Feb. 11, 1941. M. E. GOULD 2,231,186

IDENTIFYING MEANS

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Fig. 1.

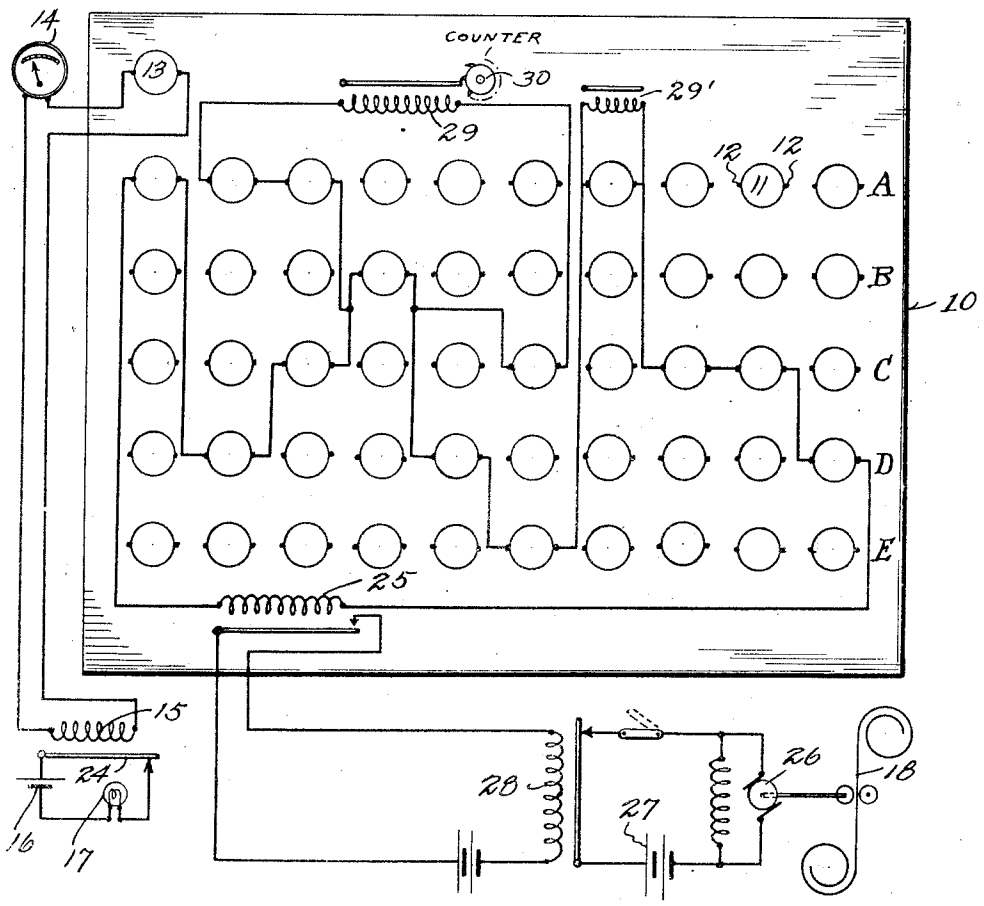
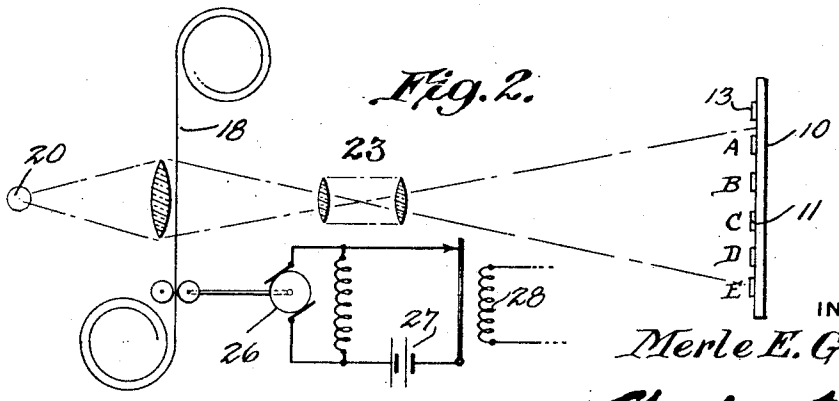


Fig. 2.



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Fig. 3.

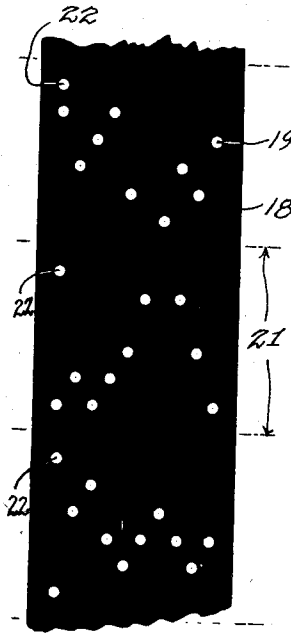


Fig. 4.

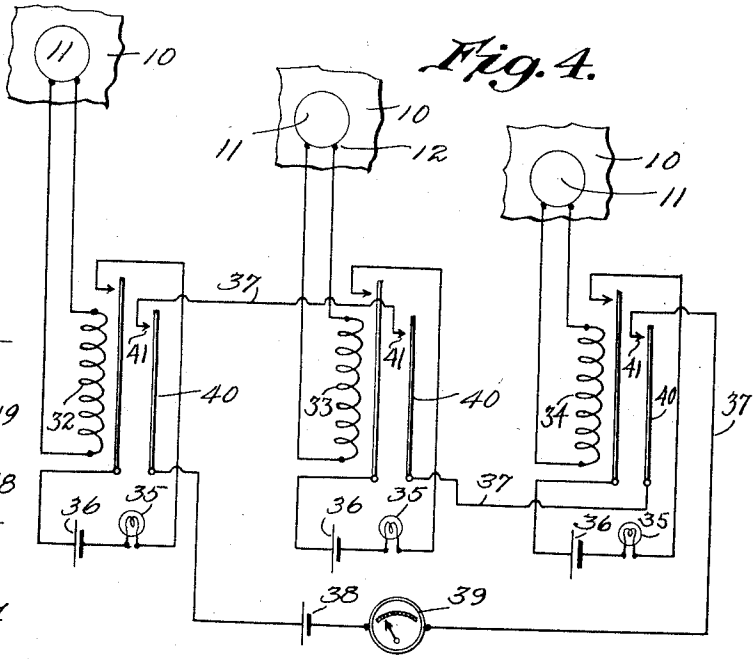
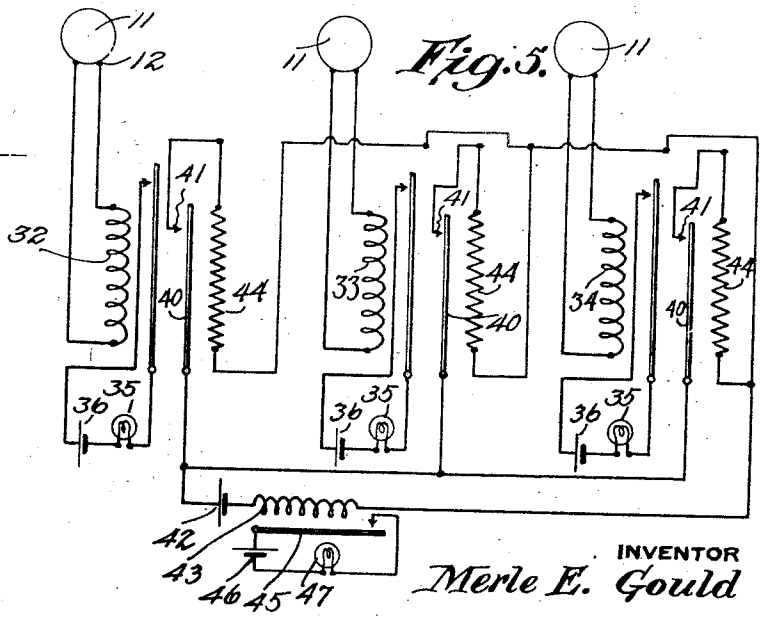


Fig. 5.



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Fig. 6.

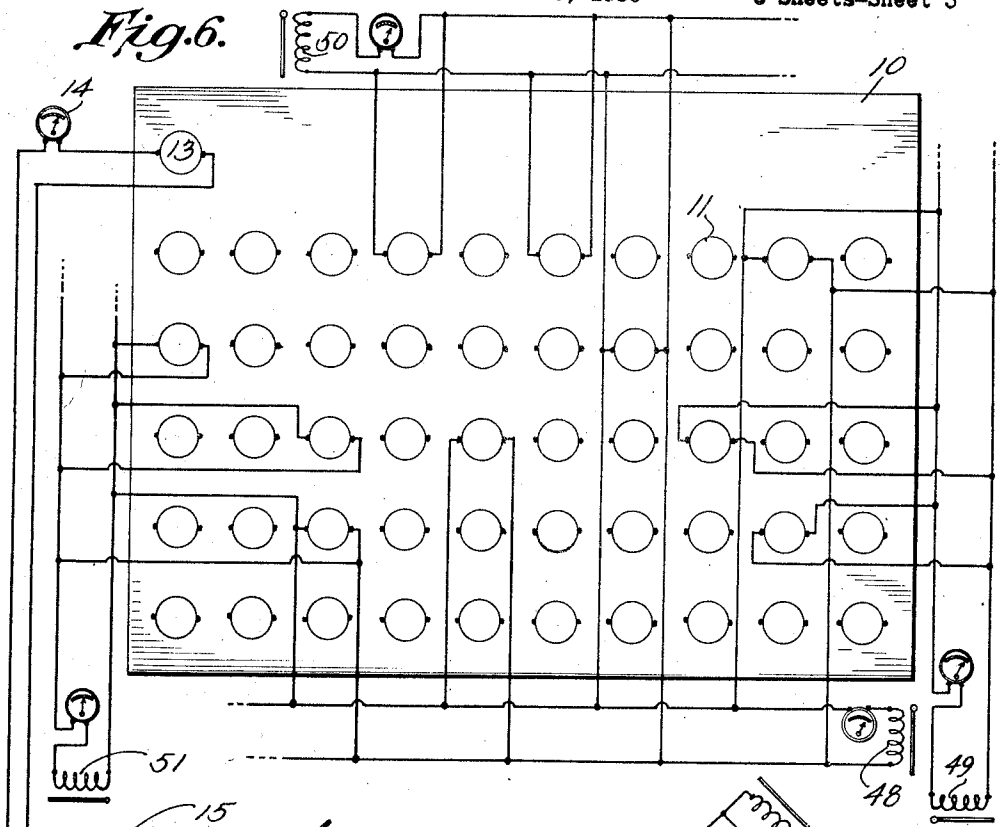
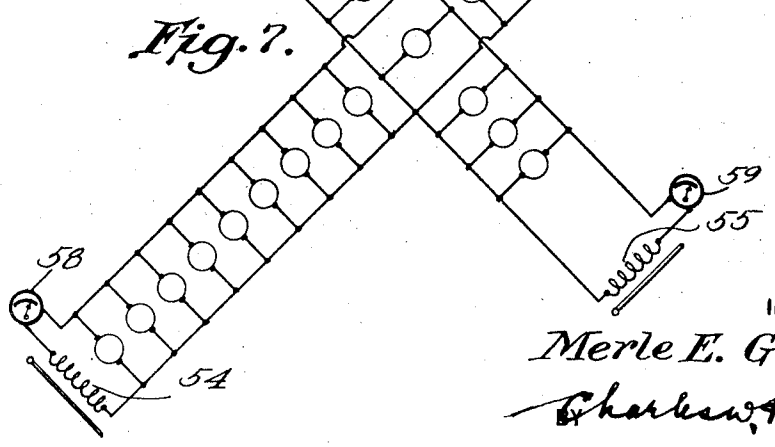


Fig. 7.



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Patented Feb. 11, 1941 2,231,186

UNITED STATES PATENT OFFICE

2,231,186

IDENTIFYING MEANS

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Application June 3, 1936, Serial No. 83,407

1 Claim. (Cl. 235—61.11)

The present invention relates to means for identifying books, documents and the like, and the method of classifying such books, documents, and the like, so that their identification may be accomplished at a high speed. The present invention also relates to the identifying, classifying, and tabulating of data, so that data may be readily tabulated according to many classifications and at a high speed.

It is an object of the present invention to provide means whereby a thing which has been classified according to a major and several minor classifications, and which is one of many other things in the same classifications, may be speedily identified.

A person, or thing, may have certain characteristics susceptible of classification in many ways, records may be kept at a certain headquarters of millions of persons or things classified in many ways to indicate the many variables in their characteristics. If an unknown person or thing is found at a remote point, the observed characteristics may be classified according to a code, the code telegraphed to headquarters, and the person or thing speedily identified by a scanning of the files at headquarters according to the means of the present invention.

It is an object of the present invention to provide a method of classifying things according to their characteristics, etc., and of providing a record of the thing classified so that it may be speedily identified according to the means disclosed herein.

It is a further object of this invention to provide means for identifying and tabulating data concerning things and events so that data may be readily tabulated according to major and minor classifications at a high rate of speed.

Other and further important objects of this invention will appear hereinafter.

In the drawings:

Figure 1 is a diagrammatic showing of the circuits connecting light-sensitive devices and current-responsive devices.

Figure 2 is a diagrammatic showing of a projection device and related control circuits.

Figure 3 is a plan view of a perforated film with parts broken.

Figures 4 and 5 are diagrammatic showings of the circuits connecting light-sensitive devices and current-responsive devices.

Figures 6 and 7 are diagrammatic showings of circuits connecting light-sensitive devices and current-responsive devices.

The numerals 10 indicate generally a panel upon which are mounted light-sensitive devices 11 of a conventional type, such, for instance, as the photoelectric cell which consists of a thin metallic disc on which there is a film of light-sensitive material and a metal collector ring in contact with the light-sensitive surface. In a cell of this type the collector ring is the negative terminal, and the output of the cell depends upon the illumination of the cell and the external resistance of the device connected to it. The equivalent circuit of the cell indicates a source of voltage shunted by a condenser in parallel with the internal resistance of the cell and with that of the external resistance of the device in the output circuit.

Other conventional light-sensitive devices may be employed, but the conventional cell just described has been found suitable, and it lends itself admirably to the illustration of the present invention without causing confusion of lines.

The cells 11 are each provided with a pair of terminals 12.

In Figure 1 there are shown five rows of cells A, B, C, D, E, with ten cells in each row, and an additional cell 13 which is connected in circuit with a meter 14 and a relay 15 to control a circuit including a source of energy 16 and an indicating device 17.

A film 18, of suitable material, is provided with openings or transparent portions 19, as indicated in Figure 3, and this film is passed in front of a light source 20 through a conventional projector having an optical system 23 and the usual shutter or "flicker" (not shown) to project intermittent beams or pencils of light to illuminate certain cells 11 on the panel 10, and to illuminate them in a desired pattern as the beams vary in location in relation to the area of the film and to the area of the panel. A suitable conventional projector, and in which the film is momentarily arrested as a frame is being exposed and the light beams are interrupted as the frames are in motion, is shown and described in the Davis Patent No. 1,075,407, of October 14, 1913.

The film 18 may be thought of as divided into sections or frames 21, each of which will permit the projection of a control beam or dot of light through a control opening 22 to cooperate with a control cell 13, and a group of beams of light variably spaced according to a code or pattern, to be scanned by the cells 11 on the panel 10, as each frame appears in front of the light source and the shutter opens.

As each frame appears before the optical system 23, and is exposed for the passing of light

by the opening of the shutter, its control dot 22 will permit illumination of the cell 13 if the frame is properly aligned with respect to the rows of cells on the panel 10. If the frame is tilted or otherwise out of alignment the control cell will not be illuminated or will be insufficiently illuminated, and observance of the current meter 14 will disclose this condition. Furthermore, insufficient illumination of the control cell 13 will cause the armature 24 of the relay 15 to drop and close the local circuit containing the battery 16 to give a visual or audible warning.

Insufficient light from the light source 20, or insufficient light due to discoloration of the film 18 may be detected by observing the reading of the meter 14.

It will now be evident that as the film passes in front of the light source 20, and properly aligned, successive groups of the cells 11 are illuminated according to the code or pattern on each frame of the film. Certain of the cells 11 are connected in series, as shown in Figure 1, and unless all of the cells of a certain group or pattern are illuminated at the same time the circuit in which the cells are placed is ineffective to operate a relay in that circuit in a predetermined manner.

As is shown in Figure 1, one group or pattern of cells is connected in series circuit association with a relay. This group consists of ten cells distributed among the five rows of cells, and unless all of these ten cells are illuminated at the same instant the energy output of the group is insufficient to operate the relay 25 in the desired manner. It follows, then, that unless the pattern of dots on the frame of the film corresponds with the specific grouping or pattern of the cells on the panel the device 25 cannot give the proper response since the film functions as a matrix to determine the pattern of the projected light.

When illuminated, the ten cells are ten sources of current connected in series, and in series circuit association with the relay 25. Should only nine cells of the group be illuminated at a given instant, the internal resistance of the dark cell is high enough to prevent sufficient current flow to operate the relay 25 in the manner intended.

It will now be evident that as the film 18 passes the light source 20 it is being scanned by the rows of cells on the panel 10, and when a certain frame is identified as having a pattern of dots precisely similar to the pattern of the cells the relay 25 indicates this identification.

Any suitable energy responsive device may be substituted for the relay 25, to indicate the identification of a certain frame of the film 18.

The film 18 may be driven by an electric motor 26 supplied from a current source 27, and the relay 25 may be arranged operative to interrupt the motor supply circuit by energizing a relay 28, in a suitable circuit, and as is indicated in Figures 1 and 2, upon the frame being identified by the cells on the panel 10.

The dots are arranged according to a pattern in each frame of the film to convey certain information to the user of the film, or to identify a particular frame carrying information on it. Thus, when it is desired to identify a certain frame of possibly millions of frames distributed over thousands of films, it is only necessary to arrange the cells 11 on the panel 10 according to the desired detecting or identifying pattern desired, and to rapidly pass the films through the projecting machine so that they may be scanned by the detecting group of cells. When the frame sought appears with its distinct pattern of dots the cells cooperate with the relays 25 and 28 to stop the motor 26, and the film may be slowly passed in the reverse direction until the desired frame again appears, for it is probably not desirable to stop the film so quickly as to run the risk of breaking it.

Documents may be identified by code numbers, the code numbers may be transferred to the frame 21 of a film in the pattern of the openings 19, and the identifying cells may be arranged in patterns on the panel according to code numbers. Thus, with ten cells in a horizontal row, and beginning at the right with the first cell representing units, the next would be in the tens row, and so on. With nine cells in each vertical row, it is evident that with only three vertical rows we may identify all numbers between 1 and 999. If the films are prepared and classified according to the location or information contained in documents, and we desire to determine the location or a nature of a document having the code number 386 or 683, we may place cell 3 of the third vertical row in series with cell 8 of the second row and cell 6 of the first row, numbering from the top of the row, and when a film is identified as having a frame with a corresponding pattern of dots we immediately have the desired information on the location of or the nature of the document.

As is shown in Figure 1, we may identify frames as lying within certain broad groups as well as within a specific narrow group by employing several groups of cells with each group connected in series circuit association with a relay. A second grouping or pattern of cells, employing four cells, is shown in series with a relay 29, and operating a counter mechanism, indicated generally by the numerals 30, to indicate how many frames lie within the broad group. This group of four cells includes a cell which is included in the first mentioned group of ten cells. It will now be obvious that the cells may be grouped in a plurality of groups in series circuit association to operate indicating devices to determine the number of frames on each film lying within different major and subclassifications while a specific frame is being sought.

The dots on the frame may, therefore, indicate persons or things lying within certain major and auxiliary groups, and information may be quickly obtained on the number lying within each group.

It will be evident that instead of four cells in the group of cells connected to the relay 29 a single cell may be employed in a circuit, instead of four, to operate a relay 29', and indicate how often a certain code element appears in each area scanned while leaving the cell available for use in identifying a film area projecting beams of light located to correspond to a specific identifying pattern on the panel 10. Thus, it is possible to have a group of cells in series circuit association to identify a film area projecting beams of light of equal intensity but variably located in space by a specific pattern of cells while having one or more cells of the group arranged to identify master and sub-master or main and auxiliary elements or combinations in the film areas scanned. The film may be also thought of as having areas divided longitudinally, with each area of the divided strip controlling the projecting of beams of light of equal intensity but located to be identified as indicators of the falling of the projected areas as

lying within certain master or sub-master combinations so that the number of each may be counted as the areas are scanned.

As is shown in Figures 4 and 5, two or more panels may be set up, each panel being provided with one cell or with a group of cells in series circuit association with a relay, and connected so that while each may identify a frame as lying within a group and indicate this fact, it is not until a group of frames are identified as a unit at the same instant that this type of identification is indicated.

Thus, three films may be passed at the same time through suitable projection machines to selectively illuminate patterns of cells on three panels, and while the cells on each panel may indicate the fact that the frames on the films carry information lying within certain major and minor classifications, as already described, it is not until all of the panels identify a specific frame on each film, and at the same instant, that the final identification sought is indicated. A single film divided longitudinally into three strips, may, of course, be employed instead of three films.

In Figure 4, the three panels are shown with suitably positioned cells, or groups of cells 11, to operate relays 32, 33 and 34, respectively, each of which is arranged to operate an indicating device 35 upon the closing of its local circuit containing a battery 36.

When all of the relays close at the same instant they are effective to close a circuit comprising the connecting wire 37, the battery 38, and the current-operated device 39, when their armatures 40 touch the contacts 41, and it will be obvious that the circuit containing the device 39 is interrupted unless all three of the armatures 40 are in the circuit-closing position at the same instant.

The alternative arrangement is shown in Figure 5 in which the relays 32, 33 and 34 are each operative to close a local circuit containing a battery 36 and an indicating or recording device 35. A circuit containing a battery 42 in series with a relay 43 is normally in open-circuit condition, and the relay 43 is arranged to be normally inoperative to raise its armature 45 to close a local circuit containing a battery 46 and an indicator 47 until all three of the relays 32, 33 and 34 have moved, and at the same instant, to bridge the circuit of relay 43 by connecting three resistors 44 in parallel.

The three panels with their patterns of photo-electric cells in series are, therefore, arranged to operate in parallel to operate the relay 43.

Conventional showing of the relays has been made for ease in illustration, and it will be understood that the relays may be of the electronic type without departing from the spirit of the invention. The voltage of the illuminated cells 11 may be inserted in the grid circuit of an electronic relay to produce a desired grid bias, and in a manner well known in the electronic tube art.

In Figure 6 the photo-electric cells 11 in the panel 10 are shown in groups or patterns of cells connected in parallel. Four groups are shown connected to relays 48, 49, 50 and 51, respectively, and, as shown, a group may contain a cell which is also an element in another group. This is, perhaps, more readily seen in Figure 7 in which several groups are shown in diagrammatic form.

In Figure 7 it will be evident that all of the four relays 52, 53, 54 and 55 are responsive to current in the network due to the cells being illuminated, but it is well understood that each may be arranged to be inoperative to perform its desired function when the current through it is below or above a predetermined value.

Relay 52 may be thought of as responsive in a certain manner to the illumination of the seven cells in parallel in the upper right arm; relay 53 to the five cells in the upper left arm; relay 55 to the three cells in the lower right arm, and relay 54 to the nine cells in the lower left arm. A cell at the point where the inclined arms cross may be considered in any one of the groups. The relay 54, for instance, may be arranged inoperative unless nine cells of the lower left arm are illuminated or unless nine cells of the network are illuminated. The associated current operated devices 56, 57, 58 and 59 will indicate to what extent the network, as a whole, is illuminated.

The relay 52 may be arranged inoperative unless seven cells of the upper right arm are illuminated or unless seven cells of the network are illuminated. Thus, relay 52 would operate when seven cells are illuminated but relay 54 would not operate; and, again, when relay 54 is operated by the illuminating of nine cells the relay 52 would also operate.

It will now be obvious that each arm may be illuminated as a unit, that parts or the whole of two arms may be illuminated as a unit, and so on, and that patterns of dots may be identified, coming from a plurality of films or strips in one or more projecting machines, as conveying information according to a code. Thus, a group of films may be identified as conveying information falling in common major and minor groups, and, when such is the case, disclosing a combination sought for out of the many combinations possible.

Each frame may carry descriptive matter, for instance, the name of an author and the title of a book, etc. The book may be classified or indexed according to Author, Title, General class, Branch, Topics, Characteristics, Value such as formulae, apparatus treated, Relationship to such fields as telegraphy, telephony, etc., and according to country of origin, and present location. It is well known that in libraries it is necessary to have a multiplicity of card indexes which are cross-referenced or cross-indexed to each other, and that in some instances there is a separate card index file for each grouping or sub-division such as mentioned above.

In the present invention the desired information is placed in a film frame, the frame is coded by a pattern of apertures or transparent dots, and when the film is scanned by a group of photo-electric cells arranged according to a desired code arrangement the desired book may be readily identified. Again, a length of film may be assigned to a book with each frame carrying certain information and being coded according to such information, and when the film is scanned by the photo-electric cells one may readily obtain data as to the general and many sub-classifications into which the information falls. Thus, with a library of index films one could readily determine how many books fall within a general class, how many in each of the many sub-classes, and pick out the one book of many that is being sought.

While the film lends itself to scanning by the photo-electric cell and to the carrying of a great deal of information in a small area, it is not mentioned herein by way of limitation, for paper strips or cards may be employed to carry the desired information and be coded by providing them with apertures, so that they may be scanned by elements arranged according to a group or pattern to operate devices for recording or indicating

identification according to the method described in conjunction with the light-sensitive cell.

While the transparent portion of the film has been indicated as a dot it will be obvious that the contour of the transparent portion may be changed to a square, a dash, or other convenient shape, without departing from the spirit of the invention.

In the present invention, books, documents, or the like, are given numerals for identification purposes, the numerals being arranged according to a code or classification arrangement, the same code numerals are applied to a film or a strip by means of openings variably positioned over a definite area, and photo-electric cells, or equivalent circuit controlling means are variably positioned over a definite area to scan the moving film or strip, and identify a desired portion of the strip.

What is claimed is:

Identifying means of the character described including a panel having a plurality of rows and a plurality of columns of photocells upon which varying coded patterns of light rays may be projected, the combination of circuit means for connecting in series circuit a first group of photocells to form a coded pattern from photocells selected from said rows and columns; a second circuit means for connecting in series circuit a second group of photocells to form a second coded pattern from said rows and columns; a current-responsive means for each group, controlled by the related series circuit arrangement to be operated only upon illumination of all photo cells in said related group, said second circuit means including a predetermined number of the photocells of said first group.

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