

[54] **ELECTRICAL VERIFICATION AND IDENTIFICATION SYSTEM**

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Related U.S. Application Data

[63] Continuation of Ser. No. 328,290, Jan. 30, 1973, abandoned, which is a continuation of Ser. No. 219,724, Jan. 21, 1972, abandoned.

[52] U.S. Cl. **235/61.12 C**; 40/2.2; 194/4 R; 340/149 A; 235/61.11 A; 235/61.7 B

[51] Int. Cl. **G06k 7/06**; G06k 19/02; G09f 3/02; G07f 1/06

[58] **Field of Search**. 235/61.12 C, 61.12 R, 61.7 B, 235/61.11 A; 340/149 A; 200/46 R; 194/4 R; 40/2.2; 360/131

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[57] **ABSTRACT**

An electrically encoded system is provided which includes a base with a first matrix mounted on the base and formed of a first plurality of electrical conductors spaced and insulated from one another, and which may also include a second plurality of electrical conductors mounted on the base which are spaced and insulated from one another and which bridge selected pairs of the conductors of the first plurality. However, the circuit is still not complete, and a second matrix which is positioned externally to the base is required. Adjustments must be made to the second matrix in order to complete a circuit through the first matrix and through the conductors of the second plurality so as to provide an output indication.

4 Claims, 3 Drawing Figures

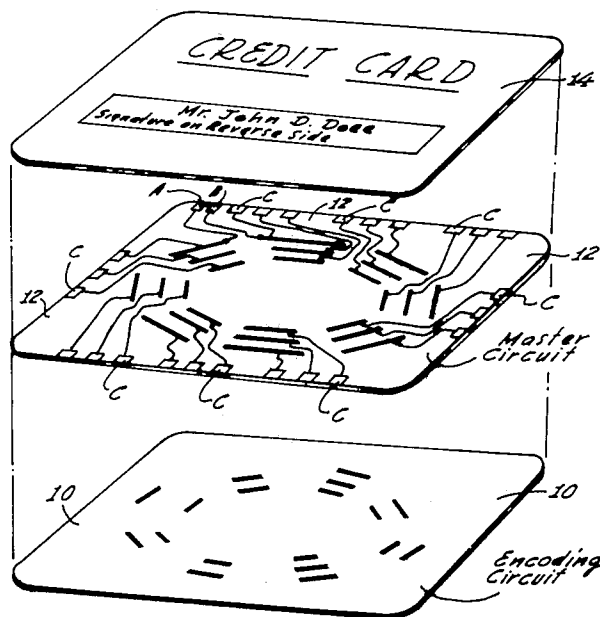


Fig. 1 (Credit Card)

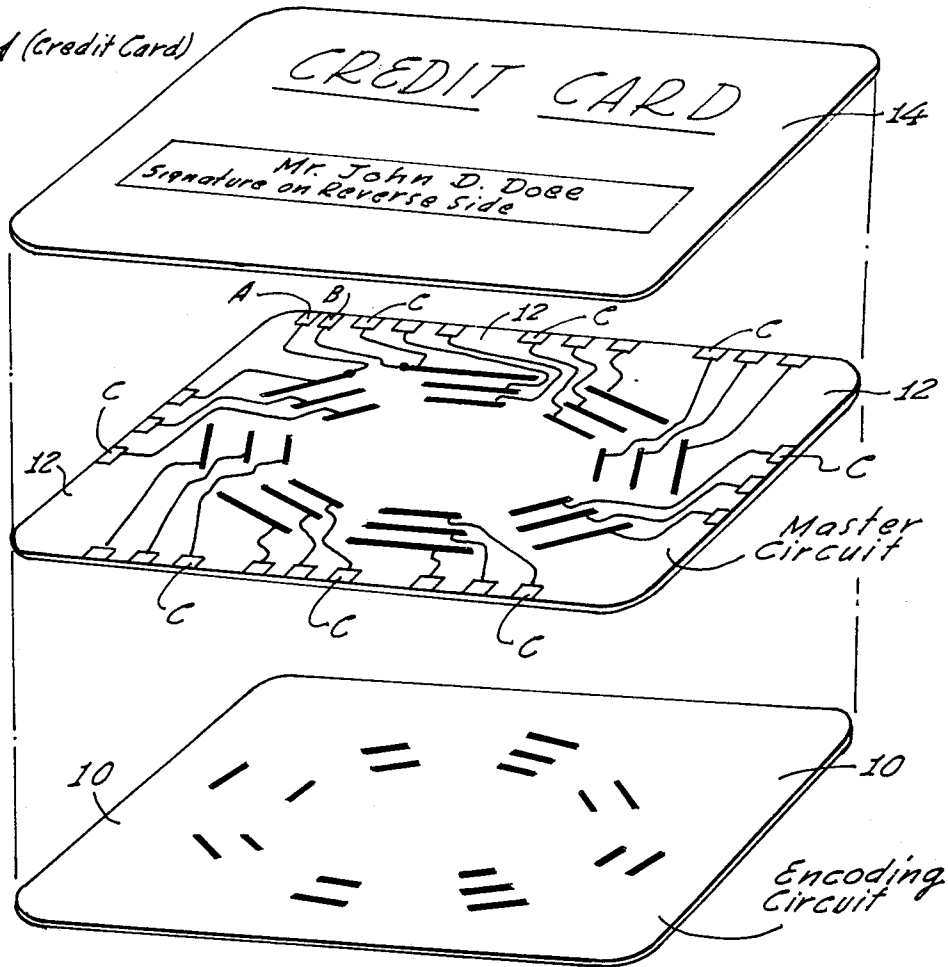
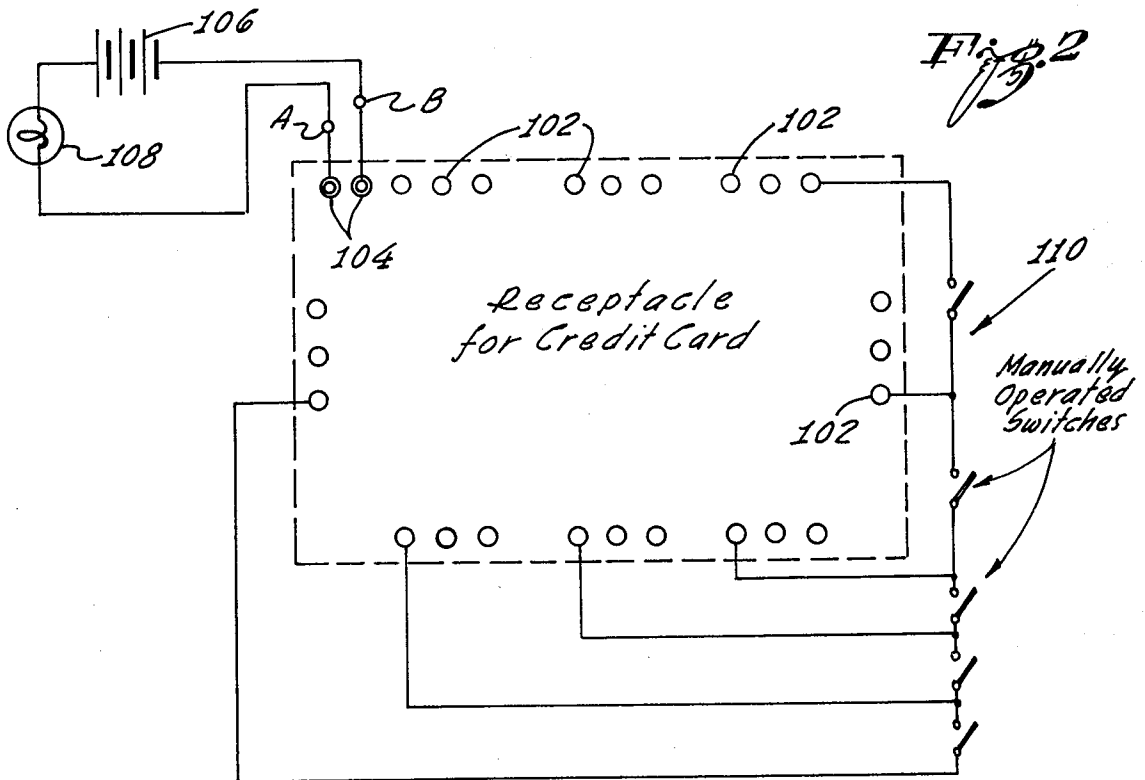


Fig. 2



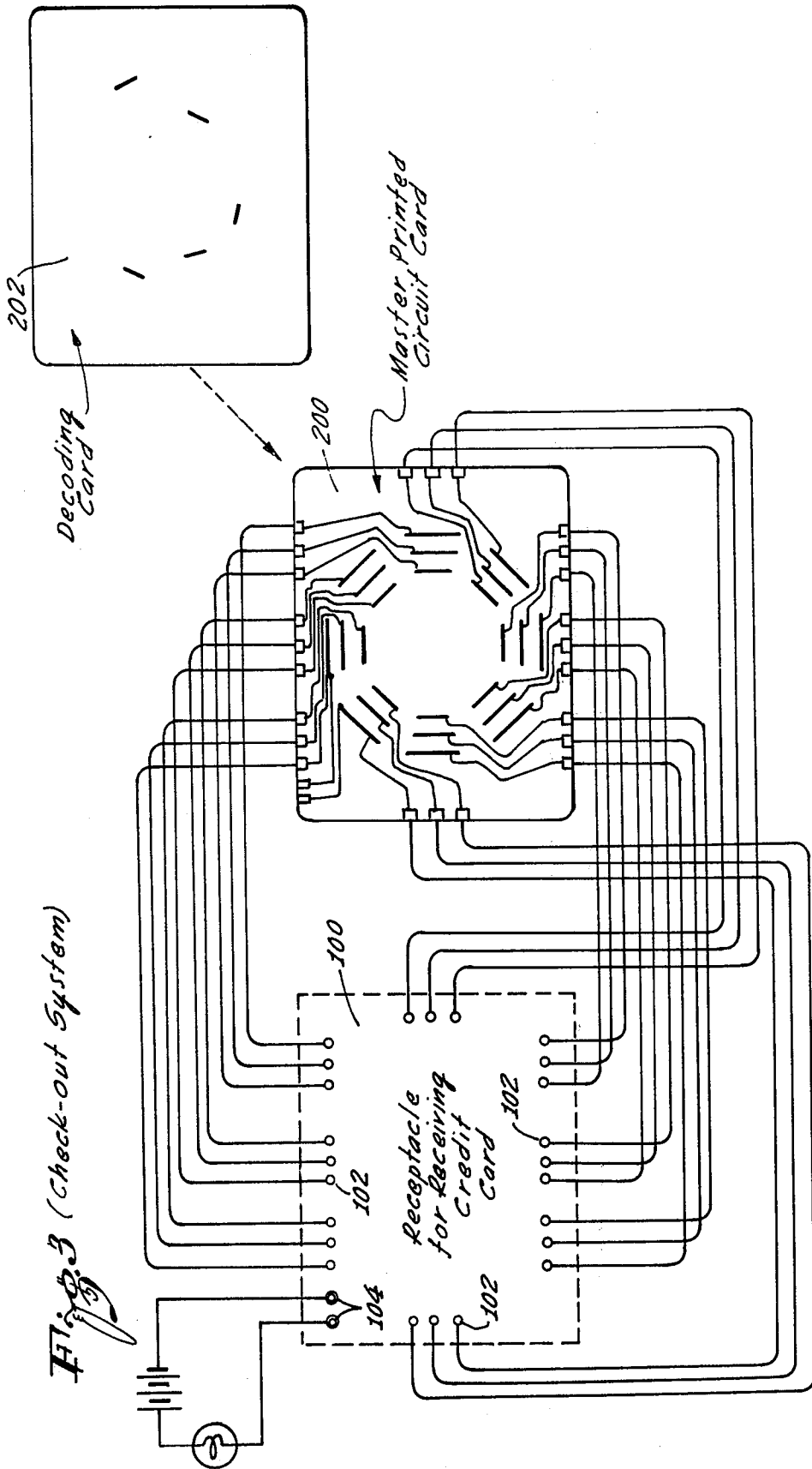


Fig. 3 (Check-out System)

ELECTRICAL VERIFICATION AND IDENTIFICATION SYSTEM

This is a continuation of copending application Ser. No. 328,290 filed Jan 30, 1973, now abandoned, which, in turn, is a continuation of copending application Ser. No. 219,724 filed Jan 21, 1972 now abandoned.

BACKGROUND OF THE INVENTION

As will become evident as the description proceeds, one application of the system of the invention is in the verification of credit cards. Although credit cards are in widespread use today throughout the world, they are subject to mis-uses which cost the industry many millions of dollars a year. This is because of the lack of a simple, inexpensive and foolproof system which will prevent the card from being used by an unauthorized person, and which also will prevent further use of the card by a person whose account has become delinquent.

The electrical verification system of the present invention provides in one of its embodiments, a simple and efficient means for overcoming the aforesaid disadvantages of the prior art credit cards and checkout systems, as well as providing additional advantages which are beyond the capabilities of existing cards and systems.

For example, the system of the present invention may be used in a manner in which the user alone is aware of a certain code number which must be set into a checkout system before his credit card will be validated. In this way, he is protected from the unauthorized use of his card in the event it should become lost or stolen.

In addition, the system of the invention may be formed so that information concerning the user may be programmed into the system. This information may include, for example, the age, height, race, etc., of the user, all of which are read by the checkout system and apparatus at the point of use of the card to protect the user against the unauthorized use of his credit card. Other information also may be programmed into the system, such as credit rating, expiration date, etc., so as to protect the retailer from the use of the card by persons whose accounts have become delinquent, or have expired.

The system of the invention may be used in conjunction with a central computer to widen its field of utility, and, as such, may be tied into a central automatic billing system. In this way, all pertinent information of each transaction, properly identified, may be carried to the account of the customer, so that a running balance of the account may be maintained for periodic automatic billing purposes. The same concept may be applied to the use of the system in conjunction with a bank account, in which case a card would function in lieu of checks, as a means for drawing on the account. Likewise, the card may be used as a telephone credit card, with information on the card automatically carrying appropriate accounting data to the account of the subscriber at the subscriber's telephone number which is programmed into the card.

Another and different use for the system of the present invention may be for programming airline flights. In this case, each retail sales outlet throughout the country would be issued groups of cards, and each of the cards would represent a different flight. A matrix on

each card would then represent the seating capacity for a particular flight. As the seats for a particular flight are sold, the central computer system effectively completes corresponding bridging circuits for the matrix, so that a "full" indication is obtained when all the seats of that particular flight are sold and the circuit is complete. Thus, each card of a particular group, as distributed around the country, would represent the seating capacity of one particular flight, and as the seats are filled the circuits close automatically at the central computer station until the flight is booked. The cards of the particular group may be used over and over for that particular flight, as long as it is in existence.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded perspective representation of a credit card constructed in accordance with one embodiment of the invention;

FIG. 2 is a schematic representation of one type of checkout system for the card of FIG. 1; and

FIG. 3 is a schematic representation of a second type of checkout system for the card.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

The system of the invention will be described herein in a credit card environment. However, it will become evident as the description proceeds, and as explained above, that the card of the invention has much wider and far reaching uses. Specifically, the invention is concerned with a first matrix formed of a group of discontinuous electrical conductors and having certain information programmed into it, and with a second matrix for completing the circuit of said first matrix and which is capable of identifying the information which has been programmed into each particular card.

In the embodiment of FIG. 1, the base for the first matrix is in the form of a credit card which is made up of a plurality of sheets, for example, sheets 10, 12 and 14, of suitable plastic material. The sheets 10, 12 and 14 may be composed, for example, of an appropriate organic polymer, such as polyester, or other plastic material, or the like, as is usual with present day credit cards.

The sheet 12 carries a first group of mutually isolated printed circuit elements, for example, formed on its upper surface which constitutes a first matrix of the card. The first matrix on the sheet 12, as shown, is made up of a multiplicity of discontinuous concentric printed circuit conductors, all of which must be electrically inter-connected, in order to form a complete electric circuit. The electric circuit must be established, for example, between output terminals A and B; the output terminals being formed by usual metallizing techniques, at the edge of the sheet 12. As shown, each conductor of the first matrix extends between two metallized holes in the card 12. Moreover, each conductor of the first matrix is connected, by appropriate printed circuit connections, to further metallized terminals C positioned around the edge of the card.

A further group of mutually isolated printed circuit conductors may be formed on the upper surface of the sheet 10 by usual printed circuit techniques. The conductors of the latter group are positioned to bridge selected pairs of the conductors of the first matrix. This is achieved by forming the conductors on the sheet 12 to bridge selected pairs of the aforesaid metallized

holes which extend through the sheet 12. In this way, the mutually isolated conductors on the sheet 10 interconnect certain of the conductors of the first matrix on the sheet 12, but cause other conductors of the first matrix to be left unconnected. The remaining circuit breaks of the first matrix must be completed in the circuitry of a third external matrix before an electric circuit may be established between the output terminals A and B so as to indicate a verification of the card, or to provide an indication of the information which has been programmed into the card.

It will be appreciated that a particular pattern of the conductors on sheet 10 is formed during the manufacture of the card, and this pattern may be selected so that the second matrix in the external checkout system must fulfill certain criteria before a validation is achieved. This criteria in a simple system, for example, may merely be a certain code number which is known to the user of the card, and which is set manually into the checkout system, so that a validation is achieved when the proper code number is communicated. In more complex systems, a central computer is used to meet various different criteria which have been programmed into the card before the validation is secured. For example, the computer furnishes the proper identification of the user, corresponding to the code selected by the encoding circuit, before a validation is established.

The various layers of the card of FIG. 1 are then sealed together at the factory, and the top layer 10 may be embossed or printed with the usual credit card of other designations. It is preferable that the card be manufactured so that the various layers become sealed together into a unitary mass, so as to preclude unauthorized tampering with the card. Also, means may be incorporated into the card so that the circuits themselves become destroyed if any attempt is made to pry the layers apart, and so that the card itself becomes discolored when such an attempt is made.

The card shown in FIG. 1 may be used, for example, in conjunction with a simple checkout system such as shown in FIG. 2. An appropriate receptacle 100 is provided which includes terminals 102 that make connection with the various terminals C on the card, when the card is placed in the receptacle. The receptacle also includes a pair of terminals 104 which make contact with the terminals A and B on the card. The terminals 104 are connected, for example, to a power source 106 and indicator 108, the connection being such that when a circuit is completed between the terminals 104, indicating the validation of the card, the indicator lamp 108 will glow. Of course, other appropriate oral or visual indicators may be used to indicate the validity of the card.

In the simple system of FIG. 2, the terminals 102 are each connected to a switching circuit 110, which is made up of a plurality of manually operated switches. The switches may be mounted, for example, on an appropriate control board adjacent the checkout device. Then, in this particular instance, when the user furnishes the proper code for his card, the retailer then actuates the corresponding switches in his switching circuit, so that the missing links of the first matrix on the layer 12 are completed. Then, a complete circuit is established in conjunction with the particular conductors on the layer 10 and so that the lamp 108 will glow, indicating that the proper code has been communicated.

However, as indicated above, the card of the invention may be used in conjunction with more complex checkout systems, such as designated schematically in FIG. 3. In the latter system, the receptacle 100 is connected to a master printed circuit card 200 which is incorporated into the system, and which compares with the first matrix on the layer 12 of the card of FIG. 1. It will be evident, of course, that the master circuit card 200 may itself be removable, either physically or electronically, so that for any particular group of cards being checked by the system, a master circuit card 200 is incorporated into the checkout system corresponding to the first matrix of the card being checked.

A computer, or other means, then physically or electronically searches through its memory for a conductor pattern, such as designated 202 in FIG. 2, which will complete the missing links of the first matrix of the particular card being tested, and when that pattern is found, the computer displays the corresponding data which represents the information which has been coded into the card.

The checkout system may incorporate appropriate memories and circuitry to simulate the master circuit card 200 and decoding card 202. For example, the particular format of the first matrix of a particular card may be stored in an appropriate register in the checkout system, and a comparison may be made within the system until the appropriate combination is found. At that time, the display of the system will incorporate the various data which has been programmed into the card.

It will be appreciated, therefore, that the apparatus for checking out the card may be incorporated with other devices such as credit card print-out machines, computers, electronic scanners and the like. In each instance, the read-out apparatus includes an actual or simulated second matrix which completes a circuit through the card being checked. As described above, the second matrix of the read-out system is connected as a system which by its nature may be changed manually or electronically in order to duplicate all the possible combinations of the matrix on the card until a match is made and the circuit is completed.

As also mentioned, manual means such as a keyboard, dials, levers, and other types of switch actuating means may be used in the read-out apparatus to complete the missing links in the matrix of the card being checked. As also described, the read-out apparatus may be electronically controlled so that it automatically reads out all possible combinations to find the missing combinations, and then displays corresponding data which has been programmed into the system and which corresponds to the match when it is made.

The invention provides, therefore, a base which includes a first matrix which contains unknown missing links, and which requires a second matrix in the checkout apparatus before a circuit is completed so as to verify the card or indicate the information which has been programmed into the card.

In the manufacture of cards in accordance with the illustrated embodiment of the invention, the various layers may be made in multiple runs and coded, according to the data which is to be programmed into each card. When a subscriber is offered a card, the top layer 14 may be embossed with his name and account number, in accordance with usual procedures, and this layer is then sealed to the other layers, and the resulting combination is filed with the owner's name. The com-

pleted card is then mailed separately without the code, for example, so as to prevent mail theft of the cards. Several days later, the subscriber may be mailed his code number, which, in accordance with the embodiment described in conjunction with FIG. 2, he presents to the retail outlet each time he uses his card.

As also described, the card may be programmed to include other information concerning the user, all of which is established in a predetermined program, to be visually displayed by the central computing system, when the particular decoding combination is derived for completing the circuit established by the combination of the master circuit and encoding circuit in the card of FIG. 1.

For example, each card may incorporate a plurality of matrices to add to the coding capabilities of the card. The terminals C can then extend down through the various layers of the card and can be used for any number of matrices. Conversely, separate terminals may be provided for each matrix. When the same terminals C are used for all the matrices, separate terminals A and B may then be provided for each matrix, and the checkout system would be constructed to read out the individual matrices in sequence. It is apparent, of course, that the matrices may be connected and/or sensed in any desired sequence, or simultaneously, depending upon the coding combination desired.

Although particular embodiments of the card and checkout apparatus of the invention have been described, modifications may be made. It is intended to cover all such modifications in the following claims.

What is claimed is:

1. An electrically encoded system including in combination: a base; a first matrix mounted on said base comprising a first plurality of electrical conductors spaced and insulated from one another; a second plurality of electrical conductors mounted on said base spaced and insulated from one another and respectively bridging and interconnecting selected pairs of the

conductors of said first plurality in accordance with a predetermined code; a plurality of electrical terminals mounted on said base and electrically connected to respective ones of said conductors of said first plurality; a pair of output terminals mounted on said base and connected to a pair of conductors of said first plurality of said first matrix; a second matrix positioned externally of said base and controllably establishing electrical connections between selected pairs of said electric terminals to interconnect the remaining pairs of the conductors of said first plurality not interconnected by the electrical conductors of said second plurality and to complete a circuit across said output terminal only when a particular program has been implemented in the control of said second matrix.

2. The combination defined in claim 1, and which includes an output circuit positioned externally of said base, and connected to said output terminals for providing an indication when said circuit has been completed across said output terminals.

3. The combination defined in claim 1, in which said base is formed of a plurality of insulated sheets of plastic material, or the like, each of a size to be conveniently carried on the person of the user, said insulated sheets being laminated to one another to constitute a card having a multiplicity of layers, and in which said first matrix is formed on one of said layers, and said second plurality of electrical conductors are formed on another of said layers.

4. The combination defined in claim 3, in which one of said layers includes a plurality of metallized holes extending therethrough, and in which each of said electrical conductors of said first matrix extends between and is connected to corresponding pairs of said metallized holes, and in which said conductors of said second plurality are positioned to bridge and to be connected to selected pairs of said metallized holes.

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