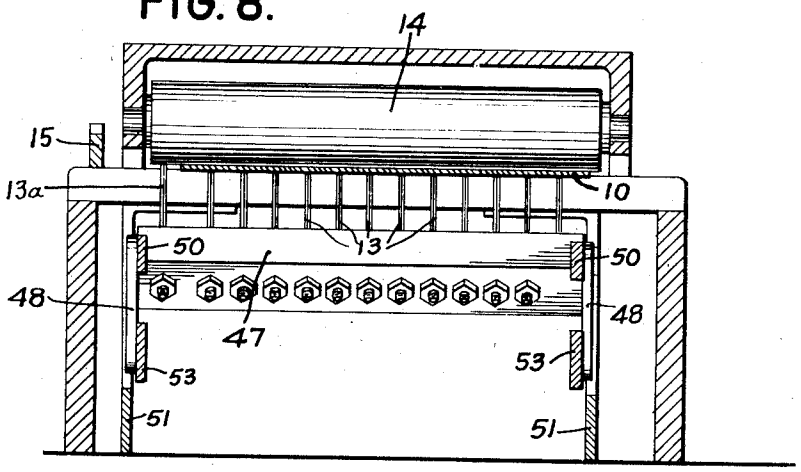
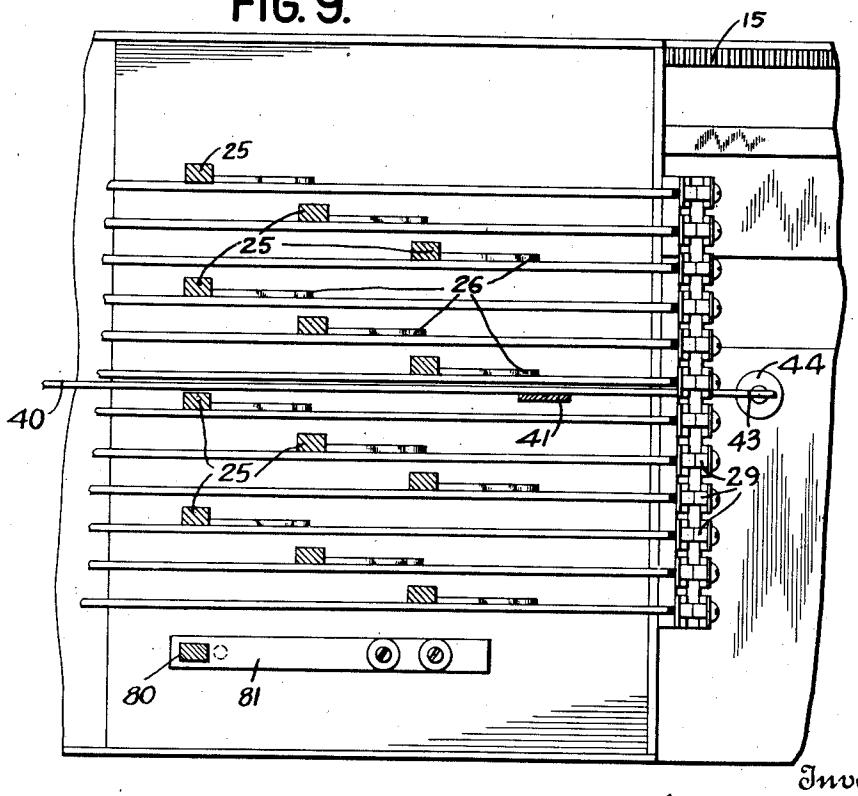


FIG. 9.



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UNITED STATES PATENT OFFICE

1,976,615

ELECTRIC VERIFYING MACHINE

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Application March 22, 1930, Serial No. 438,085

5 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. The 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 tabulated upon the card. It has therefore been found that usually 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 upon the depression of each key; but if a punch hole is incorrectly spaced in the card, the carriage does not feed forward thereby apprising the checker of the error in the card.

Heretofore in verifying machines, mechanical devices have been employed to sense the card to detect the presence or absence of a perforation. One of the objects of the present invention is to provide electrical card sensing devices for determining the correctness of the perforations in the card.

In its preferred form the invention consists of a set of independent sensing brushes adapted to make contact with a common contact roller through the perforations in the card and establish electric circuits through devices adapted to lock the machine against operation. When a card column containing a perforation is presented to the sensing brushes, a circuit will immediately be established through the locking devices. If, however, the proper or corresponding key is depressed, it will negative the effect of the locking circuit.

Where a card having multiple punching is being verified, it will be necessary to depress the several keys corresponding to the several index point positions of the multiple combination being checked.

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 construction and combination of parts hereinafter set forth and claimed.

In the drawings:

Fig. 1 is a plan view of the complete machine.

Fig. 2 is a section through the punching mechanism of the machine.

Fig. 2a is a detail view of a contact device.

Fig. 3 is a detail of the machine locking device.

Fig. 4 is a detail illustrating the manner of operating a special control contact.

Fig. 5 is a further detail of parts for operating the contact of Fig. 4.

Fig. 6 is a wiring diagram of the electric circuit of the machine.

Fig. 7 is a position view of parts shown in Fig. 2.

Fig. 8 is a section taken on line 8—8 of Fig. 2 disclosing the arrangement of the card sensing brushes.

Fig. 9 is a section taken on line 9—9 of Fig. 2.

Card feeding mechanism

In the accompanying drawings, in Figs. 1 and 2, the perforated card 10 is manually inserted between a card pusher 11 and a forward guide 12 with the first column of the card coinciding with a column of analyzing brushes 13 adapted to make contact through holes in the card with a common roller 14 insulated from the frame of the machine (see also Fig. 8). The pusher 11 and guide 12 are attached to a rack bar 15 which is suitably supported and guided by rollers 16 which cooperate with rail structure 17 integral with the frame of the machine. The rack bar 15 is normally urged to the left in Fig. 2 by a spring mechanism (not shown) and a suitable escape mechanism comprising pawls 19 and 20 cooperates with a bar 15 to permit step by step movement thereof to the left.

The normal position of the parts is as shown in Fig. 2, wherein pawl 19 engages bar 15 to hold the carriage in analyzing position. A shaft 21 when rocked in a counterclockwise direction is adapted to permit step by step advance of bar 15 in the following manner. Secured to the end

of shaft 21 is a double armed lever 22 having a pin in one arm extending into an enlarged opening in pawl 19. A second pin in the other arm fits in a slot in pawl 20. As the shaft 21 and arm 22 are rocked, the pins will cooperate with the pawls 19 and 20 which is pivoted at 20*a* to lower pawl 20 into engagement with bar 15, holding it in position while pawl 19 is raised out of cooperation with the bar. Pawl 19 is provided, as is usual with escapement mechanisms of this type, with a slot and spring which permit the pawl to advance slightly to the right so that upon return of arm 22 to its initial position the pawl 19 will engage the next succeeding tooth in bar 15. The shaft 21 has mounted thereon a bail 23 extending transversely beneath a series of interposer bars 24. Depression of any of the bars 24 will actuate the bail 23 to rock the shaft 21.

Operation of the numeral keys

In Fig. 1 the machine is shown as being provided with a plurality of keys 25, one for each of the index point positions of the well known Hollerith tabulating card. In Fig. 2 each of these keys has connection to an arm of a pivoted bell crank 26 which in turn has pin and slot connection 27 with a corresponding interposer bar 24. A spring 28 is adapted to normally maintain interposer bar 24 in its right hand position as in Fig. 2, wherein the insulated right end of each bar will maintain a related contact 29 in closed position. Depression of any key 25 is adapted through its bell crank 26 to move its corresponding interposer bar 24 to the left to open its corresponding contact 29. The forward end of each of the interposer bars 24 is cut away as at 30 and rests upon a spring pressed plunger 31 which is adapted to normally hold the forward end of the interposer in its raised position as shown. The advancement of any interposer by depression of its corresponding key moves such bar to a position as shown in dotted lines in Fig. 2. An actuating bar 32 pivoted at 33 is adapted to be rocked in a counterclockwise direction to depress such bars 24 as may have been advanced by their respective keys. Any depression of a bar 24, as we have seen, will through the bail 23 and the shaft 21, cause the operation of the escape mechanism already described to permit advance of the record card carriage rack 15. A magnet 34 is adapted upon attraction of its armature 35 to rock a bell crank 36 to which said armature has link connection. A link 37 connecting the actuating bar 32 with one arm of the bell crank 36 serves to operate said bar whenever magnet 34 is energized.

Interposer bar locking device

Each of the interposer bars 24 is provided with a recess 38, one side of which cooperates with a bail 39 pivoted at 39*a*. Depression of any of the keys, as is quite apparent, will cause rocking of the bail 39. In Fig. 2, the bail 39 is shown as having depending therefrom a pivoted hook 59 which cooperates with the lower extended blade of a contact 60 so that upon anti-clockwise rocking of the bail 39, the hook 59 will be elevated thereby to raise the lower blade of the contact 60 to close the contact. An extension 61 connected to the linkage controlled by armature 35, is adapted upon attraction of the armature by the magnet 34 to move the hook 59 to the right out of cooperation with the contact 60 to allow the contact to reopen. A spring 62 is provided, as shown, to normally hold bail 39 in its clockwise position and also to hold the free end of hook 59 in cooperation with the blade of contact 60. In Figs. 3 and 9, a bar 40 is shown as being centrally located in the machine and as being pivoted at 41. The forward or left hand end of the bar 40 is provided with a notch 42 disposed immediately above the bail 39, and the rear or right hand end of the bar has pivoted connection to a solenoid plunger 43 cooperating with a solenoid 44. A spring 45 tends to rock the bar 40 in a counterclockwise direction and deenergization of the solenoid 44 by releasing the plunger 43 will permit it to do so. Such rocking of the bar 40 will lower the notch 42 upon the bail 39 and prevent counterclockwise rotation of the bail so that whenever solenoid 44 is deenergized the consequent locking of the bail 39 due to the manner of its cooperation with the interposer bars 24 will prevent the operation of any of the keys 25 since in order to depress any key, its corresponding interposer must be free to move to the left.

Operation of the analyzing brushes

In Figs. 2 and 7, each of the analyzing brushes 13 adapted to make contact with roller 14 through a hole in the card is connected to a related spring contact plate 46 with which it makes sliding contact. In Fig. 8 a brush 13¼*a* is provided to furnish current to the common roller 14. The series of brushes 13 and brush 13*a* are adapted to bear against the contact roller 14 and are carried by an insulated brush holder 47, secured between a pair of side plates 48 of a yoke or bail-shaped member designated generally by reference numeral 49. Each side plate 48 of the yoke-shaped frame 49 is suspended or supported at its upper end by a link 50 pivoted to the frame portion 51 and at its lower end the plates 48 are supported by means of a parallel link 52.

Intermediate each plate 48 and related link 52 is a toggle plate linkage member 53 which is pivoted upon a spring stud 54 securely fastened to the frame member 51. The end of the link 52 distant from its connecting point to the toggle plate 53 is pivotally secured to an armature structure 55, the latter being pivoted at 56 to the frame member 51. The armature structure 55 is attracted against the tension of a spring 57 when a magnet 58 is energized at which time the counterclockwise rocking movement of each toggle plate 53 about its pivotal point 54 will be effective to elevate the frame 49 resulting in the contact of the individual analyzing brushes 13 with the contact roll 14. That is, energization of magnet 58 will move the parts in question from the position of Fig. 7 to that shown in Fig. 2. The purpose of thus raising and lowering the brushes 13 and 13*a* into and out of cooperation with the roller 14 is to prevent injury to the brushes due to movement of the card toward the right.

The circuit to the magnet 58 is adapted to be broken upon movement of the card carriage to the right. This is accomplished in the following manner: Pivoted to the card carriage at 63 (see Figs. 1, 4 and 5) is a handle 64 having an offset projection 65 cooperating with a rod 66 mounted in a shaft 67. Movement of the card carriage to the right through handle 64 will rock the shaft 67 through the medium of projections 65 and rod 66. The shaft 67 has depending therefrom a pin 68 which cooperates with the blade of contact 69 to open said contact whenever the carriage is moved to the right. Referring to the wiring diagram in Fig. 6, the brush magnet 58

is shown as being in series with the contact 69 so that upon opening of contact 69 the circuit through the magnet 58 will be broken and de-energization of the magnet will permit the brushes to be lowered to the position of Fig. 7.

Wiring diagram

In Fig. 6, each of the contacts 29 is shown as being connected to a brush 13 and a common bus bar 70 which is connected to one side of the circuit 71. In connection with the explanation of the wiring of the machine, the various conditions which may exist to effect the operation will now be explained.

Correct perforations

Assuming a card column about to be verified to contain a correct perforation, that is, a key which is depressed when such column is in analyzing position, corresponds with the location of the perforation in such column. Upon arrival of the column in question at the analyzing brushes, a circuit will be completed immediately from the line 71, bus bar 70, contact 29 and brush 13 of the index point position in which the perforation occurred, contact roller 14, common brush 13*a*, wire 72, resistance 73, magnet 44, relay magnet 74, back to the other side of line 75. Thus far the mere presentation of the perforation to the analyzing position will energize the magnet 44 to unlock the common bail 39 so that a key 25 may be depressed.

The energization of the relay magnet 74 is adapted to open its associated contacts 74*a* which are in series circuit with the escape magnet 34. If now the key 25 corresponding to the index point perforation which is under the brushes and which has established the circuit just described is depressed, it will cause the opening of its corresponding contact 29 at the same time rocking the bail 39 to close contact 60. The opening of the contacts 29 will interrupt the circuit through magnets 44 and 74 whereupon the relay contacts 74*a* will close to complete the circuit through escape magnet 34 from line 71, through contact 60, contact 74*a*, to the other side of line 75, and the card will be advanced to the next column.

Incorrect perforations

Where the card column to be verified contains incorrect perforations, that is, where a column should contain a single hole in a particular position and this hole is punched in another position, or more than one hole is punched in the column, the circuits involved will be as presently traced. In the case of a single hole in the wrong place, the circuit through magnets 44 and 74 will be established as in the case of a correct perforation but upon depression of a key other than the one corresponding to the perforated position, this circuit through the magnets will not be broken, and the closure of contact 60 by the depression of such key will not energize magnet 34 since the relay contacts 74*a* are still open.

Omitted perforations

Where a perforation has been omitted in a particular column, there will then, of course, be no circuit established through either of the magnets 44 and 74 so that depression of any of the keys 25 is prevented due to the locking of the bail 39 as effected by the bar 40. In order to advance the card from the verifying position a special key 80 (Figs. 1 and 9) is provided which upon depression will close a contact 81 to short circuit contacts 60 and 74*a*, and energize magnet 34.

Skipping columns

Key 80 may be depressed to pass over columns of the card in which no verification is to be made as in the case of blank columns or columns which have been perforated in gang punching machines and are conceded as being correct. In such columns the operation of key 80 will cause step by step advance of the card upon repeated depressions.

Combination hole perforations

Where a column of the card contains multiple punching, as in cases where code is used, the magnets 44 and 74 will be energized as before to unlock bar 40 and open relay contacts 74*a*. In order, however, to complete the circuit through magnet 34, the various keys 25 which correspond to the index point positions involved in the multiple punching must be depressed to break the various circuits through contacts 29 which supply energy to magnets 44 and 74. Where the keys which are depressed correspond to the punch positions contact 74*a* will close and the card carriage will advance one step.

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:

1. In a machine of the class described, means for sensing perforations in index-point positions of a column of a record card, manually operable devices, one for each index-point position, means normally locking said devices against operation and means controlled by said sensing means upon sensing a perforation in any index-point position for causing said locking means to unlock said devices.

2. In a machine of the class described, in combination, a card carrier adapted to receive a punched card; an escapement to control the movement of the card carrier, a magnet to operate the escapement, a series of verifying brushes disposed adjacent to the card; a circuit for energizing said magnet, means for interrupting said circuit upon registration of a hole in the card with a verifying brush, a series of keys corresponding to the series of brushes and means operable upon depression of the key corresponding to the hole in the card to reclose said circuit.

3. In a machine of the class described, in combination, a card carrier adapted to receive a punched record card, an escapement mechanism to control the movement of the card carrier; a series of verifying brushes, disposed adjacent to the card; a series of keys; means including a movable bail controlled by the keys and having operating connections with the escapement mechanism to operate the same upon operation of one of said keys, means controlled by said verifying brushes for locking said keys against operation when an unperforated column of the card is presented to the verifying brushes whereby said bail is prevented from operating said escapement mechanism.

4. In a machine of the class described, a card carrier adapted to receive a perforated record

card, a plurality of sensing means for analyzing said card, means for advancing the card carrier, a plurality of manually operable devices corresponding to said sensing means, means for normally locking said devices against operation, means controlled by said sensing means for causing said locking means to unlock all of said devices upon the presentation of a perforation to said sensing means and further means controlled by said sensing means for preventing the operation of said advancing means when the manually operable device operated does not correspond to the controlling sensing means.

5. In a machine of the class described, a card carrier adapted to receive a perforated record card having index point positions, means for advancing the same, a plurality of card sensing devices, one for each index point position of the card, a plurality of keys corresponding thereto, means for normally locking said keys against operation; means controlled by said sensing means for causing said locking means to unlock said keys upon presentation of a perforation to any of said sensing means, and further means controlled by said sensing means for preventing the operation of said advancing means when the keys depressed do not correspond in number and position to the sensing means cooperating with the presented perforations in said card.

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