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 [21] Appl. No. **614,865**
 [22] Filed **Feb. 9, 1967**
 [45] Patented **Jan. 5, 1971**
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[54] **DATA COLLECTION STATION AND STATIC CARD READER THEREFOR**
14 Claims, 16 Drawing Figs.

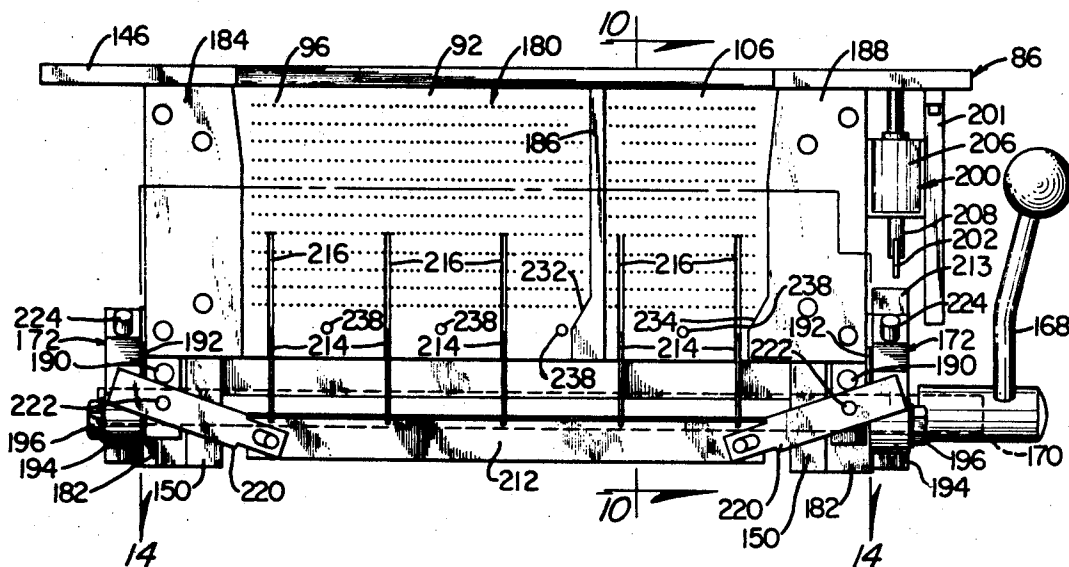
[52] U.S. Cl. **235/61.11,**
200/46
 [51] Int. Cl. **G06k 7/04,**
H01h 43/08
 [50] Field of Search **235/61.11,**
61.111, 61.112, 61.113; 200/46; 197/181.1

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ABSTRACT: A static card reader comprising a card receiving chamber having spaced-apart, generally parallel inner and outer walls, a switching chamber including a plurality of circuit portions, a first printed circuit board, and other printed circuit boards, means for moving said chambers relative to each other from a card inserting position to a card reading position, said means being disposed in a position not to preclude visual observation of the card to the outer wall of said card chamber, and card ejection means operated in response to the return of the chambers to the card inserting position, said ejection means being engageable with the lower edge of the card for elevating it in said card chamber to a position in which it may be manually removed from same. Each circuit portion contained within the switching chamber has a first part disposed upon said first printed circuit board and a second part disposed upon one of the other printed circuit boards. Each second part of each circuit portion includes a switching contact biased to a normally closed position with a corresponding first part of said circuit portion. Each switch actuator has a corresponding switching contact, both of which are formed from a single piece of electrically conducting material. Each switch actuator is adapted to move through corresponding apertures in a punched card or to be precluded from moving through the punched card when engageable with a nonperforated portion of same. Each switching contact, upon being brought into engagement with a corresponding first part of said circuit portion, is constructed for movement across said corresponding first part of said circuit portion thereby effecting a wiping action thereacross to facilitate maintaining good electrical contact between said first and second circuit portions.



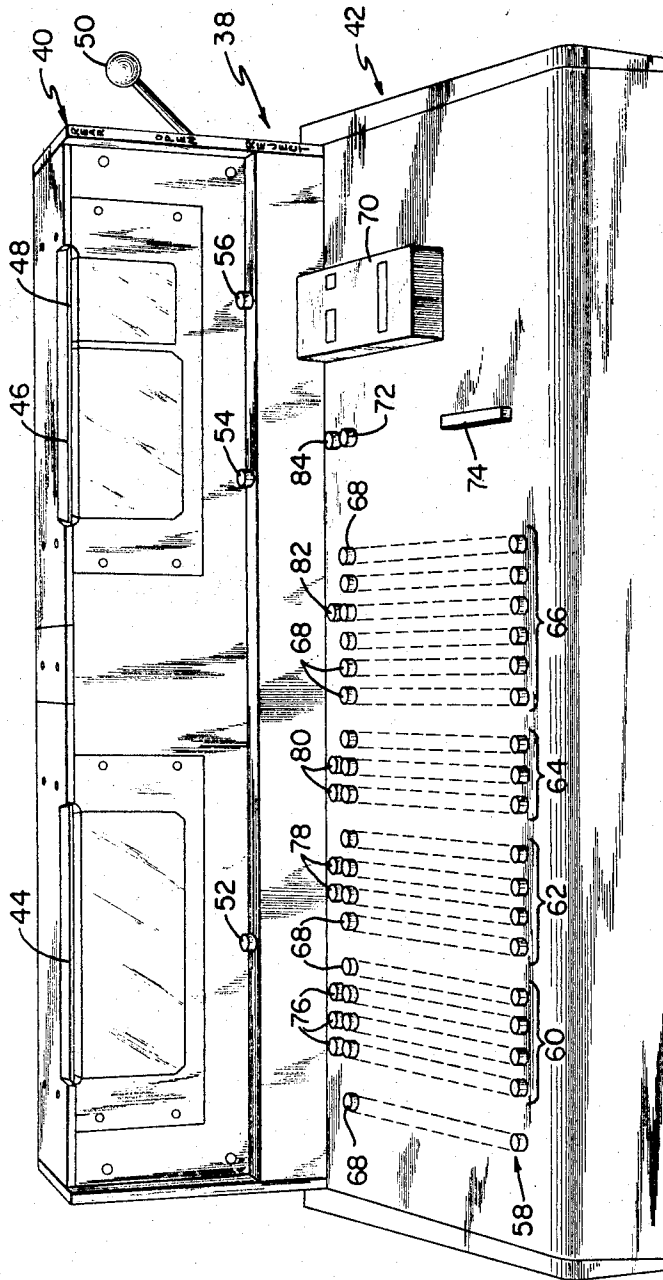


Fig. 2

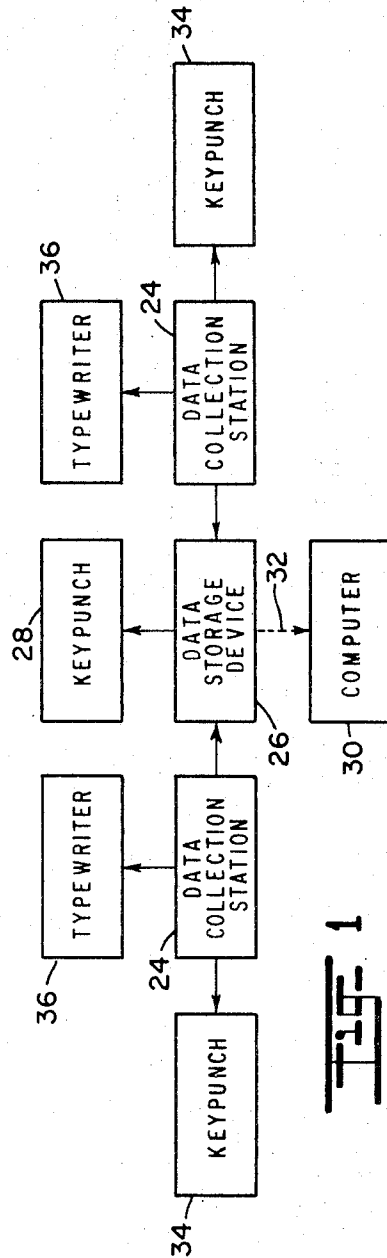
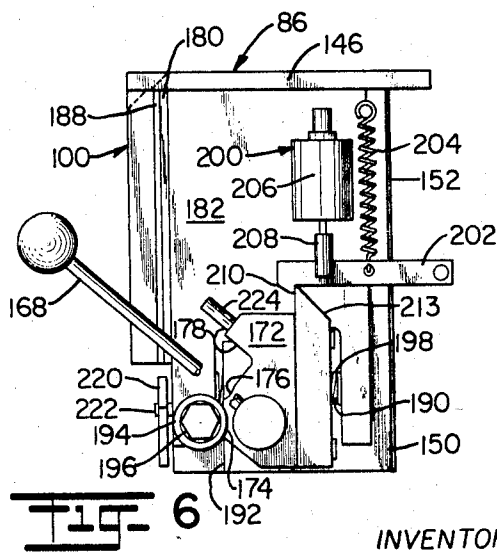
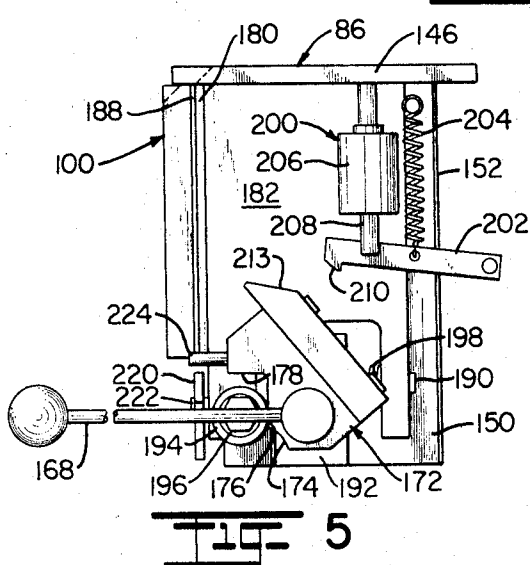
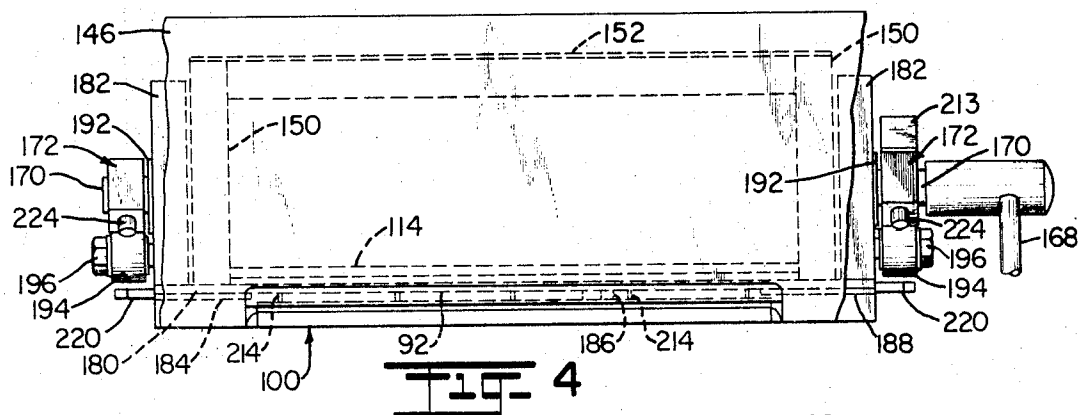
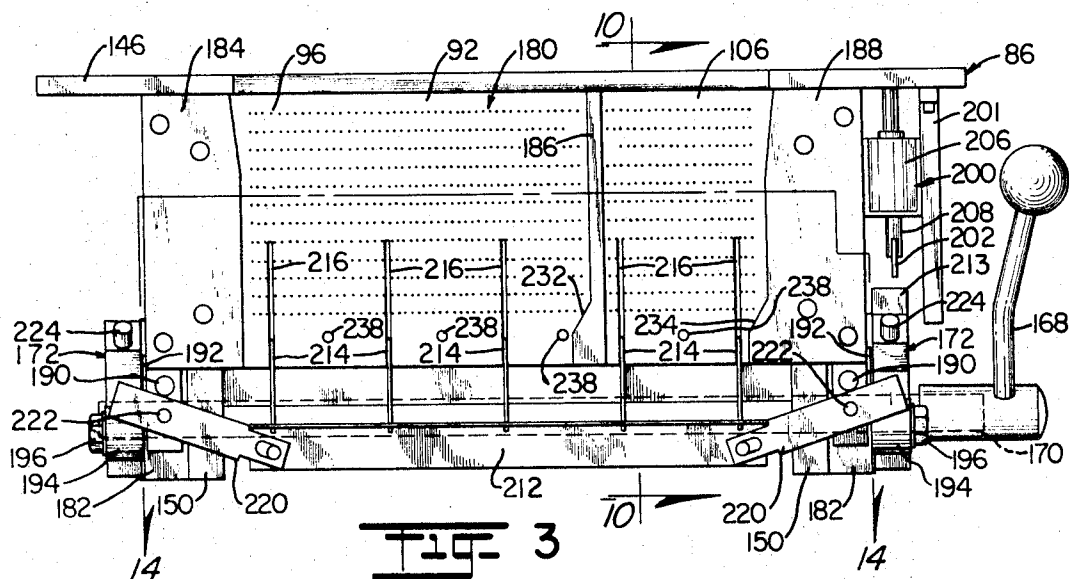
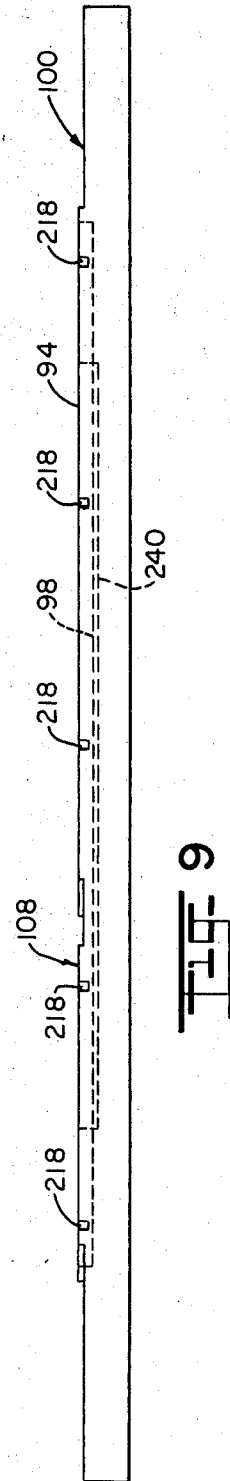
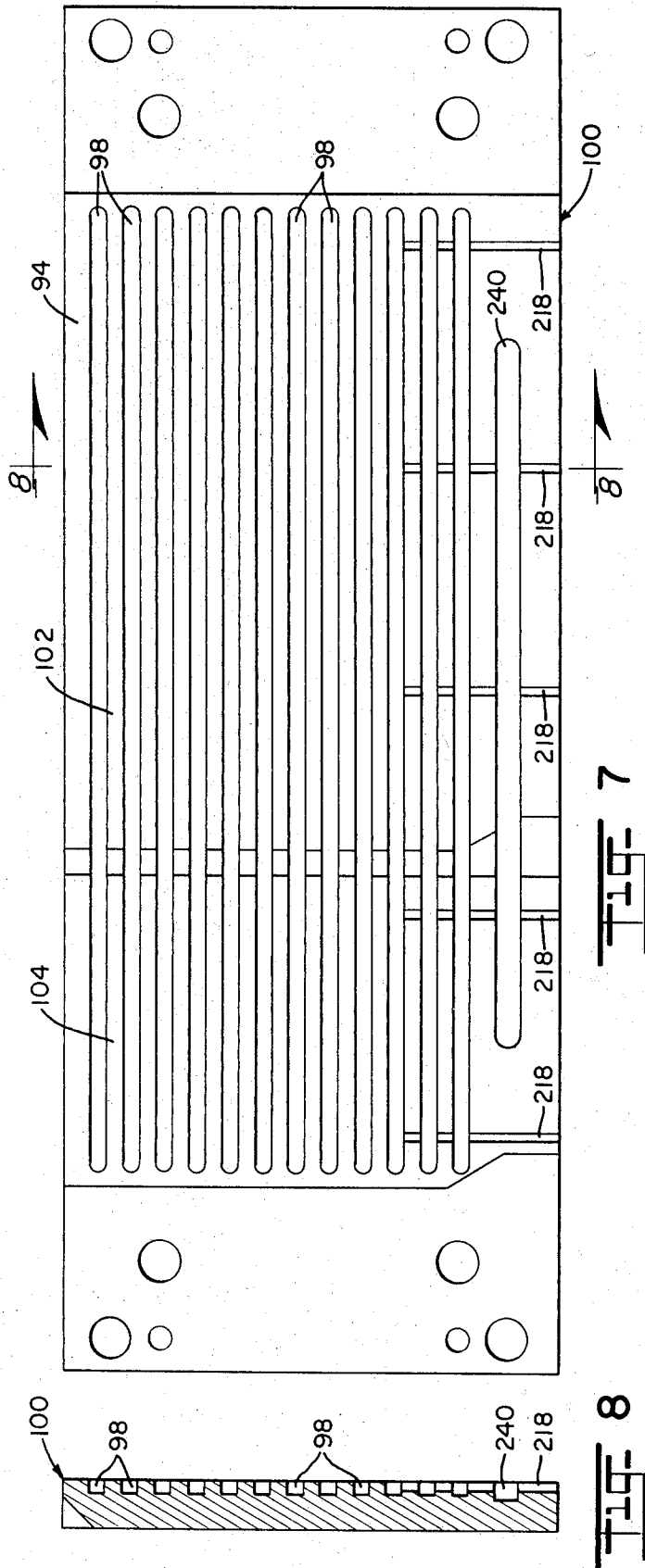


Fig. 1

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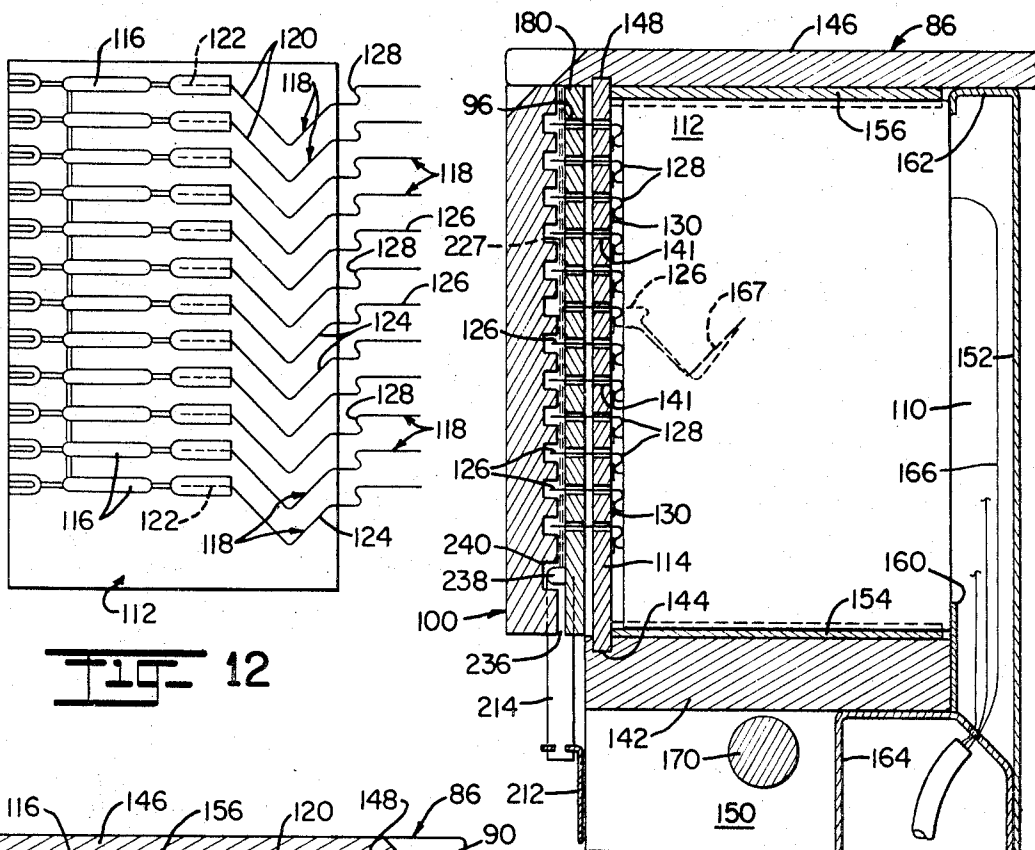


FIG. 12

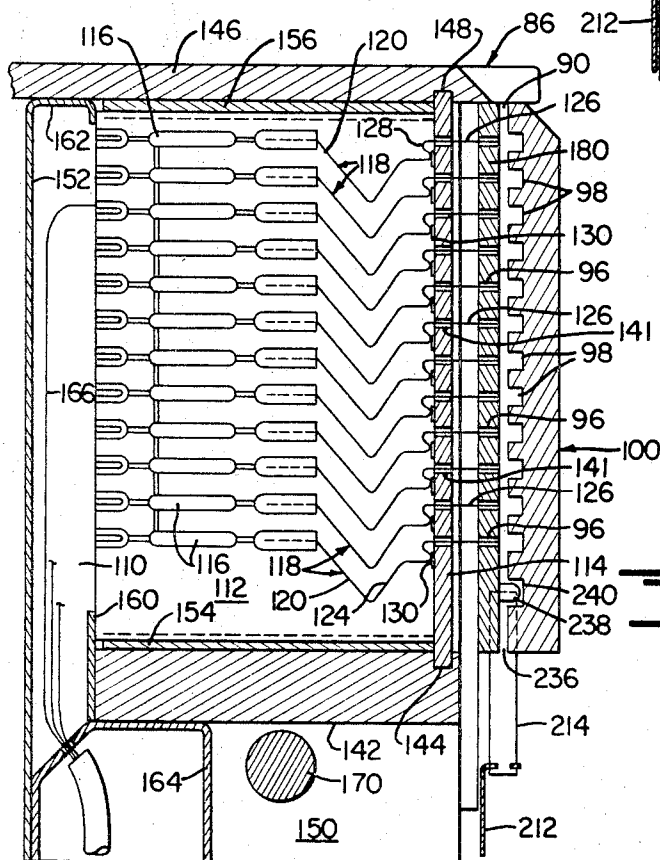


FIG. 10

FIG. 11

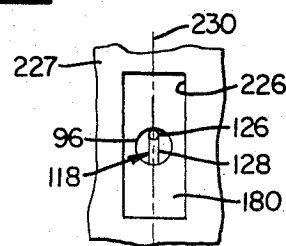
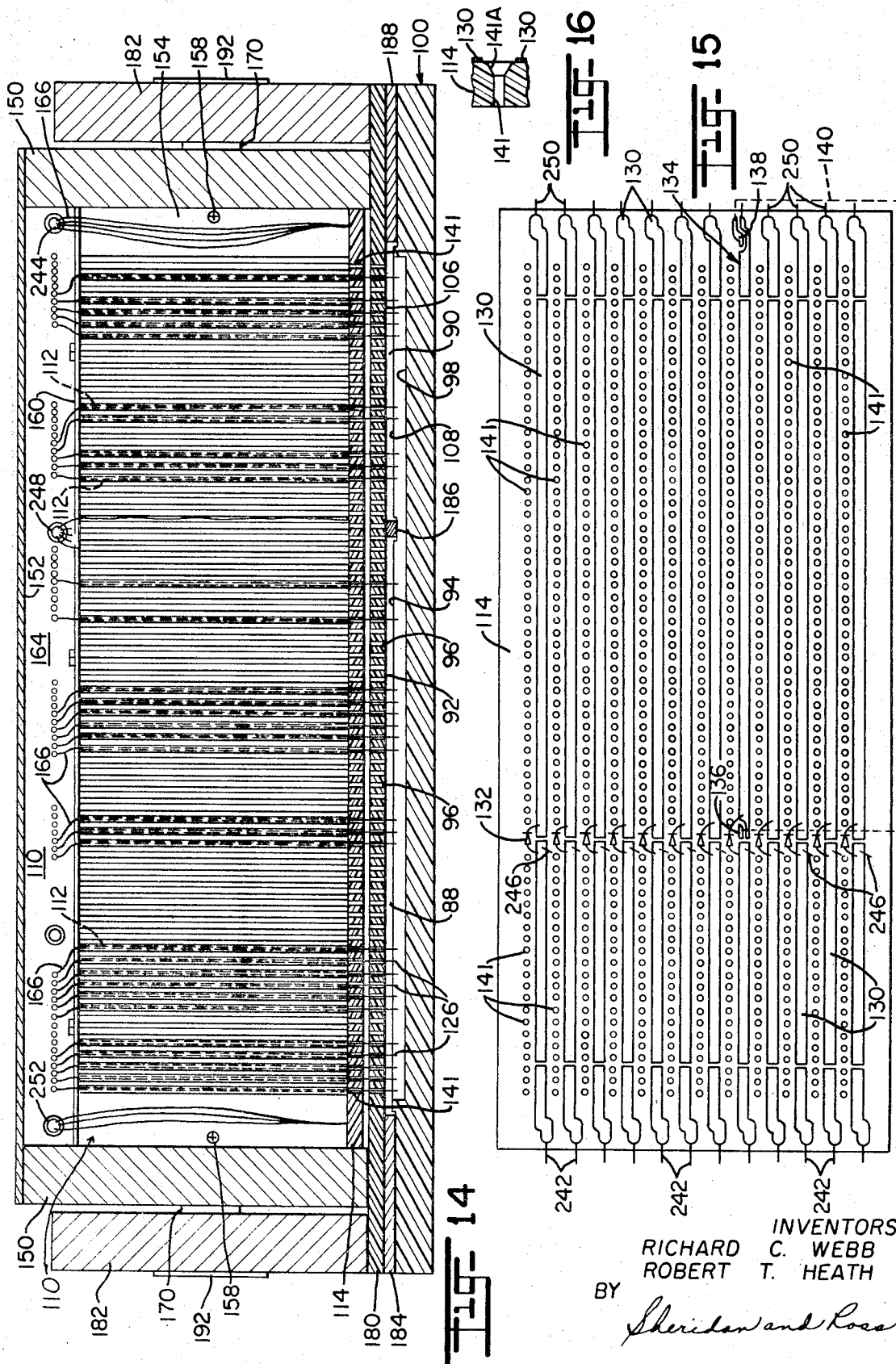


FIG. 13

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DATA COLLECTION STATION AND STATIC CARD READER THEREFOR

Heretofore, many data handling and storage systems have been proposed and used. A feature of all such systems is that same require the input of additional information from time to time. This particular operation requires the collection of the information and data which is to be supplied, the translation of such data and information into an acceptable input condition, and the use of skilled personnel for performing all of the foregoing. In addition, in order to accomplish the foregoing, many times a duplication of effort was involved since other personnel within various organizations, usually managers and supervisors, had to have access to the same information at the same time or prior to the time that same was supplied to the data handling system. Such duplication of effort involved an unnecessary expenditure in time and money; however, the failure to duplicate such effort meant that certain decision making personnel within an organization were forced to wait additional periods of time before they could obtain the pertinent and necessary information required for them to make timely and intelligent decisions. An additional disadvantage encountered by prior art data handling and storage systems arose from the fact that the data collection station included within such systems could not be operated under environmental conditions such as those found in shop areas or manufacturing areas due to the high risk of down time occurring from dirt, grease and foreign particles encountered in such environments. A further drawback inherent within prior art data handling and storage systems which included a static card reader was attributable to the unavailability of reliable, commercially feasible switching contact elements which permitted the movement of a perforated item, card or the like into contacting engagement with the actuating portion of the switch contact for reading on one side of the card; rather, the actuating portions of the switch contacts were moved into contacting engagement with the surface of the perforated item, card or the like for reading through the card.

It has been found, however, that each of the foregoing disadvantages may be completely overcome through the use of a novel data collection station and static card reader therefor and uniquely formed conductor element which comprises a part of a circuit switch means. The data collection station of this invention, and the static card reader therefor and the unique conductor element used therein, facilitate the supplying of information and data to a data storage system and/or a computer system in an extremely short period of time by workmen, laborers, and the like. Further, such personnel can be trained to operate the data collection station of the herein invention quickly and accurately after only a few minutes of instruction. Additionally, the tedious but exacting portion of the work heretofore involved in supplying necessary information to a data storage system has been eliminated through the use of the data collection station described herein wherein one or more perforated items, cards or the like are inserted in a self-cleaning chamber means contained within the static card reader of the herein invention in a manner which not only permits visual examination of at least a portion of the perforated item or card, said item or card having encoded thereon the fixed-type data needed for each input of information and data into the data collection station, but also permits the item or card to be moved into contact with the switch contacts. Moreover, the data collection station and static card reader of the subject invention may be utilized at remote locations from the data storage device under environmental conditions heretofore considered generally unacceptable for operating a data collection station. Additionally, the apparatus of the herein invention functions essentially maintenance free under such adverse environmental conditions even though the perforated item, card or the like used with the static card reader described herein has become contaminated with dirt, grease or foreign particles. Further, the maintenance problems formerly associated with prior art static card readers has been greatly reduced by eliminating the number of moving parts

contained therein. The latter has been accomplished by moving the perforated item, card or the like within a chamber means incorporated within the static card reader into contacting engagement with the actuating portions of the switch contacts rather than the converse.

One of the principal objects of this invention is to provide an improved data collection station.

Another object of this invention is to provide an improved static card reader.

Another object of this invention is to provide an uniquely formed conducting element for use in a circuit switch means.

Another object of this invention is to provide a data collection station for receiving fixed-type data from one or more perforated items or cards and variable-type data from a data-entry device having a keyboard.

Another object of this invention is to provide a data collection station which may be quickly and accurately operated by nonsupervisory personnel in shops, manufacturing and like areas without the necessity of requiring such personnel to take an involved and lengthy training period.

Another object of this invention is to provide a data handling system comprising a data storage device in combination with a plurality of remotely located data collection stations.

Another object of this invention is to provide a data collection station which may be operated under environmental conditions encountered in shops, manufacturing areas and the like.

Another object of this invention is to provide a data collection station for receiving fixed-type and variable-type data, said station comprising in combination a static card reader constructed to receive fixed-type data from one or more perforated items or cards, and a keyboard-actuating, data-entry device having a keyboard and constructed to receive variable-type data upon actuation of one or more of the keys contained in said keyboard; said static card reader being electrically connected to the said data-entry device; said static card reader including means responsive to the fixed-type data stored on one or more perforated items or cards to be used with said static card reader to indicate generally the variable-type data which must be fed into the data-entry device; said station including means to prevent transmission of data to a data storage device until all necessary variable-type data has been fed into said data-entry device.

Another object of this invention is to provide a static card reader including self-cleaning chamber means for visually displaying one or more perforated items, cards or the like; a switching chamber which is substantially isolated from contaminating particles which may adhere to a perforated item, card or the like disposed within said chamber means; a plurality of switch contacts disposed within said chamber and having actuating means extending outwardly therefrom, and means for moving a perforated item, card or the like disposed within said chamber means into coacting engagement with one or more actuating elements of said switch contacts to activate said switch contacts.

Another object of this invention is to provide static card reader including a plurality of movably mounted switch contacts each of which contains an actuating portion, and means for moving a perforated item, card or the like into contact with one or more of the actuating portions of said switch contacts to activate said switch contacts.

Another object of this invention is to provide a static card reader constructed to receive one or more perforated items, cards or the like and including means for detecting a predetermined orientation of at least one of the perforated items, cards or the like when same is being inserted within said static card reader.

Another object of this invention is to provide a static card reader constructed for use with one or more perforated items, cards or the like and including a separate chamber for each of said perforated items, cards or the like, each of said chambers including a notch-type portion, said notch-type portion being generally complementary to a similar notch-type portion

formed on the perforated item, card or the like to be disposed within said chamber.

Another object of this invention is to provide a static card reader including a plurality of circuit portions, each circuit portion including a switch contact biased in a predetermined manner, a part of each of said switch contacts being movably mounted with respect to a part of a corresponding circuit portion, each switch contact including an integrally formed, elongated conductor element comprising a pair of diverging members one of which is biased toward the other, an anchor portion securely mounted with respect to the remaining part of said movably mounted switch contact portion and integrally connected to one of said members, an actuating portion, said actuating portion and said anchor portion being disposed generally colinearly with respect to each other, and an S-shaped contact portion disposed intermediate the other one of said members and one end of said actuating portion, said diverging members, anchor portion, actuating portion, and S-shaped contact portion being disposed generally coplanarly with each other.

Another object of this invention is to provide a static card reader comprising means for receiving a perforated item, said means including a vertically disposed item chamber, having a pair of opposed wall surfaces, one of said surfaces having a plurality of apertures formed therein and the other of said surfaces having a plurality of recesses formed therein, each aperture formed in one of said recesses having a corresponding recess formed in the other of said surfaces, one of said wall surfaces being formed to permit visual display of at least a portion of one face of an item to be disposed within said item chamber; a switching chamber, said switching chamber substantially isolated from contaminating particles which may adhere to an item to be disposed within said item chamber or which may otherwise become disposed within said item chamber; a plurality of circuit portions disposed within said switching chamber, each circuit portion including a switch contact having a portion thereof biased in a predetermined manner, a part of each of said switch contacts being movably mounted with respect to a part of a corresponding circuit portion, each switch contact having an actuating portion disposed within a corresponding aperture formed in one of said wall surfaces; means for moving said item chamber toward and away from an item receiving position whereby said apertured wall surface moves relative to said actuating portions of said switch contacts; means for maintaining said item chamber in said item reading position for a predetermined interval of time; and means for effecting elevation of a perforated item to be disposed within said item chamber when said item chamber has been moved away from said item reading position.

Another object of this invention is to provide a conductor element for use in a circuit switch means, said element comprising a first portion including an anchor portion, a second portion biased, in its mounted condition, toward said first portion and including an actuating portion and an S-shaped contact portion, said S-shaped contact portion being mounted for movement relative to said anchor portion, said anchor portion and said actuating portions being generally colinearly disposed, each of said portions being generally coplanarly disposed with respect to the other of said portions.

Another object of this invention is to provide an integrally formed, elongated conductor element for use in a circuit switch means, said element comprising a pair of diverging members one of which, in its mounted condition, is biased toward the other, an anchor portion integrally connected to one of said members, an S-shaped contact portion integrally connected to the other of said diverging members, an actuating portion integrally connected to said S-shaped contact portion, said S-shaped contact portion being disposed for movement relative to said anchor portion, said anchor portion and said actuating portion being generally colinearly disposed, each of said portions being generally coplanarly disposed with respect to the other of said portions.

The foregoing and other objects and advantages will become more apparent from the specification and the accompanying drawings in which:

FIG. 1 is a block diagram of a data handling and storage system incorporating a data collection station constructed in accordance with the subject invention;

FIG. 2 is a perspective view of a data collection station showing one embodiment of a static card reader constructed in accordance with the subject invention;

FIG. 3 is a front elevational view of another embodiment of a static card reader constructed in accordance with the subject invention with the front wall of the vertically disposed card chamber being omitted therefrom;

FIG. 4 is a plan view of the static card reader shown in FIG. 3, including the front wall which was omitted from FIG. 3, with the top plate thereof partially cutaway and with the solenoid locking means being omitted therefrom;

FIG. 5 is a right end elevation of the static card reader shown in FIG. 3 with the plate upon which the solenoid is mounted being omitted therefrom and showing the lever operated cam system in the open or perforated card receiving position;

FIG. 6 is a view similar to FIG. 5 showing the lever operated cam system in the perforated card reading position;

FIG. 7 is a rear elevational view of the front wall or pressure plate of the card chambers for the card reader shown in FIGS. 3 and 4;

FIG. 8 is a cross-sectional view taken along line 8-8 of FIG. 7;

FIG. 9 is a bottom plan view of the front wall or pressure plate shown in FIG. 7;

FIG. 10 is an elevational view, in cross section, taken along line 10-10 in FIG. 3 showing the card chamber in the open position;

FIG. 11 is a view similar to that shown in FIG. 10 taken in the opposite direction showing a perforated card mounted in the card chamber and the card chamber positioned in the card reading position;

FIG. 12 is an elevational view of a printed circuit card containing a plurality of integrally formed, elongated conductor elements;

FIG. 13 is a view through one of the rectangularly shaped slots formed in a perforated item or card looking toward the actuating portion of one of the integrally formed, elongated conductor element;

FIG. 14 is a cross-sectional view taken along line 14-14 in FIG. 3;

FIG. 15 is an elevational view of the contact board mounted within the switching chamber of the static card reader constructed in accordance with the subject invention and showing, in broken lines, a portion of the circuit used to detect a predetermined orientation of one of the perforated cards disposed within one of the card chambers; and

FIG. 16 is an enlarged view, in cross section, of one of the apertures formed in the contact plate shown in FIG. 15.

Referring now to the drawings, in FIG. 1 is shown a data handling and storage system comprising a pair of data collection stations 24 each of which are electrically connected to a data storage device 26 such as a multiplexer station. It is to be understood that such a multiplexer station is capable of handling up to 30 data collection stations. The multiplexer station 26 is preferably electrically connected to a key punch station 28. The information and data fed into the multiplexer station 26 is preferably ultimately supplied to a computer 30. It will be understood that the multiplexer station 26 is not necessarily directly connected to the computer 30 and thus the connection is shown by the broken line arrow indicated by numeral 32. If desired or required, each data collection station 24 may also be electrically connected to a suitable monitoring means stationed adjacent the data collection station 24 such as a key punch device 34 and/or a driven typewriter 36.

In FIG. 2 is shown one embodiment of a data collection station constructed in accordance with the subject invention.

The data collection station 38 shown in FIG. 2 comprises a static card reader 40 electrically connected to a data-entry device 42. The data collection station 38 shown in FIG. 2 is connected to a source of power (not shown) and may also be connected to a key punch device (not shown) and/or a driven typewriter (not shown) through suitable electrical connections (not shown).

The static card reader 40 shown in FIG. 2 includes three vertically disposed perforated item or card receiving chambers 44, 46 and 48, a lever 50 for actuating a cam system (not shown) and three indicator or signal lights 52, 54 and 56. Each of the signal lights, 52, 54 and 56 are connected to suitable circuits (not shown) and to means (not shown) associated with a corresponding one of the chambers 44, 46 and 48, said means having for its purpose to detect the presence and proper orientation of a perforated item or card within said chamber. In addition, each of the signal lights 52, 54 and 56 are also electrically interconnected to one of the nine keys contained in column 58 on the keyboard. Thus, the indicating or signal lights 52, 54 and 56 will light up whenever there is an unsatisfied logic condition with respect to the nonexistence or improper positioning of a perforated item or card within the light's respective card chamber or with respect to the perforated item or card within its respective card chamber and the transaction code indicated by punching or actuating one of the keys contained in column 58, each of the keys contained in column 58 representing a predetermined transaction code for the data collection station 38.

The data-entry system 42, which is a keyboard-actuated device, comprises a plurality of key columns segregated into four groups of 60, 62, 64 and 66 in addition to a group indicated previously as column 58. Each of the columns in each of the groups contains a "skip" key 68. Actuation of any of the skip keys 68 means that no data will be fed into the data-entry device 42 in that particular column. The data-entry device 42 also contains a time mechanism 70 which, in essence, is an industrial clock. The data-entry device 42 also includes a signal light 72 which is sometimes designated as an "OK" light and a "RECORD" or transmission bar 74. The signal light 72 is associated with the keyboard lockout logic hereinafter described and must be lit up before the data-entry device will accept an entry for transmission and recording. In the event that the signal light 72 fails to light up, one or more of the keys 76, 78, 80 and 82, said keys being associated, respectively, with one or more columns in each of the groups 60, 62, 64 and 66, will be lit up to indicate the need for entry of data in the particular column. Thus, the failure of the signal lamp 72 to light up constitutes a reminder to the user that additional input must be fed into the data-entry device 42 before any data can be transmitted to the data storage device. The data-entry device 42 also includes a signal light 84 which, upon attempting to transmit data to the data-storage device, will light up if the data storage device cannot receive such data and will remain lit up until the data has been transmitted.

In FIGS. 3-16, is shown another embodiment of a static card reader 86 constructed in accordance with the subject invention. The static card reader 86 comprises means for receiving a plurality of perforated cards, said means including a plurality of vertically disposed card chambers 88 and 90, see FIG. 14. Card chamber 88 has a pair of opposed wall surfaces 92 and 94, see FIGS. 3, 4, 7 and 9. One of the wall surfaces, such as surface 92, has a plurality of apertures 96 formed therein. Said apertures 96 comprise a plurality of rows and columns. Said apertures 96 correspond with the information bits that may be encoded upon a typical business machine card. The other one of said wall surfaces, surface 94, has a plurality of recesses 98 formed therein, said recesses being represented by a plurality of grooves, see FIG. 7. Each aperture 96 which is formed in the wall surface 92 has a corresponding recess 98 formed in the wall surface 94. The purpose for this will be hereinafter described. Wall surface 94 is formed on the member 100 which serves as the front wall or pressure plate for the card chambers 88 and 90. Portions 102 and 104 of

member 100 are formed from a transparent material thereby permitting visual display and examination of a perforated item, card or the like which may be disposed within the card chambers 88 and 90.

Card chamber 90 is somewhat similar in form to card chamber 88 in that card chamber 90 likewise has a pair of opposed wall surfaces 106 and 108 which are formed similar to wall surfaces 92 and 94. More specifically, wall surface 106 has a plurality of apertures formed therein and wall surface 108 has a plurality of recesses formed therein.

The static card reader 86 also includes a switching chamber 110 which is substantially isolated from contaminating particles which may adhere to perforated items, cards or the like which are to be disposed within said chambers 88 and 90 or which may otherwise become disposed within said chambers. Within switching chamber 110 are disposed a plurality of circuit portions. Each of these circuit portions has a part formed on a printed circuit board such as printed circuit board 112 and another part thereof formed on another printed circuit board such as contact board 114. Each of these boards 112 and 114 are vertically disposed within said switching chamber 110. Further, printed circuit board 112 is disposed perpendicular to contact board 114. Printed circuit board 112 has a plurality of circuit parts as aforesaid such as parts 116. Each of said circuit parts 116 also includes a conductor element 118. Each conductor element 118 comprises a first portion 120 including an anchor portion 122, see FIG. 12, a second portion 124, said second portion being biased, in its mounted position, toward said first portion 120, said second portion 124 including an actuating portion 126 and an S-shaped contact portion 128. Said S-shaped contact portion 128 is mounted for movement relative to said anchor portion 122. Anchor portion 122 and actuating portion 126 are disposed generally colinearly. Each of the portions of said conductor element 118 are disposed generally coplanarly with respect to the other of said portions. The purpose for these features will be later described.

As previously stated, the contact board 114 also contains a plurality of circuit parts. As shown in FIG. 15, the circuit parts comprise a plurality of strips 130 of conducting material which are formed upon said contact board 114. It will be noted that each strip 130 on contact board 114 is divided into four separate parts. The purpose for these various parts is to provide card orientation and data identification logic control. Two of such parts are electrically connected through the use of a diode 132, see FIG. 15. One of the strips 130, such as strip 134, has two parts in addition to the four aforementioned parts. These two parts, designated by numerals 136 and 138 are electrically connected by an external circuit indicated by broken line 140. The purpose of these two parts 136 and 138 and circuit 140 is to provide a means for determining whether or not a perforated item, card or the like is properly oriented within the card chamber, i.e. to make sure that same is not slightly askew. Contact board 114 also contains a plurality of openings 141 in which is or may be disposed the actuating portion 126 of conductor element 118, see also FIG. 16.

The switching chamber 110 is encompassed by a base plate 142 having a longitudinally extending groove 144 running substantially parallel adjacent the top front edge thereof, a top plate 146 which also has a longitudinally extending groove 148 formed adjacent the front lower edge thereof and extending generally parallel therewith, a pair of end members 150, a rear dust cover 152, and said contact board 114. The contact board 114 is disposed between the groove 144 formed in the base plate 142 and the groove 148 formed in the top plate 146 and is positioned between end members 150. A pair of guide plates 154 and 156 are used to maintain the printed circuit boards 112 within its switching chamber 110. Guide plate 154 is mounted upon the upper surface of the base plate 142 and secured thereto by suitable means such as a pair of screws 158. Guide plate 156 is mounted upon the lower surface of the top plate 146 and secured thereto in much the same manner as guide plate 154 is secured to the base plate 142. As shown in

FIG. 14, the upper surface of guide plate 154 has a plurality of parallel grooves or slots formed in a substantial part thereof. The lower surface of guide plate 156 is similarly formed.

The grooves or slots on said guide plates cooperate to provide a support and positioning means for each of the printed circuit boards 112 disposed within the switching chamber 110. A retainer plate 160 and a flange portion 162 formed on the upper part of the dust cover 152 cooperate to hold each of the printed circuit boards 112 in firm abutting engagement against the contact board 114. Mounted beneath the base plate 142 and at the rear thereof is a wire manifold 164. The wire manifold 164 serves not only as a housing for the various electrical wires which are positioned thereunder, but also serves as a coded means for the various wires 166 which extend upwardly therethrough, see FIG. 14.

As previously indicated, the switching chamber 110 contains a plurality of circuit portions. Each circuit portion includes a switch contact which is biased in a predetermined manner such as to a normally closed position. More specifically, the switch contact includes that portion of the S-shaped contact portion which is or may be disposed in contacting engagement with one of the strips 130 formed on the contact board 114. Actuation or opening of the switch contact occurs when the actuating portion 126 of the conductor element 118 is moved under the influence of an unperforated portion of a card or the like which is disposed within one of the chambers. Movement of the actuating portion 126, see FIG. 11, results in the S-shaped contact portion moving out of contact with the strip 130 formed on the contact board. The broken line 167 indicates the position occupied by the movable portion of the conductor element 118 in its normally closed condition. It has been found that the S-shaped contact portion undergoes a small amount of clockwise movement, as viewed in FIG. 11, when the actuating portion 126 is depressed by the card. This movement is important since it results in a wiping action against the strip 130. Such wiping action provides a self-cleaning effect, an important feature to the operation of a device of this kind. Opening of this particular circuit is used to indicate the existence of a predetermined bit of information.

The static card reader 86 also includes means for moving simultaneously perforated items, cards or the like which are disposed within the card chambers 88 and 90 toward and away from a card reading position. Such means includes a lever actuated cam system as shown in FIGS. 3-6. The cam system includes a lever 168 which is securely mounted to a shaft 170. The shaft 170 extends through a pair of cam members 172, both end members 150 and beneath the base plate 142. The end members 150 are disposed intermediate the cam members 172. Each of the cam members 172 has cam surfaces 174, 176 and 178. Each of the cam surfaces 172 is keyed to the shaft 170 and, thus rotates with said shaft 170.

The chambers 88 and 90 are formed as pockets between the opposed wall surfaces of member 100 and member 180, member 180 having wall surface 92 formed thereon. Members 100 and 180 are securely mounted to each other and to a pair of end or slide members 182. Spacer or mask members 184, 186 and 188 are disposed intermediate members 180 and 100 and cooperate to provide the pockets forming the chambers 88 and 90. The end or slide members 182 are mounted for sliding movement upon a shaft 190 which is horizontally disposed within a spacer block 192 that is secured to the outer surface of each of the end members 150 and disposed intermediate each cam member 172 and its adjacent end member 150. The shaft 170 to which the cam member is keyed or splined also passes through each spacer block 192. It will be understood that each end or slide member 182 has a generally inverted U-shaped opening formed in the lower surface thereof to permit the lower part of said slide member 182 to encompass partially its corresponding spacer block 192. Mounted upon each end or slide member 182 and adjacent the lower forward corner thereof and extending laterally outwardly therefrom is a roller member 194 that is, in turn, mounted upon a shaft 196. A spring 198 is disposed inter-

mediate the lower, rear portion of the end or slide member 182 and the adjacent spacer block 192. The spring 198, as disposed and shown in FIGS. 5 and 6, biases the end or slide member 182 to a rearward position. In other words, any perforated items or cards which are disposed within the chambers 88 and 90 would be biased toward a card reading position. This biasing influence is, however, neutralized when cam surface 176 is disposed in contacting engagement with the surface of roller 194. Nevertheless, upon moving the lever 168 upwardly, this biasing influence is felt as soon as the neutral point between cam surfaces 176 and 174 is passed thereby providing a positive force to urge the static card reader into a card reading position.

The static card reader 86 also includes means 200 for maintaining the static card reader 86 in a card reading position. Means 200 is mounted on depending plate 201, see FIG. 3. Means 200 includes a solenoid actuated, pivotally mounted member 202. Member 202 is biased toward the unlocked position by spring 204. When the chambers 88 and 90 are placed in the card reading position and cards are suitably disposed therein, a circuit (not shown) is actuated which causes solenoid 206 to become energized. When solenoid 206 is energized, the movable core member 208 thereof, said core member being attached to said pivotally mounted member 202, is moved downwardly thereby causing member 202 to pivot counterclockwise, as viewed in FIGS. 5 and 6. When cam member 172 is disposed in the position associated with the card reading position and solenoid 206 is actuated, a hook portion 210 formed on the end of member 202 engages a surface portion 213 of cam member 172 thereby securing cam member 172 and chambers 88 and 90 in a predetermined position. By suitable circuit means, the solenoid actuated member 202 locks the cam member 172 in the card reading position until the data has been transmitted to the data storage device.

Static card reader 86 also includes means for effecting elevation of perforated items, card or the like to be disposed within said chambers 88 and 90 when said chambers have been moved away from said reading position. Such means includes an ejector bar 212, see FIG. 3, said ejector bar having a plurality of upwardly extending links 214. Each of the links 214 are limited to vertical translation within grooves or slots 216 or 218 formed, respectively, in wall surfaces 92 and 94. The links 214 are, however, mounted for lateral translation relative to the ejector bar 212 and, preferably, also for pivotal movement with respect thereto. Ejector bar 212 is pin mounted at each end thereof to support members 220. Each of said support members 220 are mounted upon a horizontally disposed shaft or pin 222 which extends forwardly from the lower part of each end or slide member 182. The support members 220 are actuated for pivotal movement by a pin or projecting surface 224 formed on each of the cam members 172. Actuation of the support members 220 is effected by rotating the lever 168 in a counterclockwise direction, as viewed in FIGS. 5 and 6, until the pins 224 of the cam members 172 cause pivotal movement of each of the support members 220. In this connection, it will be noted that lever 168 may be rotated in a counterclockwise direction as aforesaid until cam surface 178 of cam member 172 engages roller 194. Upon such engagement, further counterclockwise movement of lever 168 is precluded. Further upon such engagement of cam surface 178 with roller 194, all of the links 214 have been raised to their uppermost position thereby supporting any perforated item, card or the like which is disposed within the chambers 88 and 90 for easy removal from the chambers.

In FIG. 13 is shown an enlarged view of a rectangular slot 226 formed in a perforated card 227 and looking toward the end of the actuating portion 126 which is disposed within one of the apertures 96 formed in member 180. It is to be particularly noted that the longitudinal axis of the slot 226 is generally aligned with the plane in which the conductor element 118 is disposed. The importance of this feature is appreciated only when it is understood that the actuating portion

126 of conductor element 118 will, as a result of its being mounted upon printed circuit board 112 and within the apertures formed in contact board 114 and member 180, be biased in a plane parallel with the longitudinal axis of the rectangular slot 226. Thus, since the longitudinal axis 230 of rectangular slot 226 is of a greater dimension than the axis disposed at right angles thereto, it will be appreciated that installation of the conductor element in this manner minimizes misalignment which might otherwise occur due to the extremely small dimensions and tolerance involved. For example, the diameter of the actuating portion 126 is approximately 0.008 inches; the width of the slot 226 is approximately 0.055 inches; the height of the slot 226 is approximately 0.125 inches; and the diameter of the aperture 128 varies between approximately 0.025 inches and 0.033 inches.

Although the apertures formed in contact board 114 are shown in FIGS. 10 and 11 as being cylindrical in shape, the preferred aperture configuration is aperture 141 as shown in FIG. 16. The conically shaped portion 141a of aperture 141 greater facilitates inserting of the actuating portions 126 of the conductor elements 118 within apertures 141.

The use of diodes 132 in the manner as described above and as shown in FIG. 15 is to permit the static card reader to be used even though only a single perforated item, card or the like is involved.

The static card reader 86 includes means for insuring that each perforated item, card or the like is properly inserted within its corresponding chamber. These means include a notch-type surface formed in each of the chambers, e.g. the notch-type surfaces 232 and 234 formed respectively on mask members 186 and 188, see FIG. 3. Each perforated item, card or the like that is to be disposed within the chambers 88 and 90 has a complementary, similar notch-type surface formed thereon. Thus, a perforated item, card or the like will only be properly seated within the chamber when the respective notch-type surfaces are disposed in contacting engagement; otherwise such perforated item, card or the like will extend outwardly from said chamber indicating an improper installation.

An important feature of this invention is the construction of self-cleaning chambers. This is accomplished by forming one or more apertures 236 in the bottom of each of the chambers, see FIGS. 10 and 11. The use of these apertures 236 permit and facilitate the automatic removal of foreign particles which may become disposed within the chambers thereby minimizing or eliminating clogging or obstruction of the chambers. As a consequence, a static card reader constructed in accordance with this invention may be used under environmental conditions heretofore considered unacceptable from an operating viewpoint. It will also be observed that air is forced between member 180 and contact board 114 as a result of actuating lever 168. This action is beneficial in assisting in removing foreign particles from said chambers.

Each of the conductor elements 118 is mounted under a predetermined preload, e.g. approximately 7 grams. Preloading of the conductor element 118 in this manner means that a considerable amount of force must be exerted against the end of the actuating portion 126 in order to depress same within the switching chamber 110. Thus, even though the slots contained within the perforated items, cards or the like become filled or partially filled with grease or grime, such perforated items, cards or the like work very well in a static card reader as constructed herein since the force exerted by the end of the actuating portion 126 is more than sufficient to effect penetration through such grease or grime.

As previously indicated, a static card reader constructed in accordance with the subject invention is particularly advantageous since a perforated item, card or the like is moved toward the switch contacts rather than the converse. This means that the number of moving parts utilized within a static card reader has been greatly minimized. For example, except for the ejection operation, the only moving parts involved in the static card reader constructed in accordance with the sub-

ject invention are the cam lever system and the chambers. It will be understood that each of the actuating portions 126 of the conductor element 118 are mounted for movement but such movement is under the biasing influence of an unperforated portion of a card or the like rather than from the movement of another controlling part or device. The simplicity of this construction has greatly reduced the cost of manufacture of such a device while at the same time eliminating maintenance problems associated from the existence of a large number of moving parts. Also, as previously described, maintenance difficulties have been further decreased through the use of a unique wiping action between the S-shaped contact portion of conductor element 118 and strip 130. Additionally, in the static card reader of this invention, reading is done on one side of the card rather than through the card.

In FIG. 10, static card reader 86 is shown with the chambers in the open or card receiving position. It will be noted that in this position each of the actuating portions 126 extends into the apertures formed in member 180 but not therethrough. In FIG. 11, static card reader 86 is shown with a perforated card 227 disposed within the chamber. The chamber has been moved to the card reading position whereby the card 227 within the chamber has been moved into contacting engagement with at least one of the actuating portions 126 of conductor element 118. In FIG. 11 the card 227 has an aperture or rectangular slot formed opposite each of the actuating portions 126 except one. Opposite this one actuating portion 126 is an unapertured portion. The unapertured portion of the card blank causes the actuating portion 126 to be urged inwardly into the actuating chamber 110 and thereby results in opening the switch contact. As previously indicated, the opening of a switch contact in this manner is used to indicate the existence of a predetermined bit of the information. After the information and data has been transmitted to the data storage device, the cards in the card chambers are moved to the static card reader open position and then to the static card reader card eject position. The cards are removed and the static card reader is then ready for further use. It is to be noted in FIG. 11 that the actuating portions 126 which extend through the slots formed in the card also extend into the recesses 98 formed in the opposed wall surface 108, see FIG. 9. As a result, the switch contact associated with such actuating portion remains in the closed condition.

In FIGS. 3, 10 and 11 are shown pins 238 which are installed in and extend forwardly from the lower portion of member 180. These pins 238 cooperate with corresponding groove 240, which functions in the same manner as a plurality of recesses, to provide a lower support means for the bottom edge of a perforated item or card that is disposed within the chambers 88 and 90. The distance between the pins 238 in combination with the distance maintained between the opposed wall surfaces 92, 94 and 106, 108 by a mask members 184, 186, and 188 cooperate to form the apertures 236 in the bottoms of chambers 88 and 90 as aforescribed.

Certain additional operational aspects of the data collection station 38 shown in FIG. 2 is now briefly described. First of all, as shown in FIG. 2, the static card reader 40 is preferably positioned above the key board of the data-entry device 42 and along the rear edge thereof. The static card reader 40 enables the handling of two standard 80-column tabulating cards at the same time. The perforated cards are inserted by hand in static card reader 40. The perforated cards act upon a multipin sensing block so as to set up or actuate physical circuits. These circuits may be electronically scanned as required to obtain data. Such a card reader is a requirement in a system of this kind where double reading of the cards is necessary to accommodate both high speed and low-speed recording as will be later explained.

The position of the static card reader 40 at the rear of the keyboard the data-entry device 42 is particularly convenient for the operator. The transparent face plates on the card reader chambers allow the outline and color (if any) of the cards to be seen while they are being inserted and read. As

previously indicated, there is one common card control lever 50. This lever 50 has, in essence, two detent positions—open (card receiving) and closed (card reading). When the lever 50 is in the open position, the card may be inserted or removed from the chamber as desired or required. When the lever 50 is moved toward the closed or card reading position, the cards within the card chambers are moved into contacting engagement with the actuating portions 126 of the conductor elements 118. The cards must be inserted properly in order that the notch-type surfaces formed thereon are positioned against similar notch-type surfaces formed within the card chambers. When the cards are properly inserted, they will fully seat in the card chamber and, upon moving the cards into a card reading position, data may subsequently be transmitted to a data storage device. If a card is not properly inserted, the card chamber will not close and no data may be transmitted since the system is locked out pending the making of necessary corrections as indicated by the signal lamps.

As previously indicated, static card reader 40 is really a pair of card readers combined in one. One of such card readers is divided into two sections so that a 51-column tab card may be inserted in card chamber 46 and a 15-column personnel badge may be inserted with chamber 48.

The card reader 40 provides for sensing of "control" digits on the cards which, together with the settings of the keys of on the "transaction code" key column 58, form a keyboard lockout lodging control as will be later described.

A plurality of key columns are disposed across the key board of the data-entry device 42. Variable type data is manually entered by the actuation of appropriate keys within these columns.

As previously indicated, key column 58 may be used as the "transaction code" column. The next group 60 of columns may be used to designate an operation or department number or other special code, depending upon the nature of the transaction code being used. The next group 62 of key column may be used for entering set up or partial set up designated in units of time. The next group 64 of columns may be used for entering machine number or other special code, depending upon the nature of the transaction code originally designated. The last group 66 of columns may be used for entering the number of pieces made or the cycle time involved in an operation.

Signal lamp or OK lamp 72 is associated with the keyboard lockout logic, hereinafter described, and must be in a lighted condition before the instrument will accept an entry for transmission and recording. In the event that the OK lamp 72 fails to light up, one or more of the error lamps 76, 78, 80 and 82 will light up to indicate the need for entry of additional data in the associated column. In this manner, the operator is supervised by the data-entry device 42 to provide all the information necessary to permit the computer subsequently to carry out handling of the transaction without feeding in supplementary information.

As previously indicated, the top of each of the key columns is a skip key 68. These are the keys to which the keyboard is reset each time after making a recording. Each of the transaction codes, when entered in column 58 will require that one or more of the key columns be taken out of the skip condition by entry of data in such columns before the internal keyboard logic will be satisfied. Unless the keyboard lockout logic is satisfied, as indicated by lighting up of the OK lamp 72 after entries have been made, the record or transmission bar 74 will be unresponsive.

As indicated above, the data collection station 38 is equipped with internal keyboard lockout logic circuit which involves certain of the key columns. The function of the error lamps 76, 78, 80 and 82 at the top of the key columns as shown, together with the OK lamp 72, is to direct the operator in placing information on the keyboard at the proper places so as to assure error-free and unquestioned computation of the desired end results. Failure to insert the proper data means that the keyboard will be locked out and, thus, no data can be transmitted.

In FIG. 15, it is to be noted that the leads 242 extending from the right side of the contact board 114 are connected to the wires 166 extending upwardly through the opening 244 formed in the right side of the wiring manifold 164 as shown in FIG. 14. Likewise, the leads 246 extending from the right end of the second portion of each strip 130, counting the portions from left to right in FIG. 15, are connected to the wires extending upwardly through the opening 248 formed in the wiring manifold 164, see FIG. 14. Also, the leads 250 extending from the right end of the contact board 114 are connected to the wires extending upwardly through the opening 252 formed in the wiring manifold 164, see FIG. 14.

From the foregoing, it will be readily apparent that an improved data collection station and static card reader therefor and uniquely formed conductor element useful therein have been described. For example, a data collection station has been described which may be operated by existing managerial and supervisory personnel without the necessity of same taking long and involved training, and such stations may be operated under environmental conditions associated with shops, manufacturing and similar areas. Further, a data collection station and static card reader therefor constructed in accordance with the subject invention may be inexpensively manufactured and have a long useful life with a minimum of maintenance problems. Additionally, a data collection station and static card reader therefor constructed in accordance with the subject invention enables for the first time the use of modern data collection and handling techniques by personnel now working directly in manufacturing and operational areas. Thus, the herein invention represents a substantial advancement in the state of the art while at the same time reducing the cost of expense heretofore involved in attempting to duplicate, by other means, the results obtained hereunder.

It is to be understood that this invention is not limited to the exact embodiment of the devices shown, which are merely by way of illustration and not limitation, as various other forms and modifications will be apparent to those skilled in the art, and it is therefore intended that the appended claims cover all such changes and modifications.

We claim:

1. In a static card reader of the type having a stationary switching chamber with an apertured switching chamber wall, said chamber wall having a plurality of rows and columns of apertures extending therethrough and containing ends of movable switch actuators adapted to move through corresponding apertures in a punched card or be precluded to move through the punched card when engageable with unperforated portions of same, and a card chamber disposed adjacent said apertured wall, said switching and card chambers being constructed for relative movement toward and away from each other thereby permitting insertion into or removal of the card from the card chamber and for reading same, said card chamber having an outer wall, parallel spaced inner wall, said inner wall having apertures extending therethrough through which the ends of the actuators may move, the outer wall having corresponding aligned recesses in same into which the actuator ends may move, the improvements, in combination, comprising:

- a. said outer wall being disposed generally vertically and formed of transparent material through which a card disposed in the chamber may be used;
- b. manual means for moving, relative to the switching chamber, said card chamber from a card inserting post position to a card reading position, said manual means being disposed in a position such that it does not obscure vision through said outer wall;
- c. electric means for locking the manual means in the reading position until the card has been read, said electric means being responsive to a signal to unlock the manual means and permit return of the card chamber to the card inserting position; and
- d. card ejection means operated in response to positioning said manual means to a predetermined position, said card ejection means being engageable with the lower edge of

the card for elevating it in the card chamber to a position in which it may be manually removed from same.

2. Apparatus in accordance with claim 1 wherein said manual means comprises a pivoted shaft disposed beneath said switching chamber, and mechanism connecting same to the ends of said card chamber for moving same.

3. Apparatus in accordance with claim 2 wherein said mechanism includes springs for urging the card chamber toward the switching chamber, and a lever connected to said shaft and including detent means for overriding the urge of the spring means or for permitting same to operate.

4. Apparatus in accordance with claim 1 wherein said card ejection means includes means disposed beneath the card chamber and constrained for movement in a generally vertical direction, and at least two spaced pins carried by same extending into the chamber having upper ends engageable with the lower edge of the card.

5. Apparatus in accordance with claim 1 wherein said apertured switching chamber wall is provided with horizontally extending bus bars within the chamber, one for each row of apertures in same, each actuator being affixed to a switching contact engageable with a bus bar.

6. Apparatus in accordance with claim 5 wherein said switching contact is connected to one end of a pair of divergent members, such as V-shaped, the other end being rigidly affixed within the switching chamber, the divergent members adapted to converge when the actuating end moves toward the affixed end.

7. Apparatus in accordance with claim 6 wherein said switching contact is curved in generally S-shape one of the convex curved portions of which is adapted to engage a bus bar.

8. Apparatus in accordance with claim 1 including at least one like card reader, longitudinally spaced from the first named card reader, and operable by the same manual means.

9. Apparatus in accordance with claim 8 wherein said like card reader is so constructed to read a card having a different number of columns of apertures in same.

10. A static card reader comprising:

a. a card receiving chamber having spaced-apart; generally parallel inner and outer walls;

1. said inner wall having a plurality of rows and columns of apertures extending therethrough;

2. said outer wall being disposed generally vertically and formed of a transparent material through which a card disposed in a card chamber may be viewed, said outer wall having a plurality of recesses formed on the inner surface thereof, said recesses corresponding to and being aligned with the apertures formed in said inner wall;

b. a switching chamber including a plurality of circuit portions, a first printed circuit board, and other printed circuit boards;

1. said first printed circuit board having a plurality of rows and columns of apertures extending therethrough, said apertures corresponding to and being aligned with the apertures formed in the inner wall of said card chamber;

2. a first part of each circuit portion being disposed upon

said first printed circuit board;

3. a second part of each circuit portion being disposed upon one of the other printed circuit boards;

4. each second part of each circuit portion including a switching contact biased to a normally closed position with a corresponding first part of said circuit portion;

5. a switch actuator for each switching contact, each actuator and its corresponding switching contact being formed from a single piece of electrically conducting material, each actuator being disposed within corresponding aligned apertures formed in said first printed circuit board and the inner wall of said card chamber, each actuator being adapted to move through corresponding apertures in a punched card into a corresponding recess or be precluded from moving through the punched card when engageable with a non-perforated portion of same;

6. each switching contact, upon being removed out of contacting engagement with a corresponding first part of said circuit portion, being constructed for movement across said corresponding first part of said circuit portion thereby effecting a wiping action thereacross to facilitate maintaining good electrical contact between said first and second circuit portions;

c. means for moving said chambers relative to each other from a card inserting position to a card reading position, said means being disposed in a position not to preclude visual observation of the card through the outer wall of said card chamber; and

d. card ejection means operated in response to positioning said chambers moving means to a predetermined position, said ejection means being engageable with the lower edge of the card for elevating it in said card chamber to a position in which it may be manually removed from same.

11. A static card reader as described in claim 10 including electric means for locking in the card reading position the means for moving said chambers relative to each other until the card has been read, said electric locking means being responsive to a signal to unlock said moving means and permit the chambers to return to the card inserting position.

12. A static card reader as described in claim 10 in which the first parts of said circuit portions formed upon said first printed circuit board comprise horizontally extending bus bars disposed within the switching chamber, one for each row of apertures formed therein.

13. A static card reader as described in claim 12 in which each switching contact is connected to one end of a pair of divergent members, such as V-shaped the other end of said divergent members being rigidly affixed within the switching chamber, the divergent members being adapted to converge when the actuator corresponding to said switching contact moves toward the affixed end, said switching contact and its corresponding divergent members being formed from a single piece of electrically conducting material.

14. A static card reader as described in claim 13 in which each switching contact is curved in generally S-shape one of the convex curved portions adapted to engage a corresponding bus bar.