Y2587 OR 3,581,063

SEARCH ROOM

[redacted]

[11] 3,581,063

[72] Inventor Joseph L. Levasseur
St. Louis, Mo.

[21] Appl. No. 787,648
[22] Filed Dec. 30, 1968
[45] Patented May 25, 1971
[73] Assignee Simcom Corporation
High Ridge, Mo.

[54] **VERIFICATION MEANS FOR CHARACTER GROUPS**
31 Claims, 22 Drawing Figs.

[52] **U.S. Cl.** **235/61.7B,** 340/149A
[51] **Int. Cl.** **G06k 7/00**
[50] **Field of Search** .... 235/61.7, 61.7 B; 250/219 ID, IDC, DOC, WEB; 340/146.2, 149, 149 A, 357; 178/17 D

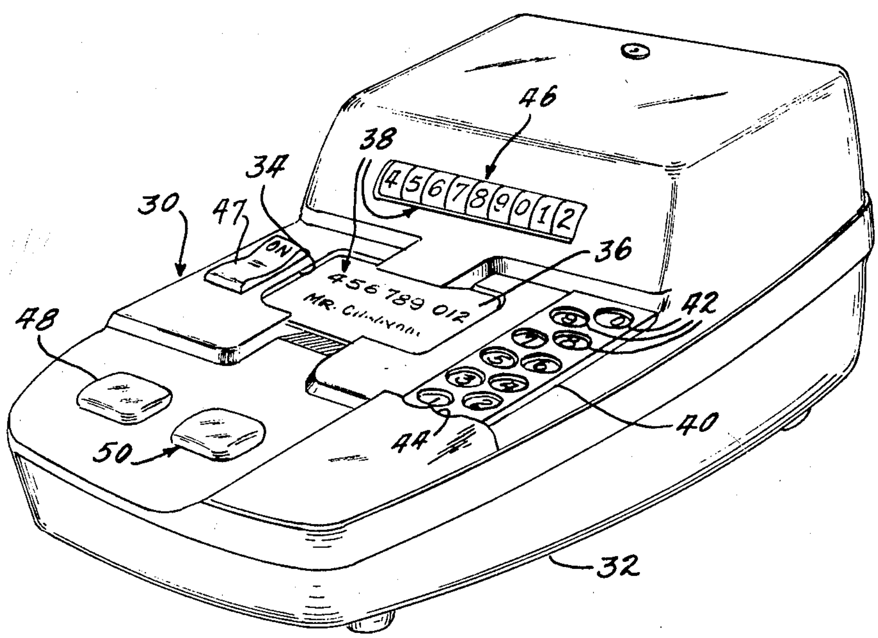
[56] **References Cited**

UNITED STATES PATENTS

2,386,423	10/1945	Blakely	235/61.11
2,482,242	9/1949	Brustman	340/149
2,785,388	3/1957	McWhirter et al.	340/149
2,975,282	3/1961	Schaffer	235/61.7
3,184,714	5/1965	Brown et al.	340/146.2
3,254,201	5/1966	Miller	235/61.7
3,255,339	6/1966	Rausing	235/61.7
3,344,258	9/1967	Michels	235/61.7
3,404,259	10/1968	Atkinson et al.	235/61.7

Primary Examiner—Thomas A. Robinson
Attorney—Charles B. Haverstock

ABSTRACT: Means for verifying that a character group such as a character group that represents an account number such as might be used on a credit card or like device is or is not known to be objectionable for some reason, including means for comparing a particular character group with a plurality of other similar type character groups and indicating the results of the comparison. The invention also includes novel means for storing and moving character groups and other means for reading and/or sensing the stored character groups during movements thereof.



326

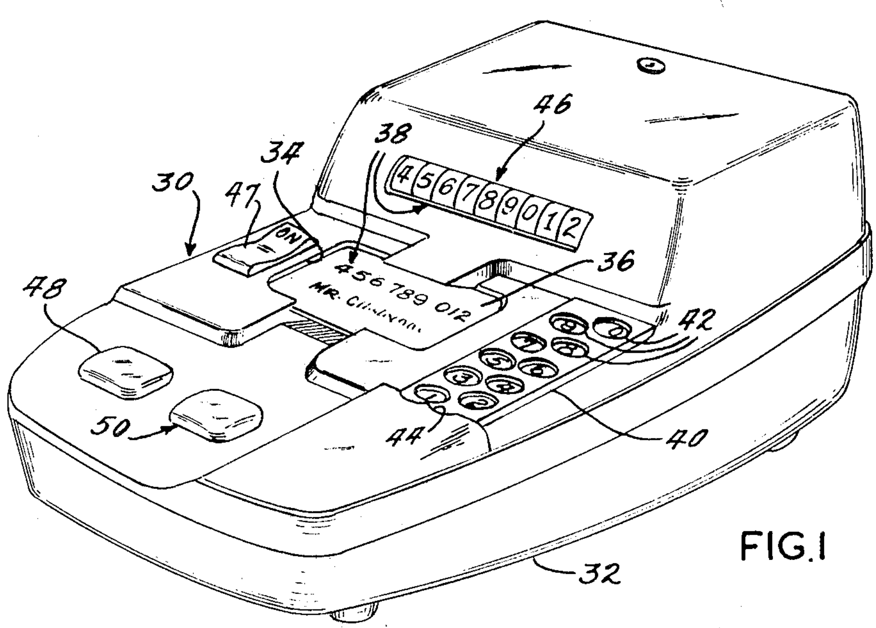


FIG.1

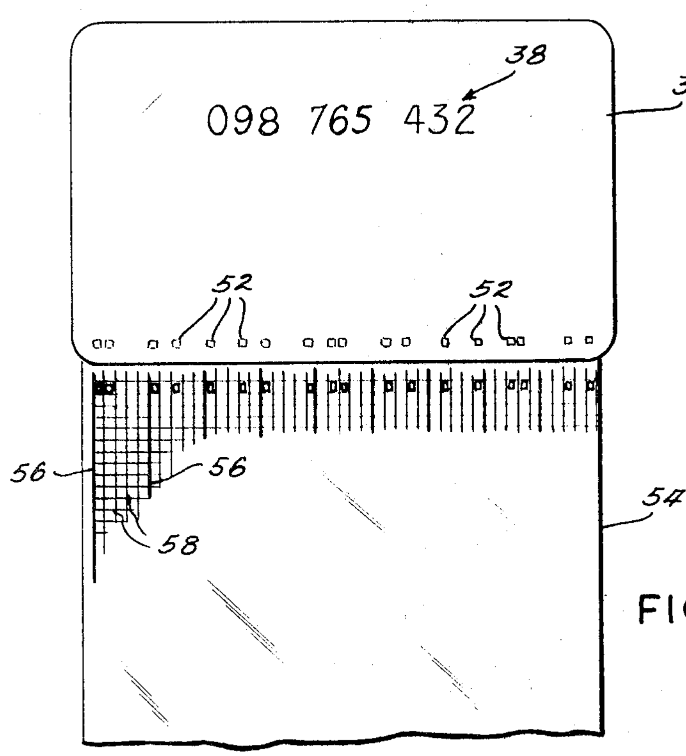


FIG.2

INVENTOR:
Joseph L. Levasseur
BY Charles B. Haveristock
ATTORNEY

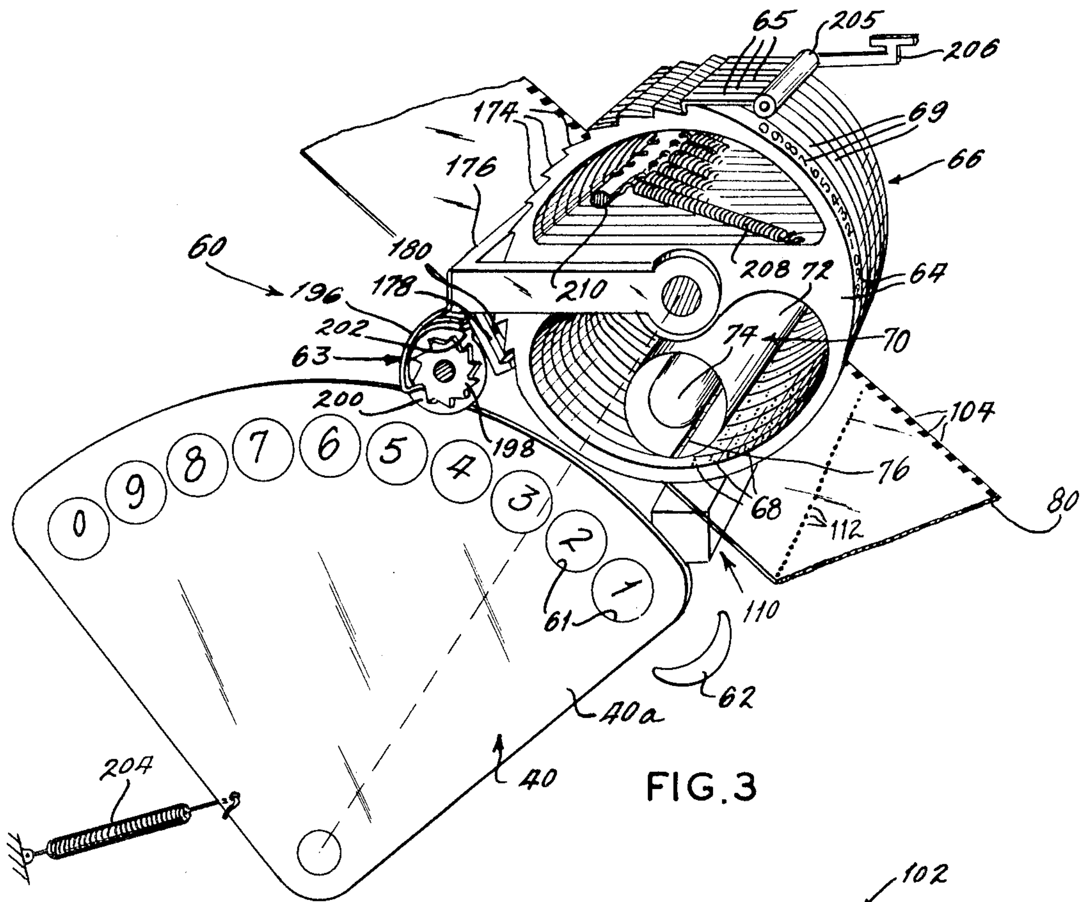


FIG. 3

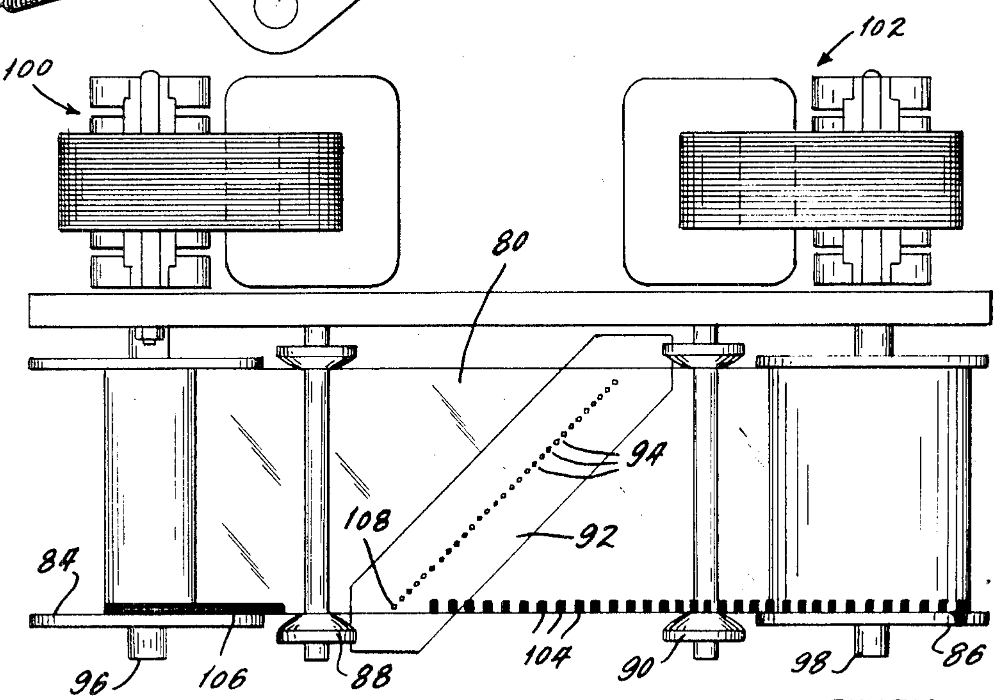


FIG. 4

INVENTOR:
Joseph L. Levasseur
BY Charles B. Haverstock
ATTORNEY.

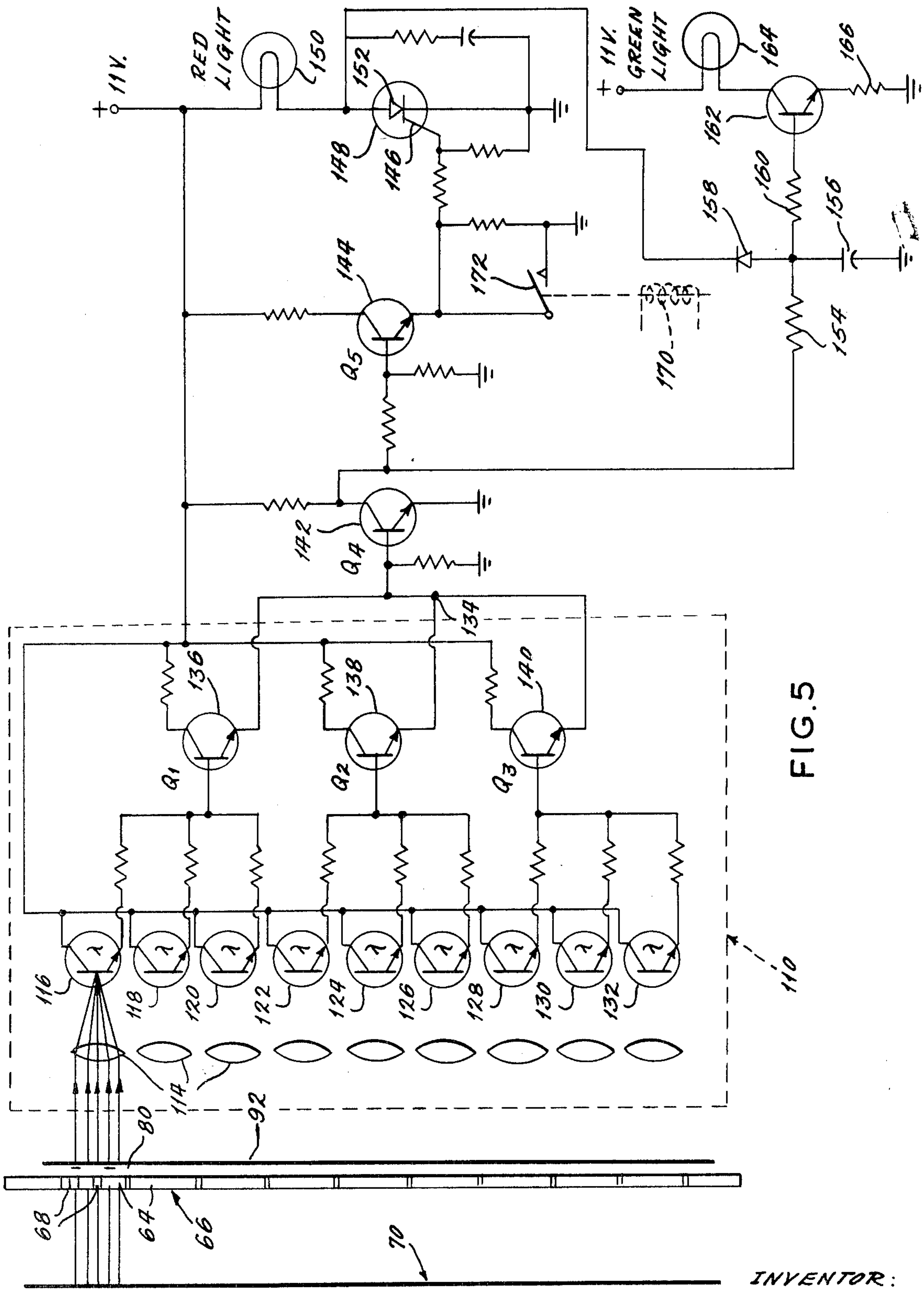


FIG.5

INVENTOR:
Joseph L. Levasseur
BY Charles B. Haverstock
ATTORNEY,

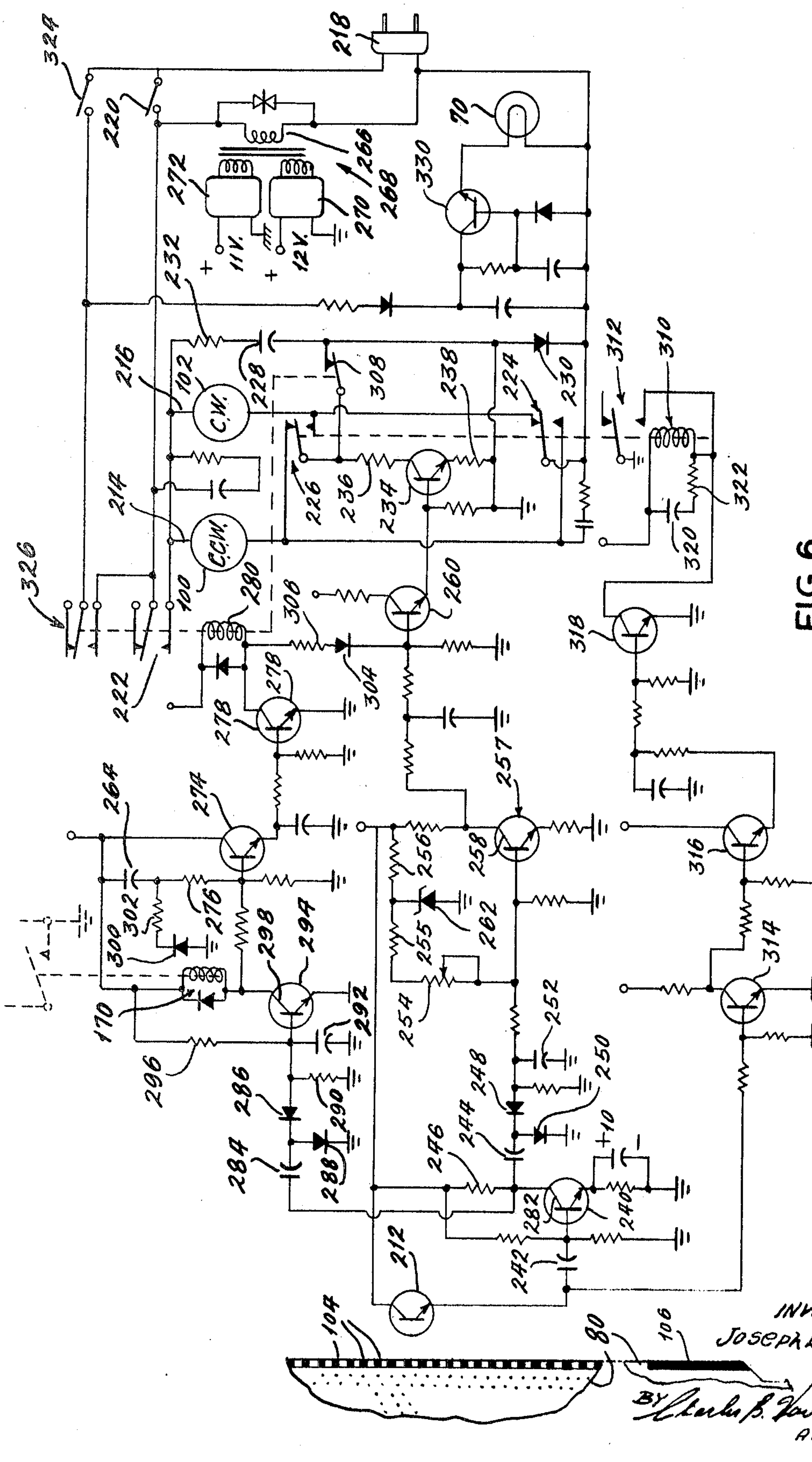


FIG. 6

INVENTOR:
Joseph L. Levasseur

BY Charles B. [signature]
ATTORNEY.

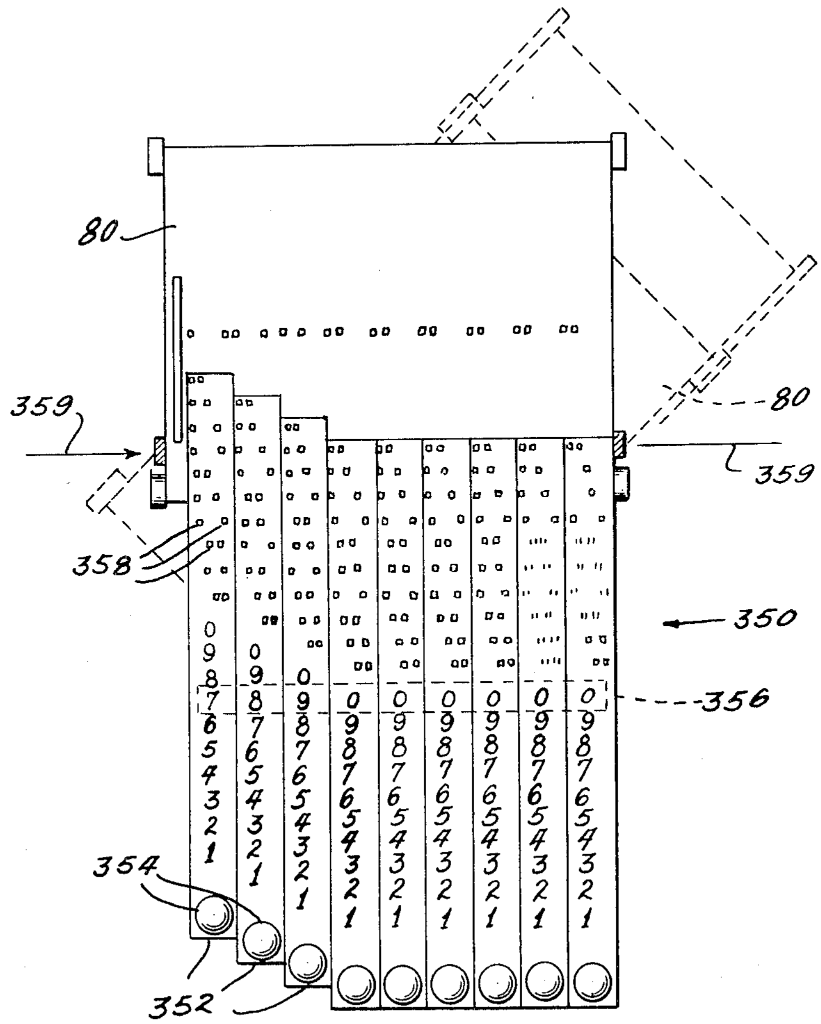


FIG.7

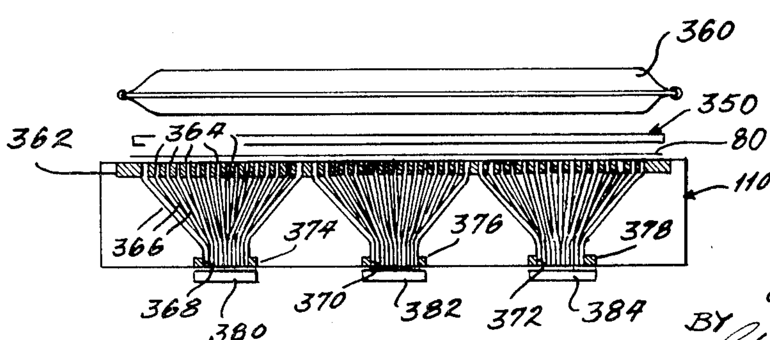


FIG.8

INVENTOR
Joseph L. Levasseur
BY Charles B. Haverstock
ATTORNEY.

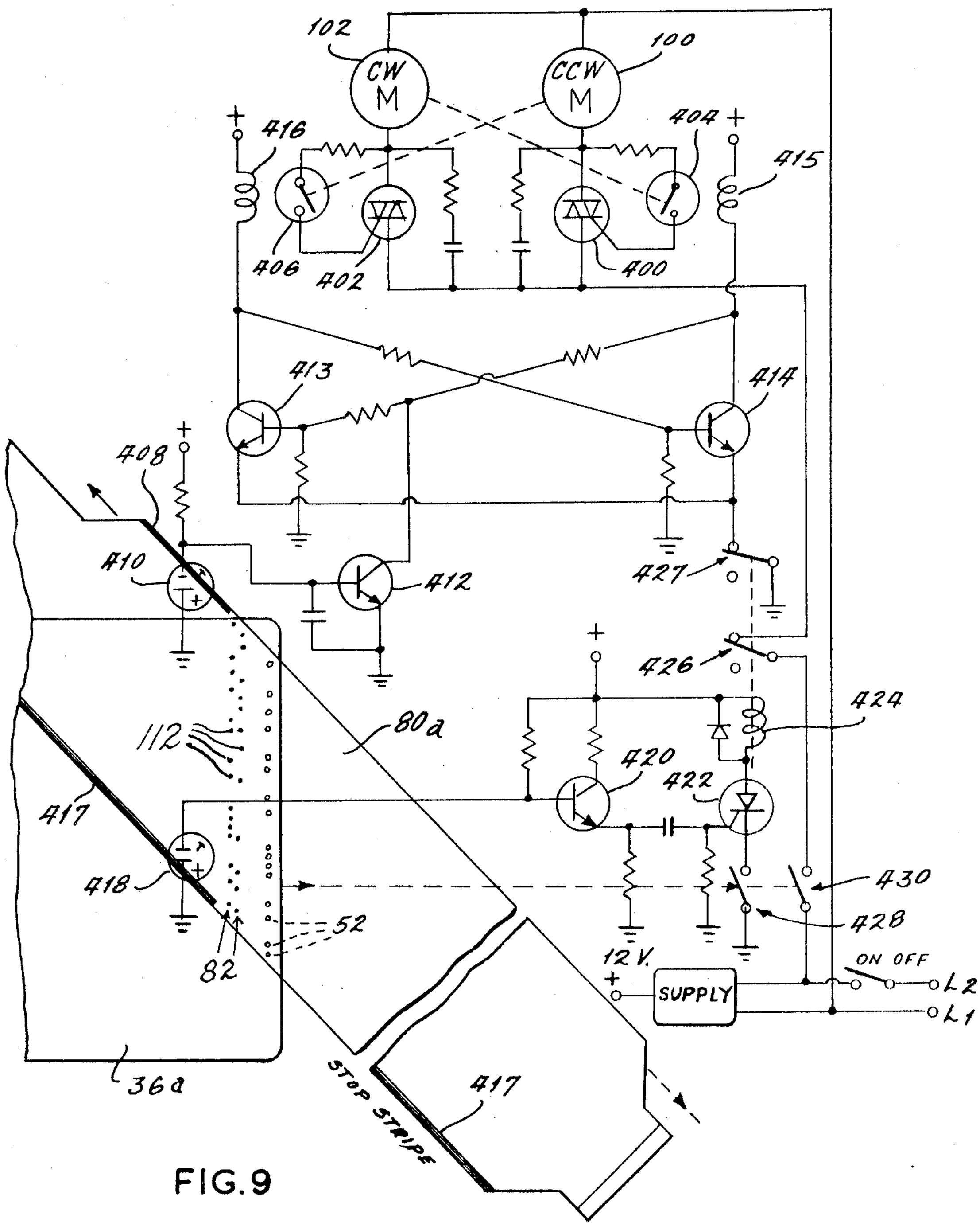


FIG. 9

INVENTOR:
Joseph L. Levasseur
BY Charles B. Haverstock
ATTORNEY.

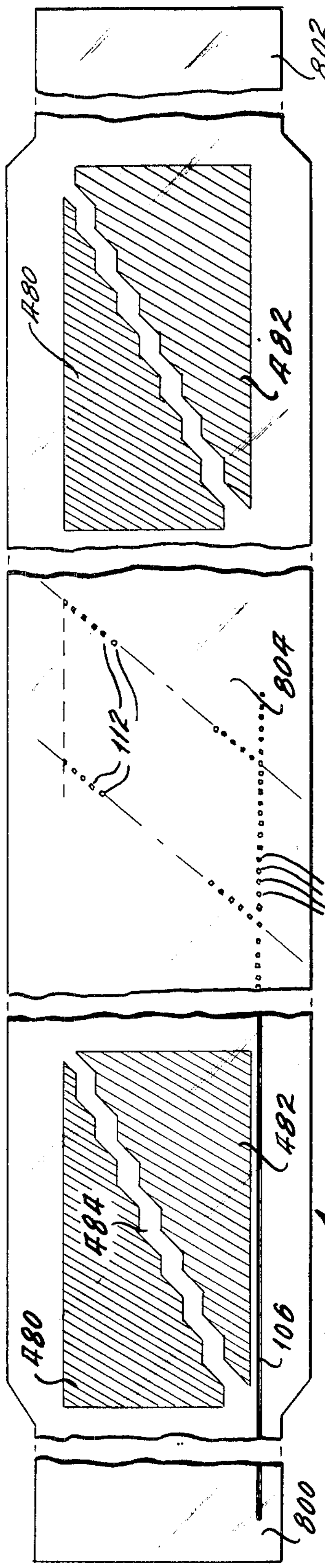


FIG. 20

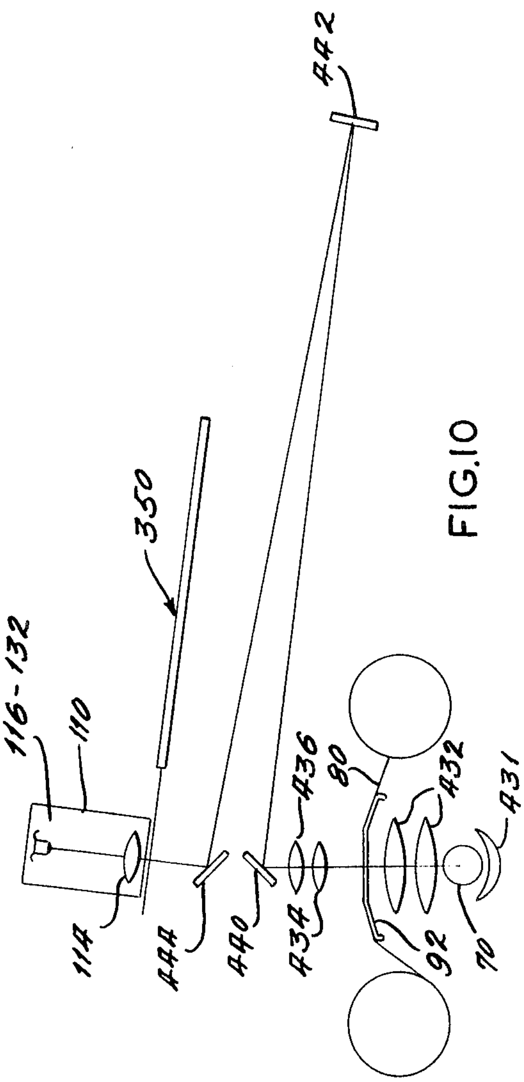


FIG. 10

INVENTOR.
Joseph L. Levasseur
BY Charles B. Haverstock
ATTORNEY.

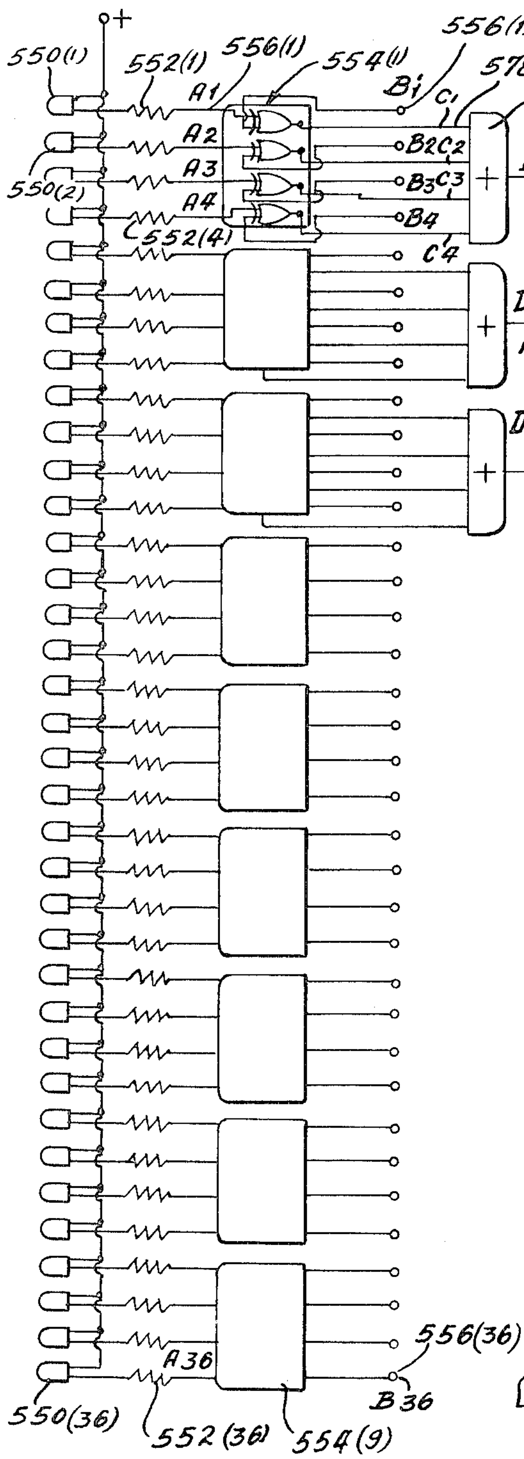


FIG.15

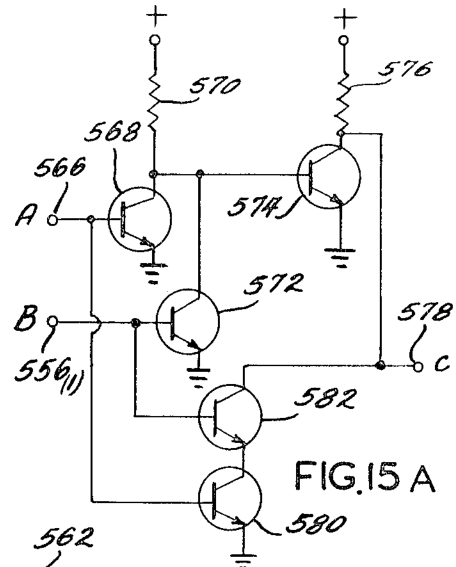


FIG.15 A

A	B	C
0	0	0
0	1	1
1	0	1
1	1	0

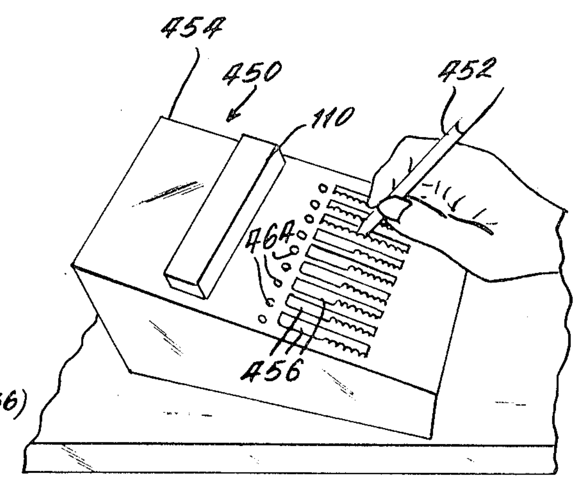


FIG.11

INVENTOR:
Joseph L. Levasseur
BY Charles B. Haverstock
ATTORNEY.

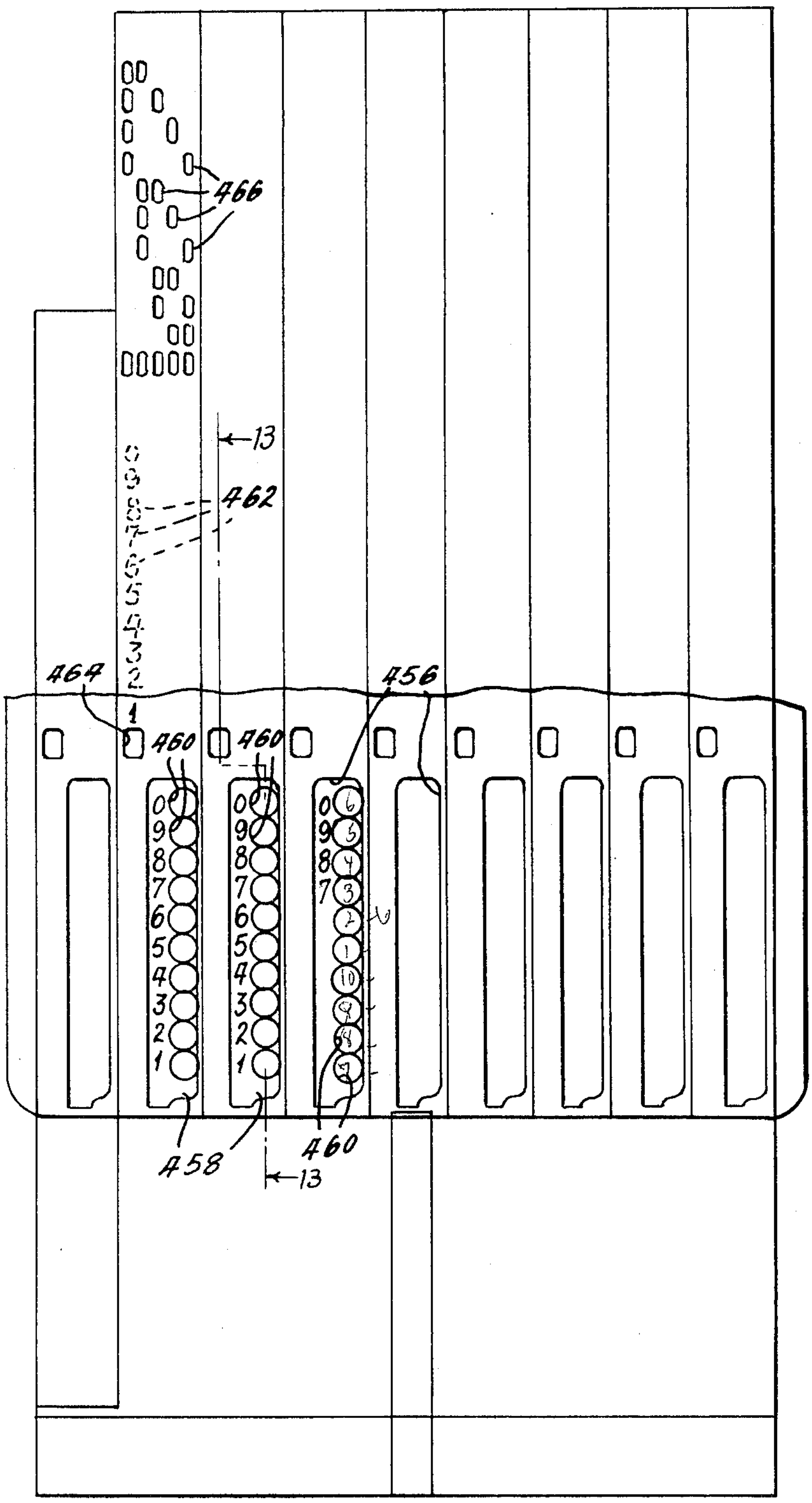


FIG.12

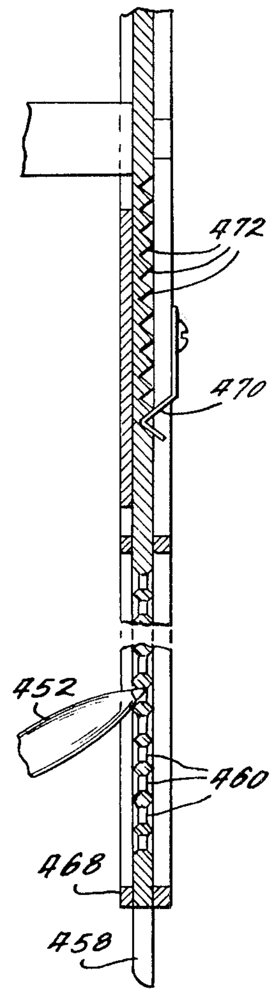


FIG.13

INVENTOR:
Joseph L. Levasseur
BY Charles B. Haverstock
ATTORNEY,

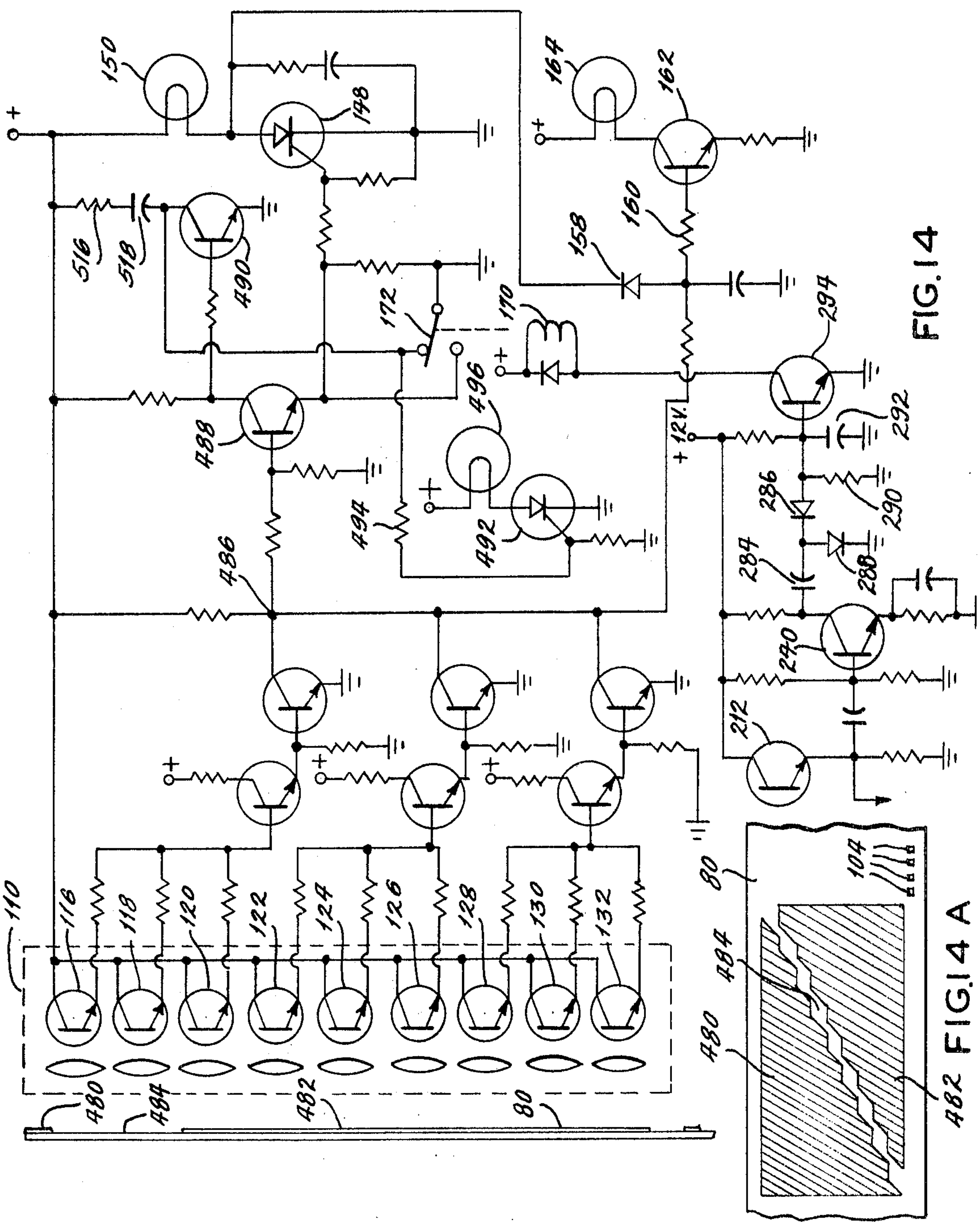


FIG.14

FIG.14 A

INVENTOR:
Joseph L. Levasseur
BY Charles B. Haverstock
ATTORNEY.

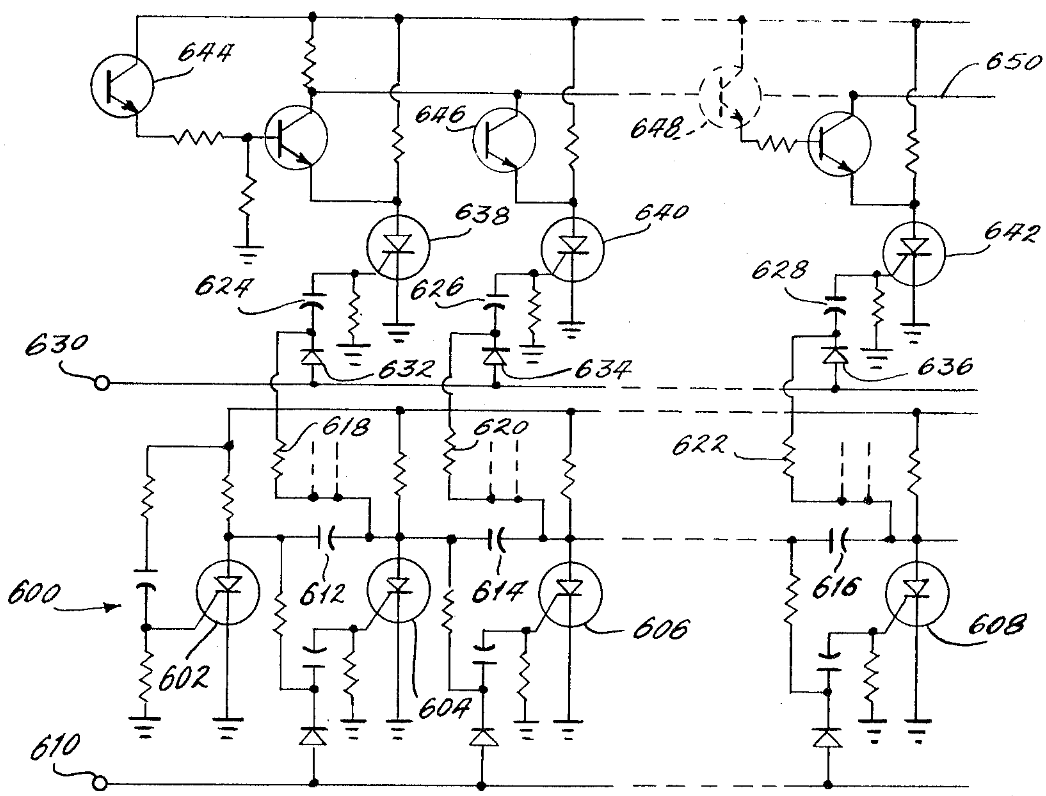


FIG.16

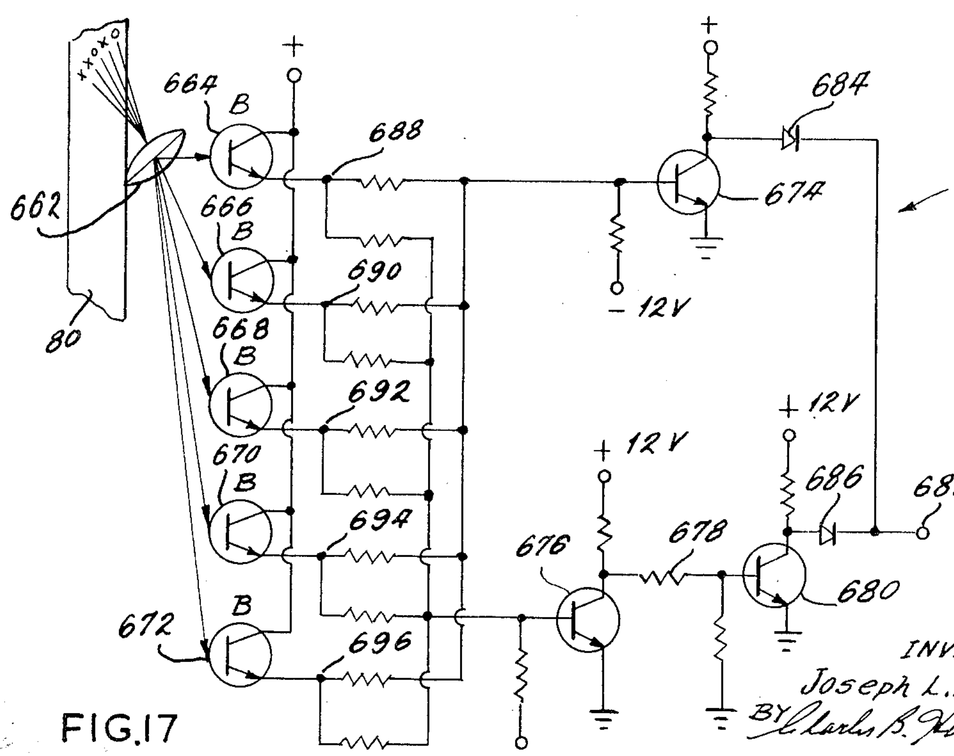


FIG.17

INVENTOR:
Joseph L. Levasseur
BY Charles B. Haverstock
ATTORNEY.

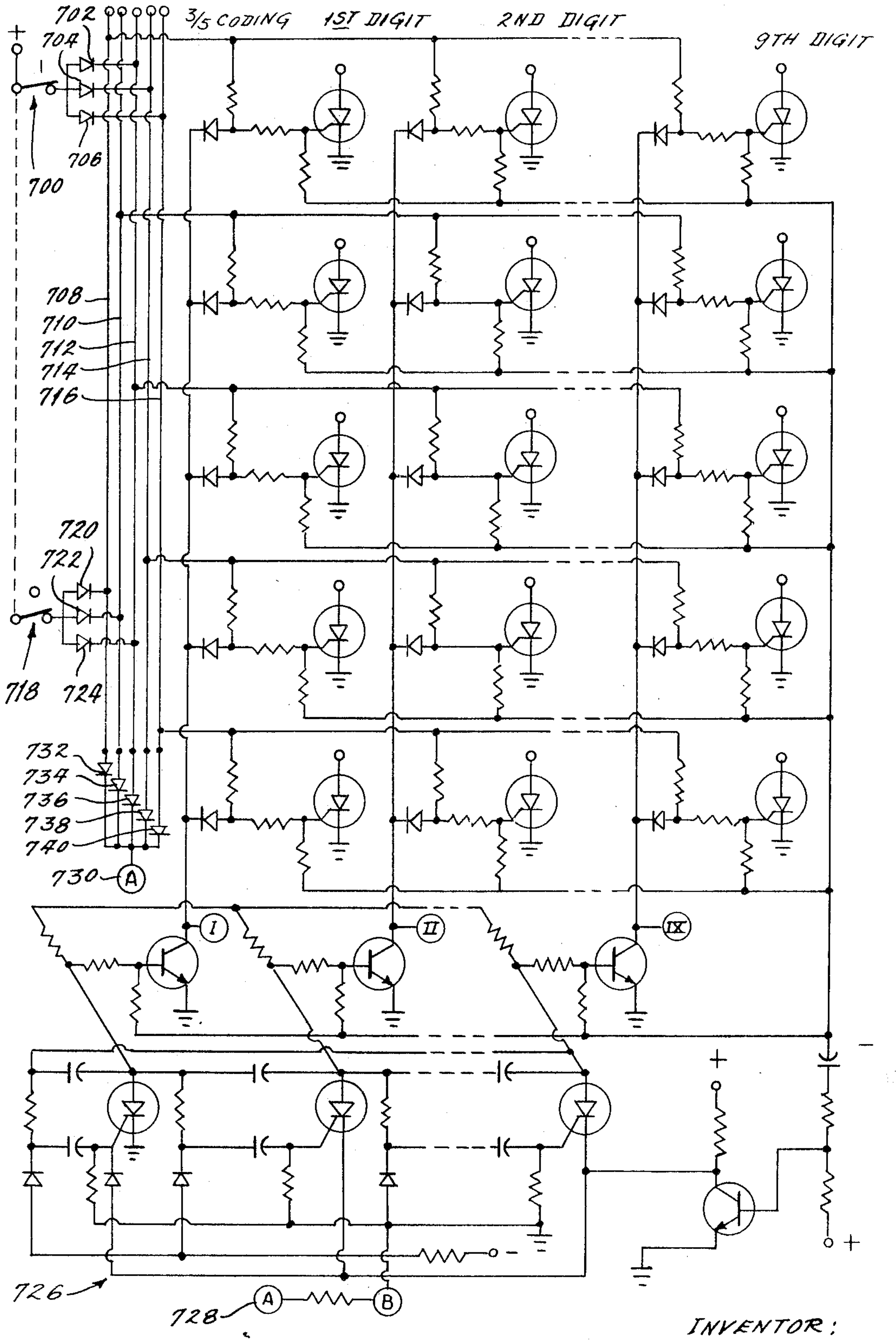


FIG.18

INVENTOR:
JOSEPH L. LEVASSEUR
BY Charles B. Haverstock
ATTORNEY.

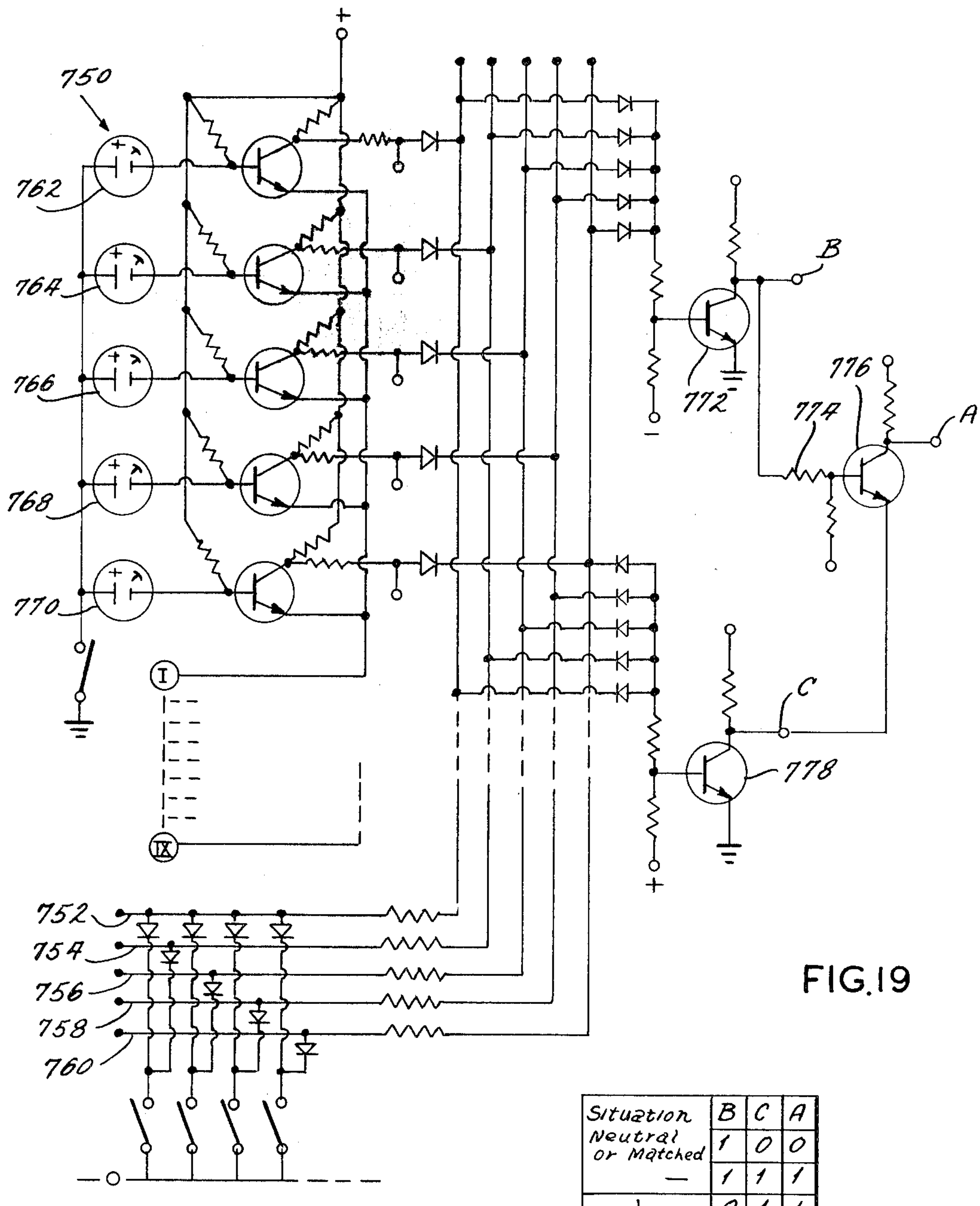


FIG.19

Situation	B	C	A
Neutral or Matched	1	0	0
—	1	1	1
+ —	0	1	1
+	0	0	1

INVENTOR:
Joseph L. Levasseur
BY Charles B. Haverstock
ATTORNEY.

VERIFICATION MEANS FOR CHARACTER GROUPS

The invention disclosed herein represents a substantial improvement over an invention of the same inventor filed Aug. 22, 1966 under Ser. No. 580,135 and entitled "Apparatus And Method Of Authenticating Holders Of Identification Symbols."

The present invention relates generally to means and apparatus for comparing a character group usually represented in coded form such as a character group that represents a particular account number with a plurality of other coded character groups that represent other account numbers to determine if the particular account number is or is not included in the plurality of character groups with which it is being compared. More particularly the present invention includes apparatus for making a relatively large number of such comparisons in a very short time and with minimum of effort on the part of the operator. The present invention has particular application in the credit and related fields including any field where it is necessary or desirable to be able to rapidly find out if a particular number or other form of identification means is or is not included in a listing of such identification means. As such, the present device has particular application as a means to protect merchants and others who extend credit to persons who present credit cards when making a purchase. To this end, the present device provides means which will enable the merchant or other salesperson in a matter of seconds to determine if there is any known reason why he should not extend credit to a customer who presents a credit card. It is not intended, however, to limit the present invention to the credit or credit card field and it will become readily apparent from the disclosure that follows that the invention has many other possible uses and applications including any application where it is desired to search a listing for a particular item.

Many businesses extend credit to their customers through the medium of credit cards and similar devices and the present invention for the sake of simplicity will be described in connection with this particular use. Credit cards are frequently lost, stolen, forged or otherwise misappropriated or misused and when misused they can result in considerable loss to the company extending the credit and possibly also to the person whose card has been misappropriated. At the present time there is no known reliable and fast way for a merchant or other salesperson to quickly, accurately and cheaply distinguish by means entirely located at the point of sale between a proper use of a credit card and a use that for some reason is know to be improper or unlawful. This is true even though the merchant may have available lists of credit card numbers that are known to be objectionable for some reason. Many efforts have been made to try to solve this problem including providing each merchant and/or sales outlet with frequently updated lists of known lost, stolen or otherwise objectionable credit card account numbers which the merchant is expected to search each time a credit card is presented. Such lists may contain many pages of account numbers which are in small print and are difficult and time consuming to search and to compare with the account number on each credit card as it is presented by a customer. Such lists are also easily damaged and misplaced, are often not available to every salesperson, and often the merchant will not destroy old lists when replacements are received thereby complicating the process. Such lists are also expensive and time consuming to prepare and costly to distribute or mail, and for these and other reasons many merchants find it too costly and time consuming to use them and prefer instead to assume the risk of occasional losses rather than spend the time necessary to use the lists. This has resulted in considerable loss and has made the credit card a prime tool for larceny and other related offenses.

The present invention overcomes these and other disadvantages and shortcomings of the known time consuming and cumbersome verification means and processes by placing in the hand of each merchant and at each point of sale a relatively simple and easy to operate means which are extremely fast acting and highly accurate for automatically comparing the account number of each credit card at the time it is presented against a master list of credit card account numbers that are known to be objectionable for some reason. The subject means can perform a complete comparison and verification operation between the card number and each number in the list even when the list contains hundreds or thousands of listings in a matter of a few seconds or less usually not substantially longer than the time required for the salesperson to dial the account number, and the entire verification operation can be done at the same time that the account number embossed or otherwise applied to the card is used to make the required impression on the sales slip for later billing purposes. It is also anticipated to include means in the subject device to automatically sense or read the account number embossed in the credit card so that the salesperson need perform no extra duties beyond what is already presently normally required when making a sale.

It is therefore a principal object of the present invention to provide quick and accurate means for comparing or checking a number such as an account number against a listing of other account numbers.

Another object is to provide relatively compact and inexpensive means which can be used at or near the point of sale for checking and verifying whether a credit card is acceptable or for some reason is known to be unacceptable.

Another object is to provide improved and simplified character group verification means.

Another object is to provide simplified means for coding character groups.

Another object is to provide improved electro-optical reading and sensing means.

Another object is to reduce or eliminate losses due to extending credit to holders of credit cards and like devices that are known to be objectionable for some reason.

Another object is to provide means for making better use of information supplied to merchants and others who extend credit to credit card holders including information as to credit card account numbers and other identification means that are known to be objectionable for some reason.

Another object is to provide a salesperson with means by which he can discover an unauthorized use of a credit card with little or no extra effort or time on his part.

Another object is to provide improved means for storing and handling data and particularly data contained in coded form.

Another object is to provide improved means for storing, moving and reading data including lists of identifying information.

Another object is to simplify the production, handling, and dispensing of lists of data.

Another object is to provide fast accurate means for searching lists of information.

Another object is to provide improved means controlling and regulating the speed and direction as well as the tension on a filmstrip as it moves between two spools.

These and other objects and advantages of the present invention will become apparent after considering the following detailed specification which discloses several embodiments thereof in conjunction with the accompanying drawings, wherein:

FIG. 1 is a perspective view of a character group verification device constructed according to the teachings of the present invention and specifically for use in verifying whether an account number assigned to a particular credit card is or is not known to be objectionable for any reason.

FIG. 2 is a simplified top view of a credit card or similar device encoded with information which can be used in a device such as the device of FIG. 1;

FIG. 3 is a perspective view showing one form of programming means for use in the device of FIG. 1;

FIG. 4 is a top plan view of data storage and transport means for use in the subject device;

FIG. 5 is a schematic circuit diagram of one form of comparison means for use in the device of FIG. 1;

FIG. 6 is a schematic circuit diagram of means for controlling the operation of the data storage and transport means of FIG. 4;

FIG. 7 is a top plan view showing a more simplified form of programming means for use in the subject device;

FIG. 8 is a side view partly in section showing one form of optical reading means for use with the present device;

FIG. 9 is a schematic wiring diagram showing a modified form of the control means for the data storage and transport means of FIG. 6;

FIG. 10 is a schematic diagram showing an optical system including a light source for use with the present device;

FIG. 11 is a perspective view showing another modified form of coding means for use with the present device;

FIG. 12 is an enlarged top plan view of the coding means shown in FIG. 11;

FIG. 13 is a cross-sectional view taken on line 13–13 of FIG. 12;

FIG. 14 is a schematic circuit diagram of a self-testing circuit for use with the present device;

FIG. 14*a* is a fragmentary plan view showing a portion of the data storage means having a self-test pattern thereon;

FIG. 15 is a schematic circuit diagram showing a total bit parallel comparator circuit for use with the present device;

FIG. 15A is a circuit diagram showing the construction of one stage of the bit comparator circuit of FIG. 15;

FIG. 16 is a schematic circuit diagram showing a data conversion circuit for converting information from serial bit to parallel bit form;

FIG. 17 is a schematic circuit diagram showing a portion of a circuit used to verify that an account or other identifying number has been fully and accurately encoded in each of its digit positions;

FIG. 18 is a schematic circuit diagram of an electronic encoder circuit for use with the present device;

FIG. 19 is a schematic circuit diagram showing another embodiment of a code verifier circuit for use in the present device; and,

FIG. 20 is a plan view of a data storage device or film strip having coded digital and control portions thereon for use in the present device.

Referring to the drawings more particularly by reference numbers, number 30 refers generally to a verification device constructed according to the present invention and designed specifically to be used to verify whether the account number or other customer identification means appearing on or assigned a credit card or like device is or is not objectionable for some known reason. In other words, the device or means 30 provides means by which a merchant or salesperson can determine quickly and accurately and with minimum expense and effort if a person asking for credit by presenting a credit card is presenting a credit card that is or is not known to be objectionable for any reason. The form of the verification means 30 shown in FIG. 1 includes a housing 32 having a recess or slot 34 formed in its upper surface into which a credit card such as the card 36 can be accurately positioned during verification of its account number 38 printed or embossed thereon and/or encoded in the card as by a row of spaced holes or apertures. The device 30 includes both electrical and mechanical components and can, if desired, be incorporated into or made part of a more conventional device such as a device which is used to imprint information such as the customer's name and address which is formed by raised or embossed symbols on the credit card onto a sales slip. The sales slip imprinting means and associated mechanisms are not parts of the present invention and are mentioned merely to illustrate one of many possible means or devices with which the present verification means can be combined. With the present device it is desired to compare and/or search to see if a particular number or other form of identification usually in some coded form is included in a group or listing of other numbers of identifications. The things being compared may be similarly or complementarily encoded or they may be in some other form such as in series or parallel bits and one or both codes may be formed on some carrier or storage means such as on a roll of film, a magnetic tape or drum or on some other storage device or medium. A typical carrier and one of many forms of coded listing thereon as well as other control information will be described later.

There are many possible uses and applications for the subject device in addition to the credit card application described in this specification, and it is not intended or suggested that the invention be limited to one or even several particular uses or applications. In general, however, the invention can be used in any application where one or several numbers or other identifying means usually in coded form are to be compared with lists or groups of similar numbers or identifications for searching, verification, and other purposes.

As already stated, it is common practice in many businesses which extend credit to persons presenting credit cards at the time of making a purchase to keep lists of credit card account numbers assigned to cards that for some reason are known to be lost, stolen, misplaced, misappropriated, counterfieted or otherwise known or suspected to be in the hands of an unauthorized person or a person with a poor credit rating. Such lists are regularly updated and supplied to the merchants or salespeople who are then expected to use them by searching them visually for the account number on each card as it is presented. These lists can become long, detailed and difficult and time consuming to use, and as a result they are not used as much as they should be and are misplaced, damaged and not destroyed when replaced by more up to date lists. As a result losses occur.

With the present device, on the other hand, it is expected that an updated listing in coded form of known objectionable account numbers in some easy to handle and mail form such as on a filmstrip or magnetic tape is provided to each merchant instead of the more conventional printed lists, and these films or tapes are then installed in the subject device and are used to automatically compare the account number on each presented card with all of the account numbers on the list in a matter of a few seconds and with little or no extra effort required by the salesperson. To be suitable for this purpose the present device must be rugged, small, compact, reliable and fast acting, and it must be relatively inexpensive to construct so that it can be purchased in sufficient quantities to be used at points of sale. The film strips employed must also be inexpensive to prepare and easy to install.

The form of the device shown in FIG. 1 includes in addition to the recess 34 for the credit card 36, movable dial means 40 which can be operated by the salesperson to enter into the device or machine the account number 38 appearing on the card 36. This is accomplished a digit at a time by placing the index finger or the end of a pen or pencil into a selected one of the holes 42 in the movable member 40 and moving the member 40 forwardly until stopped by engagement with a fixed stop 44. The member 40 is then released and spring restored to its original position somewhat like the dial means used on dial telephones. This procedure is repeated once for each digit of the account number 38 until the entire account number has been entered. At the same time the account number will appear at window 46 which is located so that the operator can, if he likes, make a quick visual comparison between the account number on the card and the number he has dialed. After the account number has been entered the operator presses a button 47 to make the necessary comparison between the dialed account number and a listing of the other account numbers which are coded onto a filmstrip. This comparison can be accomplished in a few seconds even when the list on the filmstrip includes thousands of account numbers.

The device 30 also includes two indicator lights 48 and 50 to indicate whether the dialed account number is or is not included in the listing. One of the indicator lights produces a red signal to indicate that the account number is in the listing and the other produces a green indication to indicate that the device or machine did not find the account number in the listing. Many different forms of the subject device **30** are possible including several different forms which will be described herein as modifications. It is also contemplated as indicated above to combine the present device with known means for imprinting information embossed on a credit card onto a sales slip. This application will also describe means other than those shown in FIG. 1 for entering the account number manually or automatically, and it is also contemplated to use credit cards that have holes or apertures located to encode the account number in the card so that the card can be used for a more direct optical comparison with the listed account numbers.

FIG. 2 shows a form of the credit card **36** which can be used with the present device. The account number on this particular credit card is embossed in number form and is also present in coded form by a row of aligned holes or apertures **52** which extend completely through the credit card. The holes **52**, as aforesaid, are provided to enable the card to be used for a direct optical comparison without requiring that the operator dial in or enter the account number as described above. The holes **52** are located in the card at positions which correspond to and represent the various digits of the account number **38**. In FIG. 2 the card is shown for illustrative purposes positioned in alignment with a graph **54** which is subdivided by relatively heavy graph lines **56** into major or digit divisions each of which is further subdivided by lighter graph lines **58** into five small subdivisions. The holes **52** are located in the card in the appropriate subdivisions, and two holes are required in the space between the heavier graph lines **56** to represent one digit of the account number. For example, for the nine digit account number shown as No. **098,765,432**, the first digit which is 0 is represented by two holes **52** located in the first and second subdivision between the first two heavier graph lines **56** at the left end of the card. The second digit of the account number which is **9** is represented by holes in the first and third positions, the third digit **8** by holes in the first and fourth positions, the fourth digit **7** by holes in the first and fifth positions, the digit **6** by holes in the second and third positions, the digit **5** by holes in the second and fourth positions, the digit **4** by holes in the second and fifth positions, the digit **3** by holes in the third and fourth positions, the digit **2** by holes in the third and fifth positions, and the digit **1** would be represented by holes in the fourth and fifth positions. The selection of the hole locations to represent the different digits is completely arbitrary and can be varied as desired. The particular form of code just described is sometimes referred to as a two-out-of-five constant ratio code which means that there are always two holes in five possible locations to represent each digit. If the number of digits in an account number is greater or less than the nine digit number shown, the number of holes and hole positions will be increased or decreased correspondingly. It is also possible with slight modification to encode alphamerical information as by a different constant ratio code having a sufficient number of variables such as for example by using a three-out-of eight position code and so forth. It is also contemplated instead of using holes in the credit card to use other forms of coding means including coating one surface of the credit card with a highly reflective material such as silver and locating nonreflective dots at positions corresponding to the hole locations without departing from the spirit or scope of the invention.

Referring again to FIG. 2 wherein a nine digit account number is shown encoded in the credit card, it can be seen that with five possible hole positions for each digit a total of 45 possible hole positions are provided, 18 of which will have holes in them. This particular form of encoding is shown and described for illustrative purposes only but does not necessarily represent the best or the only way to encode, and in fact other forms of coding and coding means will also be described herein including mechanical and electrical coding means that do not require any holes in the credit card as such. Some means for encoding, however, will be required both for encoding the credit card identification number and the numbers included in the listing. It is also anticipated to include means for sensing an account number embossed or otherwise appearing on a credit card and to use outputs of the sensing means to automatically set up or establish the account number for comparison with the listing thereby relieving the salesperson of the task of dialing or otherwise entering an account number into the machine. Provision may also be made in the card and/or on the film along one or both edges thereof or at some other suitable location for information used for control purposes as will be explained.

As further protection against possible fraud or misuse of a credit card, the holder may also be assigned another identification number, letter or symbol which does not appear on the card but which the owner of the card must remember and tell the salesperson at the time of purchase. For example, the owner of the card may be required to remember a special number such as "67" or a special combination of letters such as "MZ" which will be told to the salesperson at the time the card is presented, and the salesperson must enter this information along with the assigned account number to complete the identification of the customer for comparison purposes. If this were done it would make it much more difficult for an unauthorized person to use a card because he would not be likely to know the special code number or letters.

FIG. 3 shows another form of dialing means **60** used for entering an account number into a machine such as the machine **30**. The means **60** include a spring restored operator member **40*a*** which is rotated clockwise by the operator placing his finger in a selected one of the holes **61** corresponding to the number to be dialed. The member **40*a*** is then rotated until stopped by the finger bumping into a fixed stop member **62**. This rotates an assembly **63** through a corresponding angular displacement. Each time the assembly **63** is rotated it rotates one of a plurality of rotatable indicator members **64** in a coding and indicator assembly **66**. For example, the first operation of the member **40*a*** rotates the indicator member **64** in the first number position and in so doing also latches the member **64** by means of an associated latch member **65** in a position corresponding to the digit that has been dialed. The latching of the first member **64** also sets up the mechanism in the assembly **66** so that the second operation of the member **40*a*** rotates and latches the second member **64** in the second account number position and so on until an entire account number has been entered in the assembly **66**. Devices capable of entering numbers a digit at a time in the manner similar to that described are known and available and this feature by itself is not at the heart of the present invention.

The indicator members **64** are also provided with sets of holes **68** therethrough located at spaced locations therearound and coded as aforesaid to correspond to the various possible digits that can be dialed. The holes **68** in the members **64** are formed at locations such that when all of the members **64** in the assembly **66** are latched in positions a line of the holes **68** will be formed across the assembly **66** to represent the entire account number. The position of this line of holes **68** is shown at the bottom of the members **64** in FIG. 3. The members **64** may also have the various possible digit numbers **69** optionally printed or otherwise formed on their outer surfaces so that the account number will be visible through an opening such as the opening **46** (FIG. 1) for quick visual verification by the operator.

The members **64** are shown as being substantially annular in shape, and a light source **70** including a housing **72** with a bulb **74** therein is positioned extending through the members **64**. The housing **72** is shown as being a closed end tubular member having a narrow slit **76** formed along the lower side thereof in position to be in alignment with the row of apertures or holes **68** which represent the dialed-in account number. This means that the light from the bulb **74** will pass through the slit **76** and through the holes **68** for reasons that will be explained.

A film strip **80** with coded information on it is mounted for movement adjacent to the assembly **66** past the row of holes **68** which represent the dial account number. The filmstrip **80**, sometimes called a memory carrier, is an elongated flexible transparent filmstrip such as a strip of movie film and is prepared by photographic means to have rows of opaque areas or dots **82** arranged in adjacent rows, each of which represents an account number to be compared with the account number that has been dialed into the assembly **66**. The strip **80** may also have other information photographically recorded on it for control purposes. The account numbers coded on the strip **80** may represent account numbers which for some known reason are known to be objectionable, and the present invention is designed to compare the dialed-in account number in the assembly **66** or other means as will be described with all of the account numbers photographically recorded on the filmstrip **80**. If the dialed-in account number or other coded information is not on the filmstrip **80** this means there is no known reason why credit should not be extended to the person presenting the credit card. On the other hand, if the dialed number is on the strip it will be sensed as the film moves through the device and used to energize a red light or some other suitable warning device to indicate to the operator that there is some known reason why credit should not be extended to the one presenting that particular card. The same could also be used as a "good guy" check to search a list to make sure that the number is on the list before credit will be extended. There are probably as many possible applications for a "good guy" check as there are for a "bad guy" check.

FIG. **4** shows the mechanism for supporting and moving the film **80** as the account numbers thereon are compared with the dialed-in account number. This mechanism includes a pair of spaced spools **84** and **86** between which the film strip is alternately wound and unwound and between which the strip moves when being read or sensed. The strip **80** extends between the spools **84** and **86** and is supported and accurately positioned and guided during movements therebetween by spaced guide rolls **88** and **90**. During said movements the film also moves past an apertured member **92** that has a row of holes **94** positioned to be in alignment with the slit **76** in the lamp housing **72** and with the row of holes **68** dialed into the assembly **66**. The holes in the apertured member **92** are also positioned to be aligned with the rows of opaque areas or dots on the film strip. In the form of the device disclosed, the holes **94** in the member **92** are at an angle of about 45° relative to the transverse dimension of the strip **80** so that the coded rows of dots on the filmstrip can be longer than the width of the strip and also so that relatively narrow film can be used without sacrificing accuracy. This is not essential but is usually desirable because it not only permits use of narrower film but it also enables the present device to be constructed to use standard width films which has obvious economic advantages.

The spools **84** and **86** are mounted for rotation respectively on shafts **96** and **98** of motors **100** and **102**, and the motors **100** and **102** are connected and controlled by a motor control circuit such as shown in FIG. **6** (or in FIG. **9**). In the form shown only one of the motors can be energized at a time to be the driving motor that moves the filmstrip **80** while the other motor may be energized to provide drag for maintaining the film in a taut condition and to control the film speed. The motors also are constructed to drive their associated spools in opposite directions so that on alternate operation of the device the film will be moved in opposite directions through the device. For example, one of the motors rotates its shaft in a clockwise direction when it is the driving motor, and the other motor rotates its shaft in the opposite or counterclockwise direction when it is the driving motor. Bear in mind, however, that the film need move in one direction only between the spools during each operation.

The motor control circuit of FIG. **6** is under control of switch means and control markings on the filmstrip **80** including the opaque markings **104** and **106** located along one or both edges thereof. The markings **104** and **106** control light passage through the associated portions of the film and this is sensed by light sensitive means which produce signals to control the direction and speed of movement of the filmstrip and the stopping of the filmstrip at the conclusion of each operation. A special aperture **108** is located adjacent one or both ends of the member **92** to read the motor control markings **104** and **106** and a corresponding registering aperture may also be provided in the assembly **66** for this purpose.

A sensing unit **110** shown in FIG. **3** in block form is provided to respond to light from the light source **70** that is able to pass through the members **64** and the film **80**. The sensing unit **110** includes optical and other light sensitive means or elements capable of responding to the light that is able to pass through the housing slit **76**, the apertures **68** in the member **64**, the apertures **94** in the member **92** and is not blocked by the coded opaque areas **112** on the filmstrip **80**. In the particular form of the invention shown the coded opaque areas **112** on the film are complementary to the holes **68** in the members **64**; that is, when a matched condition exists which is a condition when the dialed account number in the assembly **66** is the same as an account number on the filmstrip **80**, the opaque areas on the filmstrip will block all right from the bulb and prevent any light from reaching the sensing unit **110**. This condition will exist only for the brief moment that the two identical numbers are in registration as the filmstrip is moving between the spools **84** and **86**. This same condition can also be produced more directly by using a credit card such as the credit card **36** of FIG. **2**, which has the account number coded in it by the row of holes **52** positioned as described above or possible by having a silvered card with nonlight reflective dots as aforesaid. However, this may not be as desirable as having the coding means such as the means **66** or other forms which will be described later separate from the cards themselves because of the economics required to issue new credit cards and for other reasons. It can therefore be seen that with the subject device a momentary complete blockage of light will be produced each time a matched condition is sensed to indicate that the dialed number is included in the coded listing on the filmstrip **80**. This condition will cause means to be energized to advise or warn the operator not to extend credit to the holder of that particular card. If, on the other hand, any light is able to get through from the light source **70** to one or more of the sensing elements in the sensing unit **110** in any one of the 45 odd possible positions at all times as the film is moving between the spools **84** and **86** it indicates some mismatch or some difference between the dialed account number and each of the coded account numbers represented by the rows of opaque dots on the filmstrip **80**. Under these latter circumstances a different output will be produced and if this occurs at all times as the film is moving it means that the dialed number is not included in the listing on the filmstrip and that there is no known reason not to extend credit to the person presenting the card. The subject device can also be constructed to produce an output only under conditions when a perfect match exists and not to produce any signal or indication when everything is all right without changing the nature of the invention although it is usually desired to produce an output under both conditions as this may increase the operator's confidence that the device is working properly.

FIG. **5** shows the details of the construction of a typical sensing unit which is positioned to receive and respond to light from the light source **70** after it has passed through the assembly **66** and through the film **80**. The unit **110** includes one or a plurality of lenses **114** positioned to receive and pass any light from the source **70** that is able to pass through the slit **76**, the holes **68** in the members **64**, the filmstrip **80** and the apertured member **92**. The particular form of device shown in FIG. **5** has one lens for receiving and focusing light received through the five possible aperture positions in each of the members **64**. In other words, one lens is provided for passing all of the possible light in the positions that represent each digit of the account number. The light thus received, if any, is focused by the associated lens onto an associated light sensor device **116—132**. If light reaches any one of the photocells **116—132** it means there is a mismatch between the dialed account number and the coded account number on the filmstrip and the sensor or sensors that receive this light will then go from a nonconducting to a conducting state and in so doing will cause another circuit location **134** to go from a "zero" or "off" state to a "one" or "on" state due to the forward biasing that is produced on one or more of circuit transistors **136, 138** and **140** connected as shown. This also occurs when the device **30** is turned on. If, on the other hand, all of the light paths to the sensors are simultaneously blocked which occurs momentarily whenever a matched condition occurs, the circuit location **134** will then go to its "zero" or "off" condition to indicate the matched condition.

Whenever the circuit location **134** is at a high voltage or "on" condition indicating that light has been received at one or more of the sensors, a relatively high voltage will be on the base of a transistor **142** to cause it to conduct thereby reducing the voltage on its collector electrode to at or near ground potential. This in turn reduces the voltage on the base of a succeeding transistor **144** causing it to be cut off and preventing an impulse from reaching the control electrode **146** of a silicon controlled rectifier (SCR) **148**. Hence, whenever light reaches any of the sensors in the sensing unit **110** which is the condition for a mismatch, the SCR **148** will remain in its inoperative or nonconducting condition indicating that at least so far as that comparison is concerned the credit card is valid.

If the credit card account number is identical to an account number coded on the filmstrip **80** light will momentarily be prevented from reaching any of the sensors **116—132**. When this occurs the circuit location **134** will momentarily go to a low or zero potential condition thereby momentarily cutting off the transistor **142** causing its collector to go to a higher potential which will be applied to the base of the transistor **144**. This will cause the transistor **144** to momentarily conduct thereby increasing the potential on the control electrode **146** of the (SCR) **148** turning the SCR on. The SCR **148** will thereafter remain on until later turned off as will be explained. When the SCR **148** is turned on it conducts and causes current to flow through the filament of red light **150** (light **48** in FIG. **1**) to produce a warning or indication of the matched condition. The red light will thereafter remain on until the potential on the anode electrode **152** of the SCR **148** is removed.

It should be noted that the light from the light source **70** will be able to reach the sensor unit **110** at all times except when a perfect matched condition exists, and this includes those times when the strip **80** is moving between positions when adjacent rows of dots **112** are registered with the rows of holes **68**. This condition is important to enable the device to distinguish between matched and unmatched conditions and helps to prevent false outputs.

When the potential on the base electrode of the transistor **142** is at a relatively high potential which is the usual condition when no exact comparison exists between the credit card account number and any of the rows of opaque areas **112**, the transistor **142** will conduct and its collector electrode will be grounded. At the same time, the potential on the anode electrode **152** of the SCR **148** is at a relatively high potential because at this time the SCR is not conducting. This high SCR anode potential is also applied to and through a diode **158** and a resistor **160** to the base of another transistor **162** causing it to be in a conducting condition. Whenever the transistor **162** is in a conducting condition current will flow from a positive voltage source through a green light **164** (light **50** in FIG. **1**) and through the conducting transistor **162** and resistor **166** to ground. The green light **164** will therefore not be energized until at or near the end of the cycle when the projector bulb **70** turns off assuming of course that the red light has not been energized. Once the SCR **148** conducts, however, and causes the red light **150** to be energized it will remain in this conducting condition until its anode potential is removed as already stated. Hence it can be seen that either the red or the green light, but not both, will be energized during each cycle of operation. In this regard it should also be noted that the diode **158** prevents the green light **164** from being energized after the red light **150** is energized by providing a discharge path for any signal that might try to be applied to the base of the transistor **162**.

The time duration that a positive potential is present on the control electrode **146** of the SCR **148** depends upon the speed of film **80**, the size of the dots or opaque areas **112** and the tolerance provided between the dots and the holes with which they register. It has been found that even at relatively high film speeds and with opaque areas **112** that are just slightly larger than the openings **94** in the member **92** the subject device is still able to detect and distinguish between matched and unmatched conditions and produce the required outputs. It has also been found that there are certain advantages in using square opaque areas or dots on the filmstrip rather than round or other shaped dots although other shapes including round could also be used. The same is also true of the shapes of the holes in the members **64** and **92**. The present device can also be constructed to have one or more light sources or bulbs and one or more sensors and lenses to read all or different numbers of the data channels. While the form of the device as disclosed in FIG. **5** has one light sensor for sensing light at five possible dot positions it is possible and contemplated to use one light source and one light sensor to sense light from all or any number of the possible dot positions without departing from the spirit and scope of the invention. To some extent the selection of the light, lens and sensor means will also depend on the length of each row of dots, how the dots are arranged, and the kind of optics employed.

Referring again to FIG. **5**, a relay including a relay coil **170** which will be referred to as the read relay is shown having associated relay contacts **172** connected between the emitter electrode of the transistor **144** and ground. The read relay coil **170** is provided to control the reading or sensing operation and is energized after the film **80** has reached one of its two end positions of travel by means which will be described later. When energized the read relay contacts **172** close and prevent the SCR **148** from being turned on by grounding any possible signal that might otherwise be present on the emitter of the transistor **144**. This prevents the possibility of producing a false red light signal after the strip **80** has reached or nearly reached the end of its travel. The circuit for energizing the relay coil **170** will be described in connection with FIG. **6**. The other circuit elements shown in FIG. **5** but not specifically mentioned are mostly resistors and capacitors which have their values chosen to make the circuit operative for the purposes intended and will not be described in detail.

Referring again to FIG. **3**, each of the indexing members **64** which constitute the assembly **66** has a plurality of indexing teeth **174** which correspond respectively to the various possible digit positions to which it may be set. The teeth **174** are provided to properly position and maintain the members **64** in the various possible setting positions to which they are dialed. When the dialing member **40*a*** is rotated by the operator to a particular setting position it moves through a required angular displacement and in so doing moves a pawl bar **176** which has attached thereto hinged pawl members **178—194** corresponding to each digit of the account number. Each time the member **40*a*** is dialed a different selected one of the pawls engages the teeth **174** on the corresponding member **64** and rotates the member **64** through a predetermined angular displacement. Each time the bar **176** moves it also moves another pawl **196** which cooperates with a ratchet member **198** attached to one end of a cam shaft **200** and causes the cam shaft **200** to also rotate a predetermine distance. The cam shaft **200** has a plurality of cam lobes **202** located therealong at positions corresponding to the various members **64** so that each time the cam shaft **200** is rotated it will be advanced the same predetermined amount to position a different cam lobe **202** against its associated pawl **178—194**. This is done so that on the succeeding operation of the member **40*a*** a different pawl will be moved into position for engaging the lowest tooth **174** of the adjacent member **64**. In this way, the members **64** are set one position at a time during each succeeding operation of the member **40*a***. A spring member **204** is also provided to restore the member **40***a* to its initial reset position after each dialing operation. A plurality of holding pawls **65** are also provided to retain the members **64** in their dialed positions by engaging the appropriate teeth **174** and to prevent losing the setting of the member **64** just set when the pawl bar **176** is restored after each dialing operation. The holding pawls **65** are mounted on a shaft **205** with a reset lever **206** which is depressed to release all of the members **64** after a verification operation is completed so that springs **208** of which there is one for each member **64** can restore them to their initial reset condition in readiness for the next operation. The springs **208** are shown connected between a rod **210** at one end and the members **64** at their opposite ends. The particular form of programming means disclosed is included for illustrative purposes and it is anticipated that many other forms of programming means including others which will be described herein as modified forms can also be used without departing from the spirit and scope of the invention.

FIG. **6** is a diagram of the control circuit for energizing and deenergizing the drive motors **100** and **102** (FIG. **4**) under control of the opaque areas **104** and **106** positioned adjacent to one or both edges of the memory carrier or film **80**. The same light source **70** (FIG. **3**) may be used to provide the light for reading or sensing the areas **104** and **106**. In this case, however, the light passes through other apertures located to be in alignment with the opaque areas **104** and **106** as they move with the film. These include the aperture **108** in the member **92** (FIG. **4**). The light that passes through the aperture **108** and is interrupted by the opaque areas **104** and **106** impinges on another light sensor **212** as the film moves in the device.

The motors **100** and **102** are identified, respectively in FIG. **6** as the counterclockwise and the clockwise motors and are connected, respectively, by leads **214** and **216** through switch means, which will be described later, to one side of a supply voltage source, such as to one side of an AC line represented by plug-in receptacle **218**. The connection from one side of the plug **218** to the motors is through a switch **220** and through normally open motor control relay contacts **222**. The clockwise rotating motor **102** will be energized to be the driving motor whenever a circuit is completed from its opposite side to the other side of the power supply. This circuit is through normally closed direction control relay contacts **224**. When the relay contacts **224** are in their transferred position, on the other hand, the circuit just described to energize the clockwise motor **102** is not available, and instead another circuit is closed to energize the counterclockwise rotating drive motor **100**. This circuit is through the normally open instead of the normally closed side of the direction control relay contacts **224**.

Whenever one of the motors **100** or **102** is energized another circuit will be also established through other direction control relay contacts **226** which are ganged to operate with the contacts **224** to provide some energy to the nondriving motor which is the motor that is not directly across the line. This is done for the purpose of controlling the speed at which the memory carrier or film **80** travels and to provide controlled braking force which keeps tension on the film as it moves. Speed control is provided by a circuit which includes capacitor **228** in the motor circuits. The capacitor **228** is charged by the same source voltage which energizes the motors through a circuit which includes a diode **230** and a limiting resistor **232**. The discharging of the capacitor **228** is in turn controlled by a circuit which includes a transistor **234** and resistors **236** and **238** connected through normally closed motor control relay contacts **308** as will be explained. In the form of the device shown in FIG. **6** the motors **100** and **102** are shaded pole motors, and the direct current provided to energize the nondriving motor by the circuit just described causes the motor to oppose the action of the driving motor thereby producing drag on the film **80** and keeping the film taut. The amount of drag produced also controls the speed of film movement and is under control of the opaque areas **104** as will be described.

When the film is moving through the device, the spaced opaque areas **104** move past the aperture **108** in the member **92** (FIG. **4**) and in so doing cause the light from the light source **70** to intermittently impinge on the photocell **212**. The rate at which the opaque areas **104** move past the aperture **108** determines the frequency of the signals produced in the photocell, and these signals are applied to several different circuits including a speed control circuit. These signals are more specifically applied to the base of a transistor **240** through a capacitor **242**. The transistor **240** is in am amplifier circuit which has an output produced on its collector when an input is applied to its base, and the outputs thus produced are applied to one side of capacitor **244** and resistor **246**. The capacitor **244** and the resistor **246** together produce an output impedance which is inversely proportional to the signal frequency so that the signal on the output side of the capacitor **244** is proportional to the speed of the film **80**. This signal appears on one side of diodes **248** and **250** which are connected to full wave rectify the output signal and to produce therefrom a negative output which operates to reduce the normal positive potential that appears across another capacitor **252** when no film movement is taking place. The value of the positive potential on the capacitor **252** is established by adjusting a potentiometer **254** which is connected through other fixed resistors **255** and **256** to a positive source. This adjustment establishes a threshold condition which forward biases another transistor **257** and causes the collector electrode thereof to be in a normally substantially low or zero voltage condition. This condition of the transistor **257** will persist until the film speed is such that the inputs produced by the spaced areas **104** which chop the light reaching the elements **212** are sufficient to overcome the threshold setting established for the transistor **257**. When the threshold potential is overcome the transistor will cease conducting and its collector voltage will increase thereby forward biasing another transistor **260** by increasing its base potential. The increase in the base potential of the transistor **260** is proportional to the speed of the film **80** and the size and spacing of the opaque areas **104**. The operation just described in combination with the transistor **234** results in a closed loop speed control circuit in which the conducting condition of the transistor **234** plays a key role in regulating the amount of current that can flow through the motor **100** or **102** whichever happens to be the nondriving motor. A zener diode **262** which has relatively low voltage characteristics is also connected from between the resistors **255** and **256** and ground. This zener is in effect across the potentiometer **254** and is included to establish relatively broad avalanche curve characteristics thereby making the speed setting of the potentiometer **254** relatively less critical. This is an advantage because it smooths the operation of the speed control means and prevents sharp or jerky corrections.

Referring to the upper lefthand portion of the circuit of FIG. **6** there is shown a capacitor **264** which is connected to a source terminal so that it charges whenever the power switch **220** is closed. The source which supplies power to this and other terminals in the circuits of the subject device is supplied through the receptacle **218** which when the switch **220** is closed is connected across a primary transformer winding **266** of a power supply transformer **268**. The power supply transformer **268** has secondary windings which are connected respectively to secondary power circuits **270** and **272**. The secondary circuit **270** is shown as a 12 volt power circuit and the secondary power circuit **272** is shown as an 11 volt output supply circuit. Connections are made from the circuits **270** and **272** to various terminals located throughout the circuits. When the power supply circuits are energized a charge will be established on the capacitor **264** and this charge will forward bias a transistor **274** through a circuit that includes a resistor **276**. This turns on or causes another transistor **278** to conduct and causes current to flow through a motor control relay winding **280** connected in the circuit of its collector thereby closing the normally open relay contacts **222** to supply energy from the input power source to one side of the motors **100** and

102 as aforesaid. Also as aforesaid, the condition of the direction control relay contacts 224 determines which of the motors 100 and 102 will be the driving motor and which will be controlled to supply the braking and speed control. The circuit for controlling the energizing and the deenergizing of the direction control relay means including the ganged relay contacts 224 and 226 will be described later.

It can therefore be seen that the signals generated in the sensor 212 by the movement of the opaque areas 104 and 106 control several functions of the present device including producing changes on the base of the transistor 240 as aforesaid. Also as already stated, these changes produce outputs on the collector electrode 282 of the transistor 240, which outputs in addition to being applied to the capacitor 244 are also applied to one side of another capacitor 284. These latter signals are thereafter applied to diodes 286 and 288 which perform a rectifying operation on them and are then filtered by a circuit which includes a resistor 290 and a capacitor 292. These rectified and filtered signals are negative going signals or pulses and are applied to the base of a transistor 294 to overcome the forward bias which exists thereon because of biasing resistor 296 which has its opposite side connected to the positive 12 volt supply terminal. The resistance of the resistor 296 is selected to be high enough to allow it to be overcome by the initial movement of the film 80 so that collector electrode 298 will be at an initially relatively high positive potential thereby maintaining the forward biased condition of the transistor 274. This forward biased condition is maintained until the initial forward biasing provided by the biasing condenser 264 is terminated by the establishment of a relatively rapid discharge path through a circuit which includes diode 300 and a resistor 302. This relatively rapid discharge path for the capacitor 264 allows for possible interrupted cycling of the subject device.

The read relay coil 170 (FIGS. 5 and 6) is connected in the collector circuit of the transistor 294 and will be energized briefly during the cycling interval when the condenser 264 is being discharged. As discussed above in connection with FIG. 5, the read relay contacts 172 which control the energizing of the SCR 148 are in the emitter circuit of the transistor 144 and when the contacts 172 are closed by the energizing of the relay 170 they ground the emitter and operate to prevent energizing of the SCR 148 during the beginning portion of each operating cycle when one of the motors 100 or 102 begins to move the film strip 80. This is important to prevent false errors from being produced before the film is in its reading position. Thereafter, the read relay 170 will be deenergized and normal operation will take place.

A diode 304 and a resistor 306 are connected in series between one side of the cycling relay coil 280 and the base electrode of the transistor 260. This circuit provides transient protection for the transistor 234 during times when the cycling or motor control relay 280 is deenergized, and when the relay 280 is deenergized it also prevents the motors 100 and 102 from operating. The relay 280 also has another set of normally closed contacts 308 which are connected between one side of the capacitor 228 and the resistor 236 which is connected to the collector of the transistor 234. These contacts connected the capacitor 228 to one side of the motor 100 (or 102) which ever happens to be the dragging or nondriving motor through its normally closed position after a cycling operation is completed. This is done to provide the braking energy for the proper motor at or near the end of the cycle. This also provides a fail safe protection during a power failure or power interruption.

As stated, the direction in which the film 80 moves during each operation depends upon which direction the film moved during its preceding operation. That is, if the film is wound on the spool 84 (FIG. 4) then the motor 102 will be energized to wind it back onto the spool 86 and vice versa. In other words, on every other operation of the subject device the film will move in the same direction and on alternate operations it will move in the opposite direction and this is under control of a direction control relay 310 which includes the associated direction control relay contacts 224 and 226 discussed briefly above. The direction control relay 310 is controlled by another circuit which receives its input from the sensor 212. When the relay 310 is energized it causes the counterclockwise motor 100 to be energized and when the relay 310 is deenergized the clockwise motor 102 is the driving motor. The motor 100 is energized whenever the sensor 212 is unable to sense any light from the source 70 due to the fact that the opaque area 106 on the film 80 is blocking and preventing light from reaching the sensor 212. However, as soon as the film 80 has moved far enough under control of the motor 100 so that the opaque area 106 is no longer blocking the light path to the sensor 212, the relay 301 will be held energized through a holding circuit which is established by the closing of other normally open direction control relay contacts 312.

During the time that the opaque area 106 is preventing light from reaching the sensor 212 it is preventing the sensor 212 from turning on a transistor 314. This places a relatively high forward bias potential on the base electrode of another transistor 316 causing it to be turned on and conduct thereby also turning on still another transistor 318 which transistor is in the circuit for energizing the direction control relay 310. This circuit is available until such time as light is able to reach the sensor 212 at which time the relay hold circuit takes over as just described. A condenser 320 and a series connected resistor 322 are connected across the coil of the direction control relay 310 to provide a delayed dropout of the relay 310 and to make sure that the voltage applied by the capacitor 228 discussed above in connection with the motor circuits is directed to the motor that should receive the braking potential at the concussion of the operation. When the film is moving through the device from one spool to the other it will reach a point near the end of its travel when it will run out of the opaque areas 104 and into an end area on the film where there are no opaque control areas and where the film is transparent. As soon as the last opaque area 104 has moved past the read position, the subject device will be controlled to stop the film. Also, the device will in effect be mostly turned off except for the indicator means. The film will actually come to a stop at some point after the test pattern at the end of the run has passed the read position on the film. Thereafter, when the device is again turned on to search for another account number it will be in a position where light will be able to reach the sensor 212 rather than being blocked as at the beginning of the preceding operation, and this time the transistor 314 in the control circuit of the direction control relay 310 will be turned on or in conducting condition. This in turn will turn off the transistors 316 and 318 thereby preventing the energizing of the direction relay 310 so that the clockwise rotating motor 102 will be energized instead of the motor 100. The circuit for energizing the clockwise motor 100 is through the normally closed direction control relay contacts 226 as aforesaid. Under these circumstances the speed of the film and the spacing the opaque areas 104 and the intervening transparent areas are insufficient to cause energizing of the relay 310 and the relay will remain deenergized until the next time the device is activated on the succeeding return cycle. This is further controlled by the RC time constant of the circuit elements connected to the base of the transistor 318.

Another switch 324 is connected to the same side of the input power supply receptacle 218 as the switch 220 as shown in the upper right-hand corner of FIG. 6. The switch 324 is included to provide power to other portions of the circuit including providing power to and through other contacts 326 of the read relay 280 and to another circuit which includes the light source 70 (FIG. 3) sometimes called the projector light source. The switch contacts 324 are provided to make sure that the full brightness of the source 70 is available before power is applied to the remaining circuits. The relay contacts 326 are included in the circuit to deenergize the light source 70 at the conclusion of a cycling operation. This is necessary since the switch 324 is only momentarily closed at the beginning of each operation and in order to keep the source 70 energized a hold circuit is provided through the switch 220 and the relay contacts 236.

The circuit for the light source 70 includes a transistor 330 and the associated circuitry as shown in the lower right portion of FIG. 6. This circuit is constructed to provide the usual voltage regulation necessary to maintain a relatively constant level of illumination but it is not deemed necessary to describe the operation of this circuit in detail.

The 11 volt output source which is shown connected to the output of the secondary winding circuit 272 is connected to the circuit of the red light 150 as a safety feature to prevent the possibility of undesirably triggering the associated silicon controlled rectifier 148 (FIG. 5). The connection between the 11 volt source and the circuit for the SCR 148 is the only 11 volt circuit connection included, all other circuit power connections being from the 12 volt power circuit 270.

FIG. 7 shows a modified form of coding means 350 for use in the subject device. The coding means 350 are a variation of the more complex coding means disclosed above in FIG. 3. The coding means 350 include a plurality of similar adjacent movable slide members 352 that correspond respectively to each digit of an account number to be entered. Each slide member 352 has a knob 354 for moving it longitudinally, and the slide members 352 are constructed to be mounted in a housing or container in which they can be moved. The housing should have an opening in the area of the dotted outline 356 where the operator can view of row of numbers printed or otherwise applied to the members 352 to make sure the correct account number has been entered. In the modified form of the device shown, the leftmost slide member 352 is in a position corresponding to the digit number seven, the next slide member is in an eight position, the third slide member is in its nine position, and all of the other slide members are set at zero. Each slide member 352 also has spaced pairs of holes 358 at locations therealong to represent the various corresponding digits to which they may be set. The code for locating the holes 358 can be the same as already described in connection with FIG. 2. When all of the members 352 have been moved to positions representing a particular account number, the holes 358 which are in alignment between the arrows 359 will represent the account number. It is anticipated also that some means will be provided to accurately position and hold the members 352 in their various possible setting positions. Such means may include teeth formed in the members 352 and some sort of spring means biased in engagement therewith.

The film 80 is shown in dotted outline in FIG. 7 positioned for movement adjacent to but under the members 352 such that the row of holes 358 aligned with the arrows 359 extend substantially all the way across the film but at an angle so that the film need not be as wide as the length of the row of holes 358. As aforesaid, this means that a narrower film width can be used without unduly reducing the length of the row of holes 358. This has distinct operational and cost advantages. The actual construction and coding of the film is more clearly shown and will be further described in connection with FIG. 20.

FIG. 8 shows another embodiment of the optics of the present device including showing the relationship between a light source 360, which is similar to the light source 70 in FIG. 3, the coding means represented by the unit 350, the film 80 and the sensing unit 110. The sensing unit 110 in this case includes a member 362 having 45 aligned holes or apertures 364 positioned to register with the coded opaque areas on the film and the holes 358 in the slide members 352. A light conducting wire 366 extends into each hole in the member 362 and the wires 366 are formed so that their opposite ends are grouped together into one or more groups, three groups being shown. The grouped together wire ends are positioned extending into openings 368, 370, and 372 respectively, in other members 374, 376 and 378. The openings 368, 370 and 372 are located in close proximity to associated light sensitive devices 380, 382 and 384 so that the light sensitive device 380 will respond to any light that passes through any of the first fifteen possible holes 364 and through the associated light conducting wires 366. In other words, in the embodiment shown in FIGS. 7 and 8, the light sensitive device 380 reads the first three of nine digit positions of a nine digit account number. In like manner, the second light sensitive member 382 reads the next three digit positions and the light sensitive member 384 reads the last three digit positions. An advantage of the construction shown in FIG. 8 is that it requires only three light sensitive elements to respond to light from 45 possible positions while the construction described above requires nine for a nine digit account number. If light reaches any one of the three light sensitive members 380, 382 and 384 it means a mismatch exists between the account number dialed in the members 352 and the account numbers on the filmstrip being compared therewith. Only under conditions when a perfect match occurs will the light from the source 360 be completely blocked so that a signal will be produced to energize the red light 150 as described above the indicate that the credit card or other device bearing this account number is know to be objectionable for some reason. As suggested above, it is also anticipated to still further simplify the construction of FIG. 8 by having all 45 light conducting wires 366 extend into a single aperture associated with a single light sensitive element. By the same token it is also possible to increase the number of required light sensors even to the extent of having a separate sensor for each digit or for each code position of each digit although this would probably unduly complicate the device and increase its cost without providing corresponding advantages.

FIG. 9 shows a modified and somewhat simplified form of motor control means for controlling the operation of drive motors such as the drive motors 100 and 102. The counterclockwise rotating motor 100 in the circuit of FIG. 9 is controlled by a triac 400 and the clockwise motor 102 is under control of another triac 402. The triacs 400 and 402 in turn are under control of associated reed switches 404 and 406 of which are operated by the motor associated with the other triac as shown by the dotted line connections therebetween. For illustrative purposes the modified film strip 80*a* is shown positioned extending over a perforated credit card 36*a* similar to the credit card shown in FIG. 2. The film 80*a* has an opaque area 408 positioned extending along one side edge thereof adjacent to one end to control the energizing of the counterclockwise motor 100 when the film is at the associated end of its travel. The opaque area 408 is positioned to prevent or block light from reaching a light sensitive device or sensor 410 when the film is at or near one end of its travel thereby establishing a relatively high bias voltage from a positive voltage source connected as shown to the base element of a transistor 412. This forward biases the transistor 412 causing it to conduct thereby reducing the voltage on its collector electrode. This in turn reduces the voltage on the base of another transistor 413 causing its collector voltage to increase thereby also increasing the voltage on the base of yet another transistor 414 causing it to conduct. When the transistor 414 conducts current flows through a coil 415 which closes the reed switch 404 and gates the triac 400 to energize the counterclockwise motor 100. The circuit for energizing the motor 100 is from line lead L1 to and through the motor 100, through the triac 400, through normally closed relay contacts 426 which will be described later, and back to the other line lead L2 through other contacts and switch means which will also be described.

When the motor 100 is energized it periodically and intermittently mechanically closes the contacts of the reed switch 406 which in turn gate the triac 402 connected in the circuit of the clockwise motor 102. This causes the motor 102 to be intermittently energized to produce controlled drag or braking action and to control the film speed and maintain the film 80*a* in a taut condition.

When the film is at the opposite end of its travel and has stopped there will be no opaque area or stripe similar to the area **408** to block light from reaching the light sensitive device **410**. Under these conditions the clockwise motor **102** instead of the counterclockwise motor **100** will be energized to produce the driving power, and the motor **100** will be intermittently energized by operation of the reed switch **404** to provide the drag and speed control. When there is no opaque area to block light from reaching the device **410** the tube will conduct and thereby reduce the voltage on the base of the transistor **412**. This prevents the transistor **412** from conducting thereby increasing its collector voltage which also increases the voltage on the base electrode of the transistor **413** causing it to conduct. This causes current to flow through coil **416** instead of through the coil **415** and closes reed switch **406** to gate the triac **402**. This causes constant current flow through the motor **102** which drives the film and in turn intermittently operates the reed switch **404** to produce the drag and speed control. In the motor control circuit of FIG. **9** the values of certain of the circuit elements including particularly the resistors in the network of the transistors **413** and **414** are important to produce the desired biasing action and to make certain that the proper transistor conducts under the various possible circumstances.

Other opaque areas or stripes **417** are also formed on the film **80***a* adjacent to the opposite edge thereof from the opaque area or stripe **408**. One such stripe **417** is formed adjacent to each end of the film to provide means to stop the motor **100** or **102** by preventing light from reaching another light sensitive device or sensor **418**. The light sensor **418** has its anode connected to the base of a transistor **420** which transistor conducts whenever light is cut off to the sensor **418**. When the transistor **420** conducts its emitter voltage increases thereby providing a voltage sufficient to gate SCR **422**. This causes current to flow through a relay coil **424** opening its normally closed contacts **426** to break the circuit from the triacs **400** and **402** and from the motors **100** and **102** to the other side of the power source at line lead L2. This causes which ever motor happens to be energized at that time to be deenergized. Another set of normally closed relay contacts **427**, which are controlled by the relay coil **424**, opens when the relay is energized to remove the ground connections to the transistors **413** and **414** thereby deenergizing the associated motor control circuits. It can therefore be seen that when one of the motors **100** or **102** has been energized and moves the film to the opposite end of its travel the opaque area **417** thereat will interrupt the light to the sensor **418** thereby energizing the relay coil **424** to stop the operation. It is also to be noted that the circuit for energizing the coil **424** as well as the motors is under control of other ganged switches **428** and **430** respectively, which switches are maintained closed when the device is operating and when a credit card or like means is in operating position. There are many other possible ways which could be used to control the operation and movement of the filmstrip and the several particular means disclosed in this application are chosen for illustrative purposes only.

FIG. **10** shows the details of an optical system for use with projection light source **70** of the present device. The optics include the light source **70** which is shown positioned adjacent to a reflective shield member **431**. Light from the source **70** and from the shield **430** passes through a condensing lens system which includes condensing lenses **432**, through the holes **94** in the member **92**, through the film member **80** (or **80***a*) and through projecting lenses **434** and **436**. This light impinges on a first mirror **440** and is reflected thereby onto a second mirror **442** which is spaced therefrom as shown. The light that impinges on the second mirror **442** is then reflected back to a third mirror **444** which reflects the light onto the surface of the credit card (FIGS. **1** and **9**) or through the particular form of programming members employed (FIGS. **3**, **7**, **12** and **13**) and the light that gets through the card or program members is focused onto the sensing elements in the sensing unit **110**, which may be constructed along the lines of devices shown in FIGS. **3**, **5**, **8** or **14**. It is also possible to use one light sensor or photocell for each of the 45 possible code positions in the particular nine digit device as disclosed herein. The sensing unit **110** may include condenser lenses and various forms of light sensing devices as desired. The form of the optics in the projection light system disclosed in FIG. **10**, which includes a folded light system, has certain advantages over a more direct system wherein the light passes more directly from the source **70** to the sensors because it increases the length from the light path thereby making focusing and adjustment more accurate and precise and at the same time a folded optical path such as shown can be constructed in relatively little space. It is also contemplated to use a projection system such as disclosed to project an image onto a screen rather than or in addition to simply using the light to make a comparison between two coded numbers. The same or similar projection and coding means can also be used for many other purposes in addition to those specifically mentioned including being used to search records, to stop a film strip at a particular point for viewing or other purposes and it can be used in microfilm data search devices and the like where images on a filmstrip are identified by some means which enable them to be located in a manner similar to that described above.

FIGS. **11**, **12** and **13** show another simplified embodiment **450** of coding means for use with the present device in place of the encoding means shown in FIGS. **1**, **3** and **7**. The coding means **450** are somewhat similar to the means in FIG. **7** in that they include a plurality of movable slide members which instead of being operated by knobs, are operated using a pencil, pen or other pointed instrument **452**. This construction lends itself to use in applications such as in gas stations and other merchandising establishments because it is not as easily played with as the other embodiments and it does not have as many accessible parts that can be bumped and/or damaged. There are also fewer parts to go wrong in the construction of FIGS. **11**—**13** which is highly desirable especially for a device that is as exposed to use by many persons. The device **450** includes a housing **454** preferably constructed so that its upper surface which is flat is at an angle relative to its bottom surface so that it discourages putting things on it. The upper surface of the housing **450** has a plurality of elongated openings **456** behind each of which is located an associated apertured slide member **458** each of which has a plurality of holes **460** which are constructed to receive the pointed end of a pen, pencil or other like instrument as shown in FIG. **13**. A row of numbers corresponding to the hole positions **460** are printed on or otherwise placed on each of the slide members **458** and are visible through the associated openings **456** in the housing so that the operator can select the proper hole in which to place his pencil **452** when entering an account number. The slide members **458** extend adjacent to the inner surface of the upper housing wall and each of the slide members **458** has a second row of numbers **462** positioned to register with a corresponding opening **464** in the upper housing wall. FIG. **13** shows a ball point pen or other pointed instrument **452** inserted into one of the holes **460** in one of the slide members **458** in position to move the member. When the pen **452** is so positioned, the associated slide member is moved longitudinally relative to the opening **456** until the pen abuts the end edge thereof and is stopped. In this way, the associated slide member **458** is moved to a position entering the desired digit and at the same time the digit that has been dialed is made visible through the associated opening **464**. Also at the same time a spring member **470** (FIG. **13**) moves along and engages teeth or notches **472** formed on the back side of the member **458** to accurately position and hold the member in its newly set position. This is done for each slide member **458** until the entire account number is entered. Thus it can be seen that the modified coding construction **450** is simple structurally and easy to operate and has little that can go wrong with it, all of which are important considerations in a device such as the present device. Furthermore, the simplified form of coding means shown in FIGS. **11**—**13** include convenient means for the operator to verify that the number he has entered is the number he intended to enter.

FIG. **14** shows a self-testing circuit for use with the subject device to make sure that all of the reading positions of the device are operating properly before each cycle of operation. The self-test means include means for making a similar test at the beginning of each operating cycle and require that a similar test pattern be provided near each opposite end of the film **80** at a location such that the test pattern moves past the read station before the read station begins to read the other coded data contained on the film. A typical test pattern is shown in FIG. **14***a*. The test patterns are such that each possible light sensing position is individually tested to make sure that it is operating properly. The test pattern shown in FIG. **14***a* includes two spaced opaque areas **480** and **482** formed on the film **80** and separated by a stepped transparent area **484** therebetween. The test pattern including the transparent area **484** passes between the light source **70** and the sensing unit **110** at the beginning of each operating cycle and in so doing sequentially and individually exposes each of the sensors to the light source. If the test is satisfactory an amber test light **496** will not turn on, but if one or more sensors fail to operate the amber light **496** will be energized to indicate the malfunction. The self-test feature is preferably incorporated into the normal operation of the subject device to indicate positively that the device is or is not functioning properly, and the self-test feature requires no positive acts by the operator. The circuit for the self-test means uses the same sensing unit **110** used to sense the other coded information on the film. In FIG. **14** a portion of the text pattern is shown in reading position with a portion of the transparent area **484** positioned to allow light to impinge on the first two sensor elements **116** and **118**. At the same time the opaque area **480** and **482** prevent light from reaching any of the other sensor elements. As the test pattern moves past the read station light will be permitted to reach each of the sensors one or two at a time until all of the sensors have been exposed to the light individually and in association with the adjacent sensors on each side. If a sensor is faulty so that it does not respond to light impinging on it, or if for some other reason such as the presence of dirt or foreign matter in position to block the light to a sensor, a condition is produced which is the same as or analogous to a matched condition in which no light reaches any sensor this will cause an indication to be produced that the device is malfunctioning. This is not possible, however, if all of the sensors and the optics are operating properly when the test pattern is moving past the read unit. The self-test circuit of FIG. **14** is similar in many respects to the read circuit of FIG. **5** but includes additional features which specifically pertain to the self-test feature.

In the circuit of FIG. **14** a malfunction condition will produce a high voltage at circuit terminal **486** which in turn will produce a high potential on the base of transistor **488** causing it to conduct. This will also cause the potential on the collector of the transistor **488** to go to a low potential condition which in turn will cut off a succeeding transistor **490** causing its collector to go to a high potential. When the transistor **490** is cut off the high potential on its collector will be applied to the gate electrode of a SCR **492** through a resistor **494** to turn the SCR **492** on and thereby cause current to flow through an amber light **496** to indicate the faulty condition. The red light **150** which is energized whenever a matched condition is produced during normal operation will not be energized at this time in the usual way because at this time the emitter electrode of the transistor **488** is grounded through the transferred condition of the read relay contacts **172** as already stated. These contacts as will be recalled will transfer back to their normal operating condition after the test operation is completed as already explained.

In the present device it is preferable and anticipated to have a test pattern formed on the film **80** adjacent to each opposite end so that the device will have to go through a test operation before reading the other information contained on the film. This is necessary because the film moves in opposite directions on succeeding cycles of operation.

During the time that the device is going through a self-testing operation as already stated it is possible because of the transferred condition of the read relay contacts **172** to energize the amber light **496** as just described but not the red error light **150**. Thereafter, when the read relay **170** is deenergized, the conditions for normal reading are established and the circuit for energizing the red light **150** will be operative. Also at this point it will no longer be possible to energize the amber light **496**, except that if the amber light was energized during self-testing it will remain energized thereafter until anode potential is removed from the SCR **492**. The circuit for preventing energizing of the light **496** after a read cycle is started is through the deenergized condition of read relay contacts **172** which operate to ground the collector of the transistor **490** instead of the emitter of the transistor **488**. The transistor **488** and some of its circuitry is analogous to the transistor **144** in FIG. **5**.

The read relay **170** is controlled by the opaque areas **104** which begin just after passage of the test pattern as shown in FIG. **14***a*. Referring to FIG. **14**, it can be seen that the opaque areas **104** which follow the test pattern are sensed by the sensor means **212** as described above in connection with the motor control circuits of FIG. **6**. The sensor means **212** as shown also operate other circuits which control the energizing of the read relay **170**. These include transistor **240** which when turned off by the first opaque area **104** produces an output on its collector represented by an increase in voltage. This causes a decrease in the voltage on the base of succeeding the transistor **294** which is connected to the said collector through a circuit that includes the capacitor **284**, diodes **288** and **286**, resistor **290** and capacitor **292** connected as shown (see also FIG. **6**.) This circuit causes a low potential to be applied to the base electrode of the transistor **294** when the first opaque area **104** is sensed and causes the transistor **294** to stop conducting. This in turn reduces current flow through the coil **170** of the read relay deenergizing the relay and enabling its contacts including contacts **172** and to return to their normal condition which is the condition necessary for the subject device to read the coded information contained on the film. When the read relay contacts **172** go back to their normal or deenergized condition they remove the ground from the emitter of the transistor **488** as aforesaid thereby establishing the circuits necessary to operate or gate the SCR **148** which controls the energizing of the red light **150** whenever a matched condition is sensed.

A resistor **516** and a capacitor **518** are also connected in series between the positive voltage source and the collector of the transistor **490** to provide the collector with a positive potential during the beginning part of each operating cycle. This circuit is grounded when the read relay contacts **172** return to their normal deenergized condition so that once the read cycle has commenced it will no longer be possible to energize the amber bulb **496** until the next test cycle at the beginning of the succeeding operating cycle. In other words, this circuit is provided to prevent false test pattern error signal from being produced during the read part of the operation.

The diode **158** described earlier in connection with FIG. **5** is connected between the anode of the SCR **148** and the base of the transistor **162** through the resistor **160**. The diode **158** is included to prevent the green light **164** from being energized at the end of a read cycle under circumstances when the SCR **148** and associated red light **150** are turned on. Another diode (not shown) could also be connected if desired to the circuit of the SCR **492** which controls the amber light **496** to prevent the green light **164** from being energized during a test pattern cycle.

FIG. **15** shows a total bit parallel comparator circuit which for illustrative purposes is shown having **36** light sensor devices numbered **550** (1)—**550** (36). One side of each of the sensors is connected to a positive voltage source and the opposite side of each is connected to associated resistors **552** (1)—**552** (36). The other or output sides of the resistors **552** are connected in groups of four as inputs to four position half-adder circuits **554** (1)—**554** (9). The half-adders **554** can be substituted for by four bit comparator circuits, and nine such circuits are required for the 36 sensors **550**. A nine digit binary coded number is also applied to the half-adder circuits **554** at 36 associated input terminals **556** (1)—**556** (36). These inputs are applied in total bit parallel and are compared with the information sensed by the sensors **550** (1)—**550** (36). Whenever the same combination of input bits are sensed by the sensors **550** as are fed into the half-adders **554** all of the half-adder circuits **554** will produce outputs and these outputs will be applied to the inputs of associated "OR" gates **558** of which there are nine. Under conditions of an exact comparison the nine "OR" gates will produce outputs, and the outputs from each group of three "OR" gates **558** will be fed as an input to a succeeding "OR" gate **560** of which there are three. In like manner, the three "OR" gates **560** will produce outputs which will then be fed to still another "NOR" gate **562**. An output will be produced at an output terminal **564** of the "NOR" gate **562** only under circumstances when the programmed inputs at the terminals **556** correspond exactly to the information sensed by the sensors **550** indicating a perfectly matched condition. Various codes and numbers of bits and/or digits can be handled and compared in the manner just described to determine when a matched condition exists between programmed data and other data such as data on a film or other data carrier including data contained on a magnetic or other storage medium. It can therefore be seen that the particular circuit shown in FIG. **15** is a modified form of data comparison means from the comparison means described above, and one which does not require any direct optical comparison.

FIG. **15*a*** shows the details of one stage of the bit comparator circuit disclosed in FIG. **15**. For example, FIG. **15*a*** shows a circuit which might be used for one position of a half-adder circuit such as one of the half-adders **554**. Insofar as possible the elements of FIG. **15*a*** are numbered to correspond to the corresponding elements in FIG. 15. The terminal **566** which is also labeled A corresponds in both figures to the input terminal for one position of one of four similar half-adder circuits shown located in each of the blocks **554** (1—9). Each half-adder also receives input signals from one of the sensors **550** (1—36a). These inputs are connected to the base electrode of a transistor **568** which has its collector connected through a resistor **570** to a positive voltage source, to the collector of another transistor **572**, and to the base of yet another transistor **574**. The collector of the transistor **574** is likewise connected through a resistor **576** to the positive voltage source and to an output terminal **578** which represents the uppermost output connection of the associated "OR" gate **558**. The other input terminal **556** which is also labeled B, is connected to the base electrode of the transistor **572**. Each of the inputs **566** and **556** is also connected respectively to the base electrodes of other serially connected transistors **580** and **582**, and the collector of the transistor **582** is connected to the output terminal **578** and to the "OR" gate **558** which follows. Similar circuits are provided to accommodate each input position. A chart is shown in connection with FIG. **15*a*** to show what happens in the circuit for the various combinations of possible input signals at the input terminals **566** and **556**. Column A of the chart represents the inputs at the A terminal **566**, Column B represents inputs at the B terminal **556**, and Column C represents the outputs at the output C terminal **578**. When zero inputs appear at both terminals **566** or **556** there will be a zero output at the terminal **578**. By the same token when there are "one" inputs at both of the said A and B input terminals indicating a matched condition there will also be a zero output at the output terminal **578**. These two conditions represent the two possible matched conditions. If, on the other hand, one input receives a zero input and the other a "one" input indicating a mismatch, a "one" will be produced at the output C terminal **578**.

It is not deemed necessary to describe the operation of the "OR" gates **558** and **560** or the "NOR" gates **562** in detail since they operate in a conventional manner and produce outputs only under conditions when there is no difference present between the inputs. Thus it can be seen that the comparator circuit shown in FIGS. **15** and **15*a*** can be used in the subject device to make a comparison between to inputs one of which is read by the corresponding sensors **550** and the other of which is dialed or otherwise optically or electronically entered into the device for comparison purposes. Referring again to FIG. **15*a***, it can be seen that if no input signals are present at either terminals **556** or **566** none of the four transistors **568, 572, 580** or **582** will conduct and under these circumstances the relatively high voltage connected through the resistor **570** to the collector of transistor **568** will also be applied to the base electrode of transistor **574** causing it to conduct thereby reducing or lowering the potential on the output electrode **578**. In like manner, if a relatively high input potential is present on the two input terminals **566** and **556** all of the four transistors **568, 572, 580** and **582** will conduct and this will again ground or lower the potential on the output terminal **578** by establishing a relatively low impedance path to ground through the transistors **580** and **582**. This is true even though the transistor **574** may be in a conducting condition at this time. On the other hand, when one of the input signals is a high potential and the other a lower potential, a high potential will be produced on the output terminal **578** under these conditions. This is because under these circumstances one of the transistors **580** and **582** will be nonconducting and the other not, and also one of the two transistors **568** or **572** will likewise be nonconducting and hence will produce a low input voltage on the base of the transistor **574** preventing it from being in a conducting condition and increasing its collector voltage. Under these circumstances there will be relatively high potential at the output terminal **578**.

FIG. **16** shows another circuit for use in the present device and included specifically to convert serial input data into parallel data. The circuit includes a more or less conventional ring counter circuit **600** having a plurality of circuit stages each of which respectively includes an SCR **602, 604, 606** and so on to the last or output stage which has SCR **608**. The SCRs in the ring counter circuit **600** turn on in succession in response to the receipt of each succeeding clock pulse received at input terminal **610**. Coupling condensers **612, 614** ... and **616** are connected between the adjacent circuit stages of the ring counter and are provided to automatically turn off the conducting or active SCR when the following stage is turned on by receipt of another input signal. Resistors **618, 620** ... and **622** respectively are also provided in each counter stage to couple the stages to corresponding stages of another circuit. This coupling is provided through circuits which include other capacitors **624, 626** ... and **628** respectively. These circuits also receive other inputs which are present on input terminal **630** through corresponding diodes **632, 634** ... and **636** connected as shown.

Input data in the form of positive data pulses are fed to the circuit of FIG. **16** at the terminal **630** and depending on which of the capacitors **624, 626** ... or **628** happens to be discharged charges that capacitor through the associated diode **632, 634** ... or **636**. This in turn causes an associated SCR **638, 640** ... or **642** to be turned on or to go into a conducting condition. Whenever one of the SCRs **638, 640** ... or **642** is turned on it disables an associated light sensor element or photocell **644, 646** ... or **648** and this in turn produces a change on an output lead **650**. The voltage on the output lead **650** increases to a relatively high voltage only when all the sensors **644, 646** ... and **648** are receiving no light or are disabled which is the situation when a matched condition occurs.

In connection with the ring counter portion **600** of the circuit of FIG. **16**, it can be seen that the anodes of the SCRs **604, 606** ... and **608** are provided with other dotted output connections, two being shown for each of the circuit stages. These dotted outputs are connected to other parallel input data pulse lines as required. It can thus be seen that serial input data pulses that are received at the inputs can be converted by the circuit shown in FIG. **16** into parallel data information, and this is important in order to make the subject device able to read data sequentially and at the same time simultaneously compare a predetermined amount of the serial received data with other data which may be programmed into the device in serial or parallel bit form. The conversion means shown can also be expanded by the addition of more data pulse input leads similar to the lead **630** and by increasing the number of circuit stages.

FIG. **17** shows an optional quality control circuit **660** which when included monitors the code which is described above in one form as being a two-out-of-five code that appears as rows of position coded opaque dots on the film **80**. The quality control circuit includes means to make sure that there are always two dots for each digit. If one or both dots in any digit position is missing or if there is one or more extra dots in any position the code for that position will be inaccurate and this will be determined by the circuit of FIG. 17. FIG. **17** shows only that much of the total quality control circuit that is necessary to check the five possible dot positions for one digit of the coded number. This partial circuit receives optical inputs from the projector bulb source **70** through a lens **662** which focuses the light that passes through the film **80** onto five possible light sensors **664, 666, 668, 670** and **672**. In the figure, the film **80** is shown having two transparent areas in the two positions marked "**0**" and three opaque areas in the three positions marked "x." The light passing through the two transparent positions will impinge on the corresponding sensors **664** and **668** and the others, namely, sensors **666, 670** and **672** will remain dark or nonenergized. The sensors in this case, can be photovoltaic or other types of light sensitive devices, one terminal of each being connected to a positive voltage source, and the other being connected to the common side of two associated resistors such that one resistor of each pair is parallel with the corresponding resistors associated with the other sensors. The opposite side of one of the parallel connected groups of resistors is connected to the base of a first transistor **674**, and the opposite side of the other parallel connected group is connected to the base of another transistor **676**. With this arrangement the transistor **674** will be forward biased only if at least two of the sensors **664—672** are conducting or receiving light, and the transistor **676** will be forward biased only if three or more of the sensors are conducting or receiving light. This is controlled by the values of the base resistors connected to the transistors or by the base biasing potential. The output or collector of the transistor **676** is connected through a resistor **678** to the base of another transistor **680** which operates to invert the outputs of the transistor **676** whereby in combination with the outputs of the transistor **674** an "AND" gate is formed whose outputs appear at output terminal **682**. The output terminal **682** is connected to the collectors of the transistors **674** and **680**, respectively, through diodes **684** and **686**. Only under conditions when two sensors are conducting will the output terminal **682** be in a low voltage condition thereby indicating correct operation of the present device. Under all other conditions as for example when more or less than two coded areas are provided in any digit position will the output terminal **682** have a high voltage indicating an incorrectly coded digit on the film **80**.

The circuit **660** can also be used as a parity checking circuit whenever the device is programmed to use a constant ratio code. In this case the sensors **664—672** are replaced by switching devices (not shown), the output side of each switching device being represented respectively by terminals **688, 690, 692, 694** and **696**. The signals at these terminals can then be used to measure the level of lightness or darkness at each position for quality control. Quality control in this instance is a measure of the opaqueness of the information dots on the film and the accuracy of their location. This quality or parity control feature is an optional feature which can be used to further improve the accuracy and reliability of the subject device. This feature can also be used as a quality control feature of production of the film strips 80 as well.

FIG. **18** shows another alternate form of signal encoding means which can be used in place of the mechanical encoding means described above. The encoding means shown in FIG. **18** are more electronic in nature than those described above and include controllable circuit stages each of which is shown having five SCRs for encoding one digit position of an account or other number to be encoded. The particular form of electronic encoding means shown in FIG. **18** is for directly encoding three-out-of-five coding positions, and only a portion of the entire circuit is shown for simplicity and understanding. As shown the circuit has two separate inputs connected to sources of binary coded information. One of the input sources sometimes called a binary one input source includes a switch **700** which is connected through three input diodes **702, 704**, and **706** to three of five input leads or channels in a bank of leads numbered **708, 710, 712, 714** and **716**. The second input which is the binary zero input is connected through another switch **718** and through three other diodes **720, 722** and **724**, respectively to the three leads **708, 710** and **712** in the same bank of five leads. The five leads are connected to the various SCRs shown connected in the maze circuit. The first row of SCRs to the left are used to encode the first digit of an account number, the next row to the right is used to encode the second digit and so on across the maze.

Immediately below the maze circuit is a counter circuit **726** which has an input terminal **728** that is connected to all of the five leads **708, 710, 712, 714** and **716** through respective diodes **732, 734, 736, 738** and **740**. It can therefore be seen that every time a signal occurs on any one of the five leads **708—716** the same signal will not only be recorded in the maze circuit by turning on an SCR but it will also be available at the terminal **730** which terminal is connected to the terminal **728** to advance the counter circuit **726**. For example, the first time an input signal is received at the terminal **728** it will be recorded in the first digit position of the maze circuit and it will also be entered in the first position or stage of the counter circuit **726**. The next input will then be recorded in the second stage of the counter **726** and will be entered in the second digit position of the maze and so forth until the entire account number is entered. In this way, an account number which has been entered into the maze circuit can later be compared with other information sensed or read by the read unit such as the read unit **110**. The counter circuit **726** may be a ring counter of known construction or some other similar or equivalent counter and it is not deemed necessary to describe its structure and operation in detail. Electronic encoder means such as described may have certain advantages over mechanical or optical encoders depending on the particular application for which the device is to be used.

FIG. **19** shows still another circuit **750** which can be employed in the present device for verifying one coded digit position that has been entered mechanically or electronically with the corresponding digit position coded on the film **80**. Verifying means such as the verifying means **750** can be used to verify almost any kind of code including the two-out-of-five code described above, a three-out-of-five code and so on, and it is not intended to limit it or the other coding means included in the present device to a particular form of coding. The coded input information which has been dialed or otherwise entered into the subject device is available in the circuit of FIG. **19** on the input leads **752, 754, 756, 758** and **760**. This information is to be compared with similar information sensed by the read unit which is shown as including the sensors **762, 764, 766, 768** and **770** that are positioned to read the corresponding coded information as it appears in each row of dots on the film. The information sensed by the read unit sensors is applied to bases of associated transistors that have their collector electrodes connected respectively to the lead **752—760**. Each of the leads **752—760** is also connected to two output circuits through oppositely polarized diodes connected as shown. All of the diodes in each group are polarized in the same direction and are connected to the base of another transistor **772** which has the output on its collector connected through a resistor

774 to the base of still another transistor 776 which is the output transistor. The output sides of the other group of polarized diodes are connected to the base of transistor 778 which has its collector connected to the emitter electrode of the output transistor 776. Other diodes are also connected in each of the leads 752—760 as shown to isolate the two different sources of inputs.

The chart accompanying FIG. 19 shows the various possible operating conditions for the circuit taking into the account the presence of a binary "1" or "0" at the circuit locations labeled A, B, and C. For example, the B column in the chart represents the condition at the output on the collector of the transistor 772, the C column represents the condition at the collector of the transistor 778 and the A column represents the final output which is present on the collector of the output transistor 776.

In this connection it should also be noted that the output at B which appears on the collector electrode of the transistor 772 will be in a "1" state only if no positive potential from the sensor circuit reaches its base. This is true whenever a corresponding one or more of the leads 752—760 has negative potential applied thereto through the associated input switches. The output at C which appears on the collector electrode of the transistors 778, on the other hand, will only be in a "0" state if no negative potential reaches its base electrode from one of the leads 752—760. This can be true only when a correspondence exists with the positive potential applied from the sensor circuitry. Thus a null or balanced situation results when the output at B is high ("1") and when the output C is low ("0"), and only under these conditions will the output at A go to a low or "0" state. This is indicated on the chart which accompanies FIG. 19 where it can be seen that there is only one set of conditions which will produce a zero output at A, namely when the output at B is "1" and the output at C is "0." All other conditions and combinations of condition signals at B and C will produce a "1" output at the terminal A. This can be verified by considering "1" to represent a high voltage condition and "0" a low voltage condition and applying these conditions to the circuit elements as shown.

Without going into further detailed description of the operation of the circuit of FIG. 19 it is sufficient to note that the circuit is able to make a comparison between two separate inputs and to produce different outputs depending on whether the inputs are the same or different. It is also obvious from what has been said above that similar circuits can be used for comparing as many digit positions as desired, and the outputs of these circuits can be fed through gate circuits to complete the comparison between the entire two inputs which represent numbers or other forms of identification.

FIG. 20 shows a typical filmstrip 80 constructed according to the present invention. The film includes end leader portions 800 and 802 for attaching to the spools 84 and 86, similar test patterns located respectively near or adjacent to the opposite ends of the film 80, a central body portion 804 which is the portion that includes the plurality of rows of dots 112 position coded to represent various account numbers or other identifying information, and the opaque edge areas or dots 104 and 106 (or 408 and 417). The length of the film 80 will depend on the number or rows and the spacing between the rows of dots 112 as well as the dot size. It is also preferred though not required that the rows of dots 112 be at some angle such at in the angle shown to enable a narrower width film to be used without unduly crowding the dots. Filmstrips in various widths have been tested in the present device including relatively wide filmstrips as well as more conventional film widths such as 8, 16 and 35 millimeter filmstrips. It is also preferred though not essential to have the various opaque areas or dots including the dots 104 and 112 be made square or rectangular in shape to provide the most coverage for a given area of film. Square or rectangular shaped dots may also have certain advantages in adjusting tolerances in addition to possibly providing some economy in the film size. There may also be some advantages in selecting square or rectangular dots from the standpoint of film preparation. It is anticipated, however, that round and other shapes can also be used for all or part of the opaque areas or dots without departing from the spirit and scope of the invention. It is also contemplated to use a transparent medium with hot stamped information, or an opaque medium with transparent dots or coded areas, or an opaque medium with holes position coded therethrough, or even an opaque medium with reflection coded areas to name a few possible variations. It is also possible and within the scope of the invention to use a magnetic tape or film medium with magnetized and demagnetized areas.

The present device also has many and varied possible applications and uses. One application for which the device is particularly suited is at points of sale where it is common practice for a customer to present a credit card rather than paying cash. With the present device it is possible for the salesperson to quickly check the account or other identifying number assigned to the credit card with a great number of other similar type account numbers which have been gathered by the company and which are known to be objectionable to see if there is any known reason why credit should not be extended. It is also possible to make a "good guy" check of an account number to make sure the number is on a listing before extending credit or for some other purpose. The present device provides means for accomplishing these verification operations accurately and in a very short time with little or no effort being required by the salesperson. The present device also has application to microfilm data searching devices such as inventory and stock searching applications and any applications where coded information is or could be used. In a microfilm search application, for example, the present device could be used to stop a filmstrip when a particular number in coded form is sensed at a place for viewing a particular image contained on the film or it can be used for other purposes. The present device can also be used in many data storage system applications where searches are made to locate data from some purposes. It can therefore be seen that applications for the subject device are many and varied and it is not intended to limit it to any particular application or use.

Thus there has been shown and described novel means for searching and comparing data and for verifying the accuracy and/or validity of data, which device fulfills all of the objects and advantages sought therefor. Many changes, variations, modifications, and other uses and applications of the subject device will, however, become apparent to those skilled in the art after considering this specification and the accompanying drawings. All such changes, modifications, variations and other uses and applications which do not depart from the spirit and scope of the invention are deemed to be covered by the invention which is limited only by the claims which follow.

What I claim is:

1. Means for comparing a coded representation of a first identification with a coded representation of a second identification to see if the two identifications are the same or different comprising means for encoding the first identification including a filmstrip having transparent and opaque areas position coded thereon in groups, each group to represent a digit of the first identification, means for simultaneously optically sensing the areas on the filmstrip that represent the second identification including a light source positioned on one side of the filmstrip and light sensing means positioned on the opposite side of the filmstrip, said light sensing means having individual portions positioned to sense light passing through the filmstrip in finite numbers of said groups of transparent and opaque areas, circuit means connected to said optical sensing means for producing output signals to represent said coded first identification, means to represent the second identification in a coded form similar to the coded form representing the first identification, and means for comparing the coded form of the second identification with the coded form of the first identification to determine if the first and second identifications are the same or different.

2. Means for comparing a coded form of a first identification with a similarly coded form of a second identification to see if the two identifications are the same or different comprising a memory carrier, means forming an optically detectable coded representation of the first identification on the memory carrier, other means forming an optically detectable coded representation of the second identification, said coded representation of the second identification being the optical complement of the coded representation of the first identification, means for making a direct optical comparison between the coded representations of the first and second identifications, means for moving the coded representations of the first and second identifications into optical registration with each other, means including a light source positioned on one side of said registered coded representations, light sensitive means on the opposite side thereof, and circuit means connected to said light sensitive means for producing a first output to indicate if the two compared identifications are the same and a second output when the two compared identifications are different.

3. The comparing means defined in claim 2 wherein said coded representation of the first identification on the memory carrier includes a row of position encoded optically detectable areas, the coded representation of said second identification including a plurality of members having optically detectable portions registrable with the detectable areas on the memory carrier, said members being movable to preselected positions to form a row of said optically detectable portions which encode the second identification in a form similar to the form of encoding on the memory carrier that represents the first encoded identification, said means to move in registration the encoded forms of said first and second identifications so that an optical comparison can be made therebetween including means for moving the memory carrier.

4. The comparing means defined in claim 3 wherein said memory carrier includes a filmstrip having a plurality of adjacent rows of position encoded optically detectable areas representing different coded first identifications for comparison with the second encoded identification, and means for moving the memory carrier to successively register each of said encoded representations of said encoded representations of first identifications with the coded representation of said second identification.

5. The comparing means defined in claim 3 wherein said memory carrier includes the optically detectable encoded areas, and means for optically sensing said other encoded areas including means for producing signals to control the speed and direction of movement of the memory carrier.

6. Means for comparing a coded representation of a first multidigit identification with a coded representation of a second multidigit identification to see if they are the same or different comprising a memory carrier having relatively transparent and relatively less transparent areas position encoded thereon in groups, each of which represents a different digit of the first coded identification, said transparent and less transparent areas being arranged in a row extending substantially transversely across the memory carrier, a light source positioned adjacent to one side of the memory carrier and light sensitive means positioned adjacent to the opposite side of the memory carrier in position to respond to light from said source that passes through the memory carrier in the area of the position encoded transparent and less transparent areas, other means positioned adjacent to the memory carrier in the space between the light source and the light sensitive means, said other means including means optically coding the second identification in a form optically complementary to the encoding of the first identification, means for moving said memory carrier relative to said other means to bring the said coded areas on the memory carrier into registration with said other optical coding means to make a direct optical comparison therebetween, some light from the light source being able to reach the light sensitive means whenever there is a difference between the encoded forms of the first and second identifications.

7. The comparing means defined in claim 6 wherein said other optically encoded means include a card having a row of apertures position encoded therein in groups, each group representing a different digit of the second identification.

8. The comparing means defined in claim 6 wherein said memory carrier includes a filmstrip having a plurality of adjacent rows of transparent and less transparent areas position encoded to represent different first identifications for comparing with the encoded second identification.

9. The comparing means defined in claim 6 wherein said other optical encoded means includes a plurality of adjacent movable members each having spaced sets of apertures therethrough, each set of apertures on each movable member representing a different digit of the second identification, and means for selectively moving said movable members to form a row of preselected ones of said apertures in said movable members which row represents the said second identification.

10. The comparing means defined in claim 6 wherein said means for moving the memory carrier includes a pair of spaced spool members on which and between which the memory carrier extends, and means for driving a selected one of said spools to wind the memory carrier thereon, said last-named means including an optically detectable image on the carrier, means for optically sensing said image, and means under control of said optical sensing means to control which of the said spools will be driven.

11. The comparing means defined in claim 10 including other optically detectable images at spaced locations along the memory carrier, and means for optically sensing said other images during movement of the memory carrier including means responsive to the frequency of occurrence of said other images, said last-named means including means for controlling the speed of movement of the memory carrier between the spools in response to the frequency of occurrence of the sensing of said other images.

12. The comparing means defined in claim 8 wherein said rows of transparent and less transparent encoded areas on the filmstrip are positioned thereon extending at an acute angle thereacross that is less than 90° to the length of the filmstrip.

13. Means for encoding information so that it can be sensed by optical sensing means including spaced light producing and light sensing means comprising a plurality of adjacent relatively movable members each having spaced sets of position coded apertures therethrough each set of which represents a different coded bit of information, means for moving said members into the space between said light producing and light sensing means to positions in which selected sets of said apertures representing a selected plurality of information bits are therebetween, a strip of film having spaced sets of photographically recorded images encoded thereon to represent other information bits for comparison with the selected plurality of information bits represented by the positions of said movable members, said spaced sets of images being arranged in rows representing a listing of different identifications which extends along and occupies most of the area of the filmstrip, means for moving the filmstrip relative to the selected sets of apertures in said plurality of movable members to successively register the spaced sets of images on the filmstrip with said selected apertures, said light sensing means being positioned to receive and respond to light from the light producing means that is able to pass through the said selected apertures and said coded film images in each position of registration as the film is moving, said light sensing means producing a first output condition when the film images represent the same information as the information represented by the registered selected apertures, and said light sensing means producing a different output condition when the registered film images represent different information than is represented by the selected sets of apertures during registration thereof.

14. Means for optically comparing first and second identification numbers represented in coded form comprising a light source, a coding assembly positioned adjacent to said light source and including a plurality of movable coding members

each having a plurality of spaced sets of apertures therethrough, each set of said apertures on each member being position encoded to represent a different digit of an identification number to be encoded, means for predeterminately positioning said members so that selected sets of apertures on each of the members are arranged in position to represent in combination the entire first identification number to be compared, a movable data carrier positioned adjacent to said plurality of members including a filmstrip having rows of transparent and opaque areas position encoded thereon to represent second identification numbers to be compared to the said first encoded identification number, the positions of the transparent and opaque areas in each row on the filmstrip representing in coded form a different second identification number, said rows occupying most of the area of the filmstrip, means for moving the filmstrip relative to the coded members to optically register the first identification number with each row of transparent and opaque areas representing the second identification numbers successively, and optical means including a light source and light sensitive means positioned on opposite sides of said adjacent members and on opposite sides of said filmstrip so that light from the light source will try to pass through the registered first and second coded identification numbers to the light sensing means, some light being able to reach the light sensing means whenever the first and second identification numbers are different.

15. The means for optically comparing first and second identification numbers defined in claim **14** wherein the selected sets of apertures in said plurality of members are in alignment.

16. The means for optically comparing first and second identification numbers defined in claim **14** wherein said light sensing means produces a first output condition whenever a first and second coded identification number are different and a second output condition whenever a first and second compared identification number are the same, and means responsive to said first and second output conditions for producing an appropriate indication thereof.

17. The means for optically comparing first and second identification numbers defined in claim **14** including spaced first and second spool members on and between which the said filmstrip extends, motor means operatively connected to at least one of said spool members for rotating said spool member to wind the film therebetween, other optically encoded images on the filmstrip, and other means for optically sensing said other encoded images as the film is moving, said last-named other sensing means including means for controlling the direction and speed of movement of the film as it moves between the said spool members.

18. Means for optically comparing first and second coded images comprising a light source, a light sensitive assembly spaced from the light source and including a light sensitive member, and means positioned between said light source and said light sensitive assembly for controlling the amount of light from said source that reaches said assembly, said last-named means including adjacent first and second optically encoded assemblies, said first assembly including a plurality of adjacent movable members each having similar sets of position encoded light conducting and nonlight conducting portions to represent respective digits of a first identification number, the coding of each set of the light conducting and nonlight conducting portions being according to a constant ratio code, and said second assembly having light conducting and nonlight conducting portions position encoded complementarily with respect to the constant ratio coding of said movable members to represent respective digits of a second identification number for comparison with the first identification number, the encoded portions of said second identification assembly being registrable with preselected coded portions of said members of said first assembly in the space between the light source and the light sensitive assembly to prevent light from reaching the light sensitive assembly only under conditions when the registered first and second encoded identification numbers are identical.

19. The means for optically comparing first and second coded identification numbers defined in claim **18** wherein said light sensitive assembly includes aperture means registrable with the said registered first identification number, means for increasing the length of the optical path between the light source and the light sensitive assembly, and means for focusing light from the light source onto the light sensitive member.

20. Means for optically comparing first and second coded images comprising a light source, a light sensitive assembly spaced from the light source and including a light sensitive member, and means positioned between said light source and said light sensitive assembly for controlling the amount of light from said source that reaches said assembly, said last-named means including a credit card having a plurality of holes therethrough, said holes being position encoded in the card in sets of holes to represent individual digits of a first identification indicia, and a second member having light conducting and nonlight conducting portions position encoded in sets to represent individual digits of a second identification indicia for comparison with the coding for the first identification indicia, the holes in said card being aligned and positioned to be placed in registration optically with the coded light conducting and nonlight conducting portions of said second member to make a direct optical comparison therebetween, light from said source being prevented from reaching the light sensitive assembly only under conditions when the coded first and second indicia are complementarily identical.

21. The means for optically comparing first and second coded images defined in claim **20** including means forming a folded light path between the light source and the light sensitive assembly, said path extending through the registered encoded first and second coded indicia.

22. Means for comparing a first multidigit identification number with a plurality of second multidigit identification numbers to see if the first identification number is included in the plurality of second identification numbers comprising an electronic circuit including a plurality of circuit stages each having a plurality of bistable elements, means for entering data to represent said first identification number into said circuit stages to precondition the bistable elements therein wherein each circuit stage is conditioned to represent electronically in coded form one digit of said first identification number, other means including an elongated filmstrip having a plurality of multidigit second identification numbers each digit of which is encoded thereon by a group of position encoded light conducting and opaque areas, the coding of said second identification numbers being arranged in parallel rows extending transversely of the filmstrip to form a compact listing thereof on the filmstrip, a light source and a light sensing assembly positioned in spaced relationship, means for moving the filmstrip in the space between the light source and the light sensing assembly, said light sensing assembly including a plurality of sensing elements, the encoding on said filmstrip controlling which of the light sensing elements will receive light from the light source as the film is moved therebetween, each of said light sensing elements being in a first condition when light from the light source is blocked from reaching it by an associated opaque area on the filmstrip and in a second condition when light from the light source is able to reach it after passing through the associated light conducting area of the filmstrip, means for electronically comparing the simultaneous conditions of all of said light sensing elements with the identification number electronically entered into said circuit stages to see if said first and second identification numbers are the same or different, and means for indicating whenever an exact comparison occurs between said first and one of said second identification numbers.

23. Means for comparing a coded representation of a first multidigit identification with a coded representation of a second multidigit identification to see if the first and second identifications are the same or different comprising means for optically encoding the first identification including a filmstrip having optically distinguishable position encoded areas thereon, said areas being arranged in aligned groups each of which represents in coded form according to a constant ratio code one digit of the first identification, means for optically sensing the encoded areas on the filmstrip including light sensitive means and associated circuit means connected to said light sensitive means for producing output signals in response to light impinging on said light sensing means, said output signals representing said coded first identification, means to represent the second identification including electronic means having a plurality of bistable circuit stages adapted respectively to be in first or second conducting conditions, the conducting conditions of said plurality of stages representing in combination and according to a constant ratio code the digits of the second identification, and means for simultaneously comparing the output signals representing the first identification with the electronically encoded second identification to ascertain if the first and second coded identifications are the same or different, said last-named means including gating circuit means.

24. The means for comparing coded representations of first and second identifications defined in claim **23** wherein each of said plurality of bistable circuit stages for encoding the second identification includes a controllable bistable element, and means for sequentially controlling the conducting conditions of the bistable elements in succeeding circuit stages to enter therein a stage at a time a serial encoded representation of the second identification.

25. The means defined in claim **24** wherein said means for sequentially controlling the conducting conditions of said bistable elements in succeeding circuit stages include a counter circuit operatively connected to condition the circuit stage a stage at a time in sequence to receive succeeding serial bits which represent the second coded identification.

26. The means defined in claim **23** wherein said electronic encoding means include a plurality of bistable circuit stages, each stage of which includes a predetermined number of bistable elements the combined conducting conditions of the bistable elements in each of said circuit stages representing one digit of the second identification, and means for controlling the entering of the second identification into said plurality of circuit stages.

27. Means for comparing first and second stored representations of first and second multidigit identifications in coded form comprising means for encoding the first coded representations in optical form including a filmstrip having position encoded optically detectable images thereon, said images being arranged on the filmstrip in groups according to a constant ratio code, the images in each group representing one digit of one of said first identifications, means for sensing the optically encoded images on the filmstrip including a light source positioned to project light onto the filmstrip in the region of the images thereon, and sensing means including a plurality of sensor elements positioned to respond to the light that impinges on preselected portions of said images, light from the light source impinging on selected ones of the sensor elements depending upon the optical encoding of the images on the filmstrip, means for electronically storing representations of the second identification, a plurality of half-adder circuits each having a first input connected respectively to an output of a corresponding one of the sensor elements, a second input connected to respond to a corresponding position of said means electronically encoded to represent the second identification, and an output, each of said half-adder circuits including at least one "exclusive OR" gate, and other gate circuits having inputs connected to selected outputs of said half-adder circuits in combination to establish a first output condition when the first and second identifications are the same in all corresponding positions thereof and a second output condition when the first and second identifications are different in one or more corresponding positions.

28. Means for optically detecting position coded images on a filmstrip that accumulatively represents a multidigit identifier comprising a filmstrip having position coded optically detectable images thereon, said images including adjacent rows of light conducting and nonlight conducting areas arranged in groups of images, the images in each group being position encoded according to a constant ratio coded to represent a distinct digit of said identifier, a light source positioned adjacent to the filmstrip including lens means for concentrating the light therefrom on a preselected coded portion of the filmstrip, light sensitive means positioned to receive light from the light source that impinges on preselected coded portions of the filmstrip, said light sensitive means including a plurality of light sensitive members positioned to simultaneously detect and respond to light impinging on different preselected coded areas of the film, and means optically positioned between the light source and the light sensitive means for increasing the length of the optical path between the light source and the light sensitive members.

29. Means for determining if the form of position encoded optically detectable images is correct in all positions used to encode the several positions of a multiposition identification comprising a coded member having adjacent light conducting and nonlight conducting portions position encoded on the member in groups to represent individual positions of a multiposition identification, at least two of the light conductive and at least two of the nonlight conductive portions being required to encode each individual identification position, a light source including means for directing light from said source at said light conductive and nonlight conductive portions of the coded member, means responsive to the light impinging on the light conducting portions from said source for each position of said coded identification, and circuit means connected to each of said light responsive means including means for producing an output to represent the amount of light impinging on the associated light responsive means.

30. The means defined in claim **29** wherein said circuit means including the means for producing an output to represent the amount of light impinging on the associated light responsive means includes means establishing a range of light level impinging on the associated light responsive means that is considered to represent a correctly encoded condition.

31. Means for comparing first and second stored representations of first and second multidigit identifications in coded form comprising means for encoding the first coded representations in optical form including a strip of material having position encoded optically detectable images thereon, said images being arranged in rows with the images in each row being grouped so that each group has the images therein position encoded according to a constant ratio code to represent a distinct digit of the first identification, means for sensing the optically encoded images on the strip including a light source positioned to project light onto the strip in the region of the images thereon, and sensing means including a plurality of sensing elements positioned to respond to light that impinges on preselected portions of the encoded images in each row during movement of the strip, means for electronically storing portions of said second identification which correspond portion-for-portion to the preselected portions of coded said first identification, and means for comparing the corresponding portions of said first and second representations of said first and second identifications to determine if the first and second identifications are the same or different, said comparing means including a plurality of comparison circuits each having a first input connected respectively to an output of a corresponding one of the sensor elements, a second input connected to respond to the corresponding electronically stored portion of said encoded second identification, and an output, and gate circuit means connected to the outputs of said comparison circuits including means for producing a first output condition when the first and second representations of the first and second identifications are the same, and a second output condition when the first and second representations of the first and second identifications are different in one or more of the encoded portions thereof.

PO-1050 (5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,581,063 Dated May 25, 1971

Inventor(s) Joseph L. Levasseur

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 8, line 19, "right" should be "light"; line 27, "possible" should be "possibly".
Column 10, line 63, "predetermine" should be "predetermined".
Column 12, line 10, "am" should be "an"; line 31, "elements" should be "element".
Column 14, line 32, "concussion" should be "conclusion".
Column 16, line 38, cancel "of" (second occurrence).
Column 17, line 61, "430" should be "431".
Column 19, line 33, "area" should be "areas".
Column 21, line 41, "(1-36a)" should be "(1-36)".
Column 27, line 43, "the" should be "other".

Signed and sealed this 16th day of November 1971.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Patents