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[73] Assignee **The United States of America as**
represented by the Secretary of the Air
Force

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[54] **PHOTOSENSING FOLIO KEYED KEYBOARD**
9 Claims, 14 Drawing Figs.

[52] U.S. Cl..... **250/219 DC,**
35/5, 235/61.12, 250/208, 250/221

[51] Int. Cl..... **G01n 21/30**

[50] Field of Search..... **250/219 I,**
219 ID, 221, 222, 208, 209; 235/61.12, 61.15,
145; 35/5, 6, 53

ABSTRACT: A photosensing keyboard which is utilized in conjunction with a folio. The folio is mounted on the face of the keyboard. The keyboard has a first and second photosensing means therein. The photosensing means and folio are interrelated in such a manner that the keyboard is capable of detecting the presence of the folio thereon and also the specific page the folio is opened to.

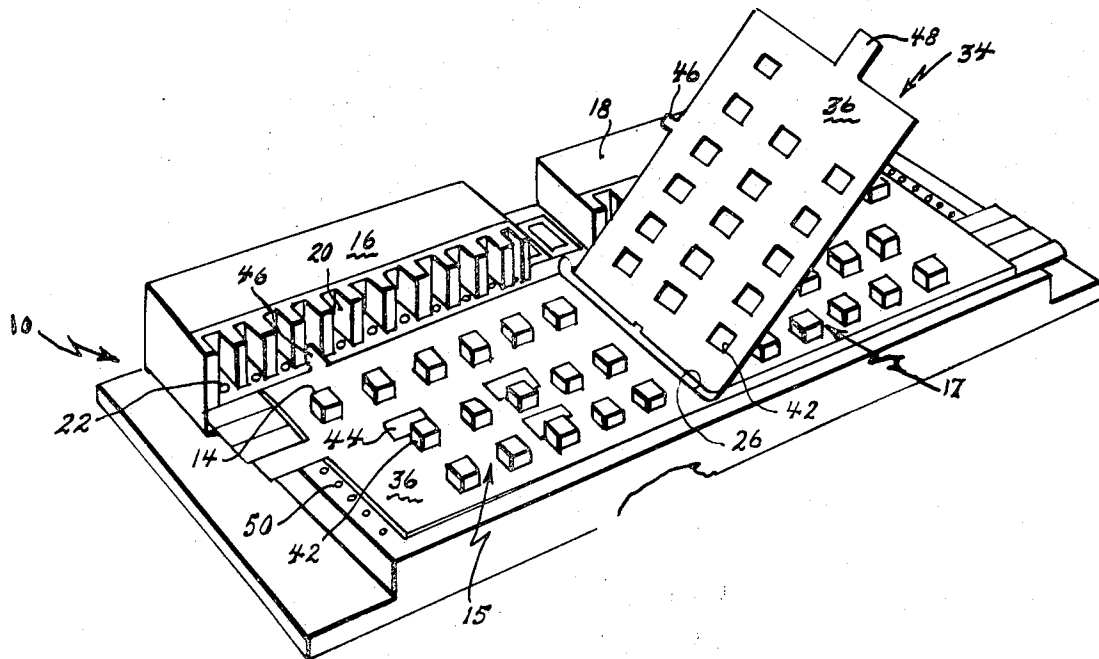


FIG. 1

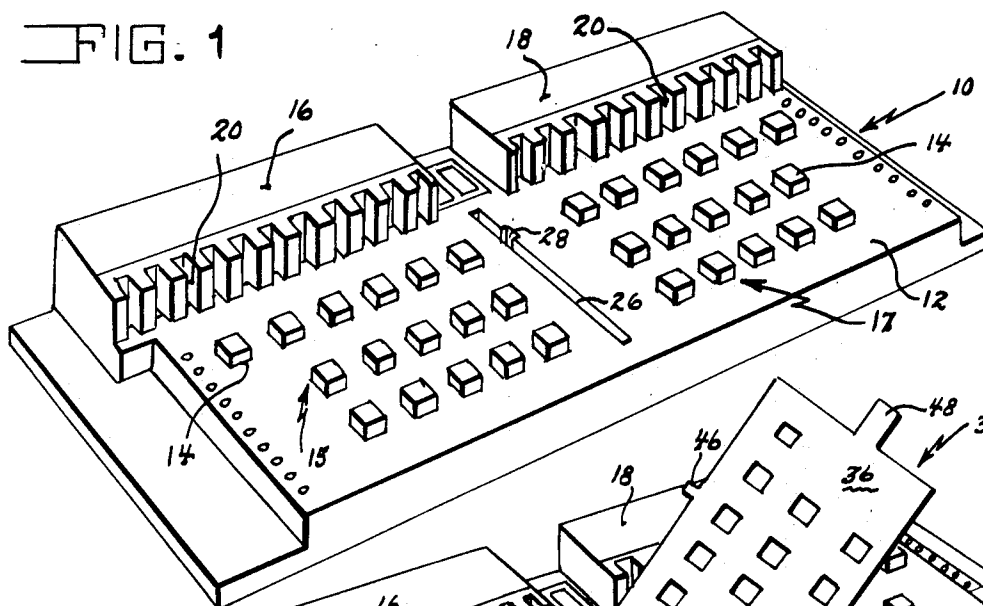


FIG. 3

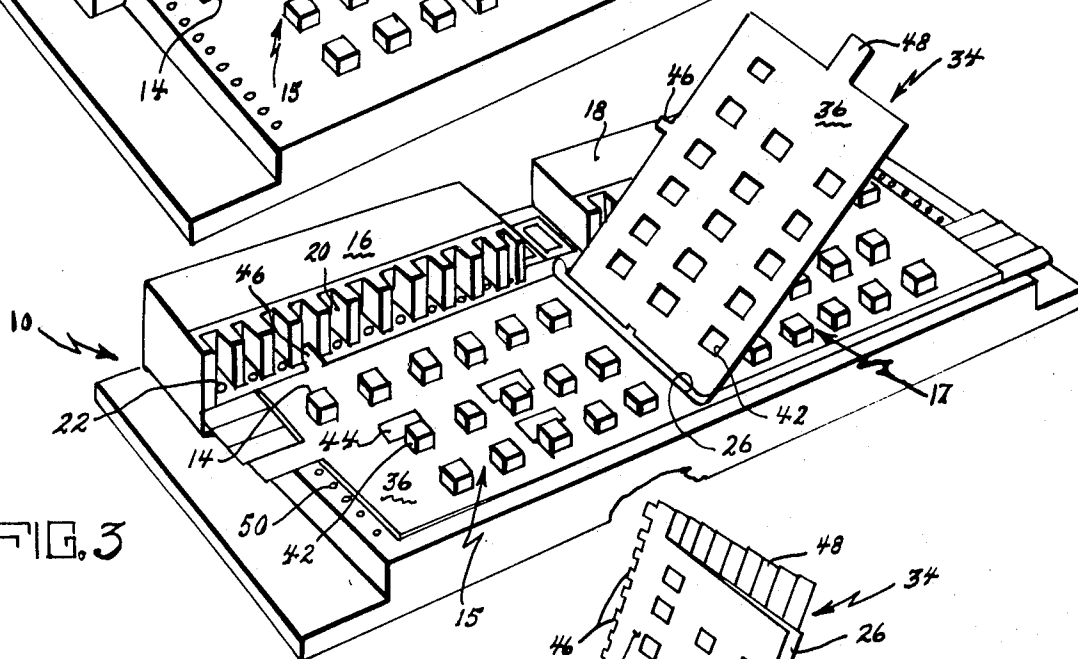
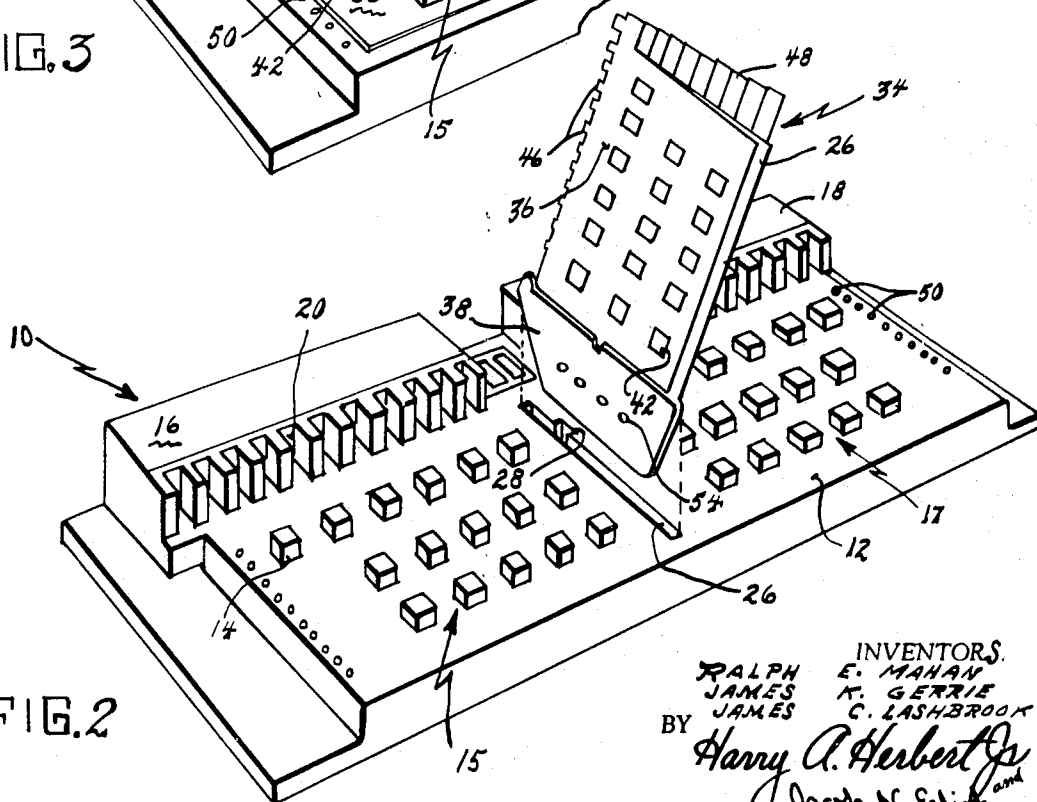
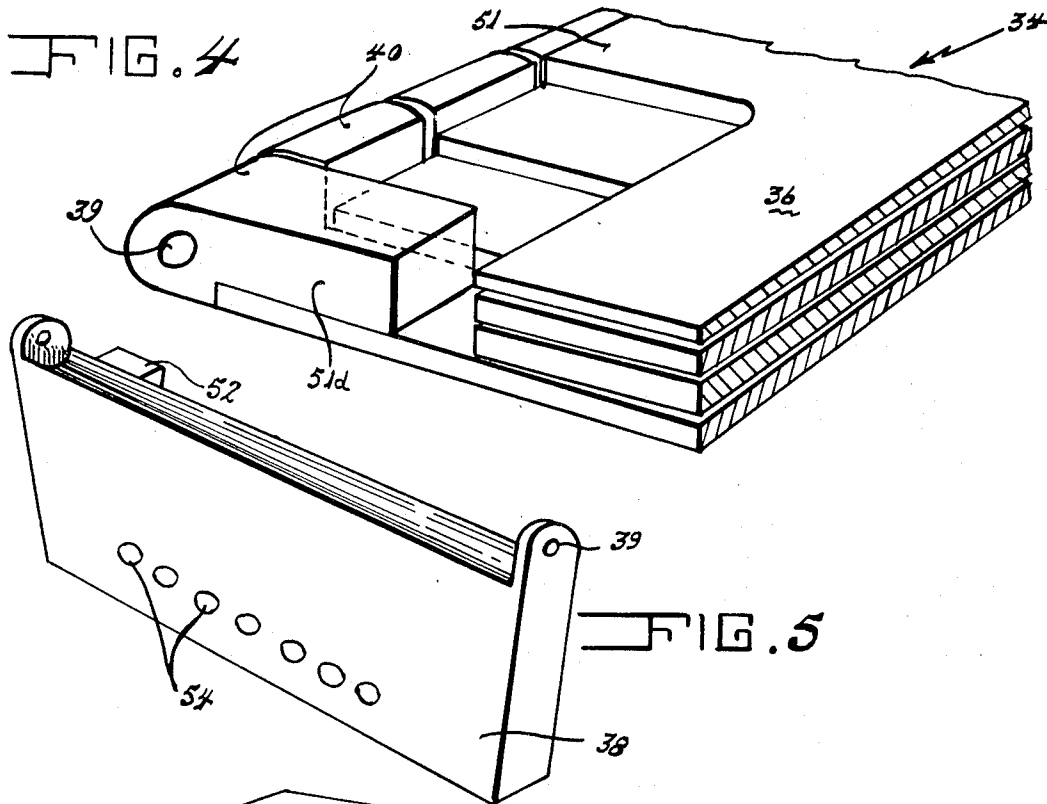
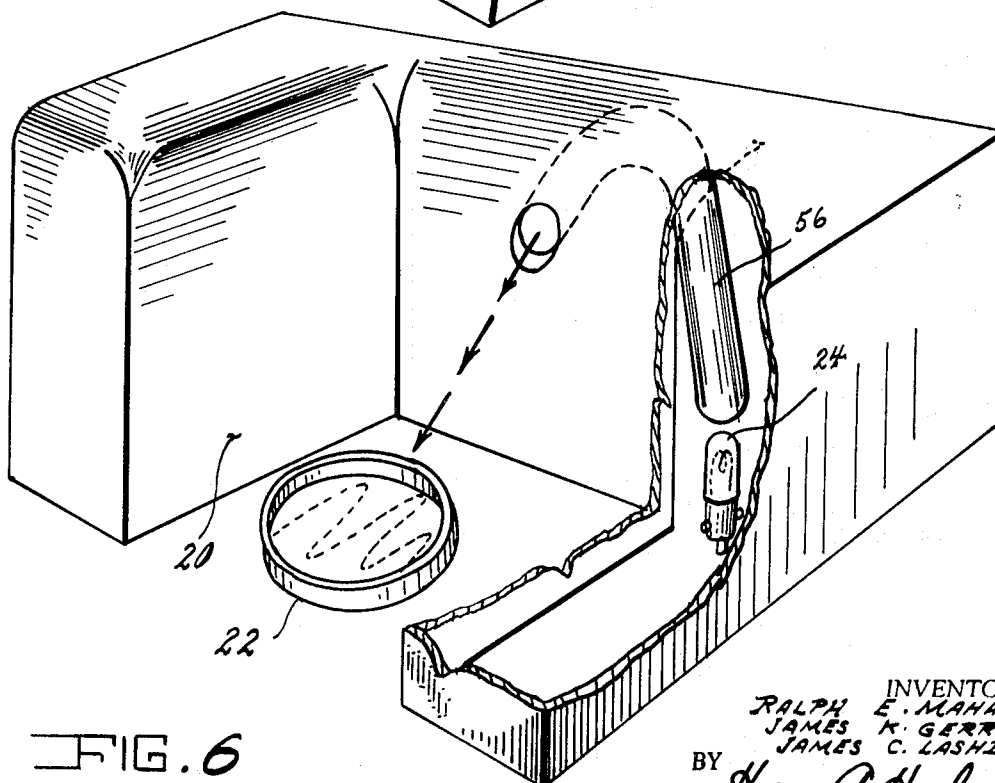


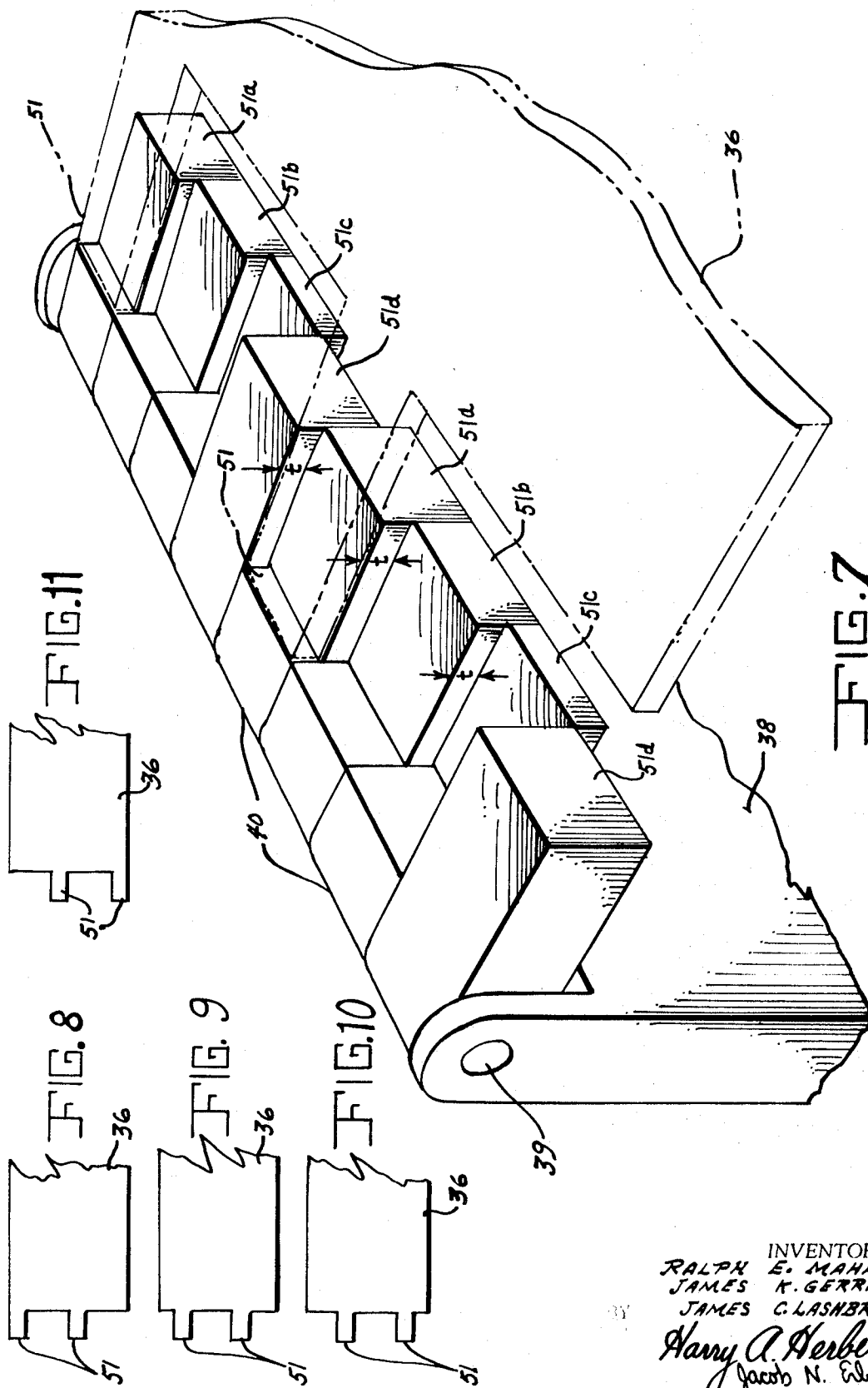
FIG. 2



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FIG. 12

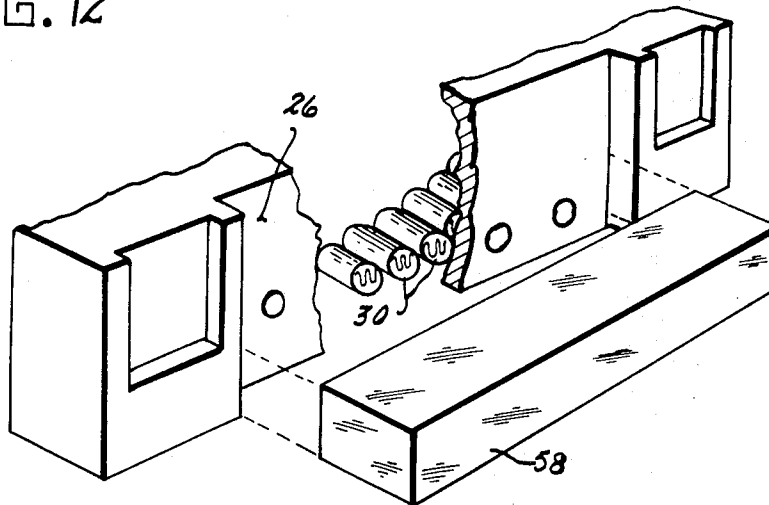
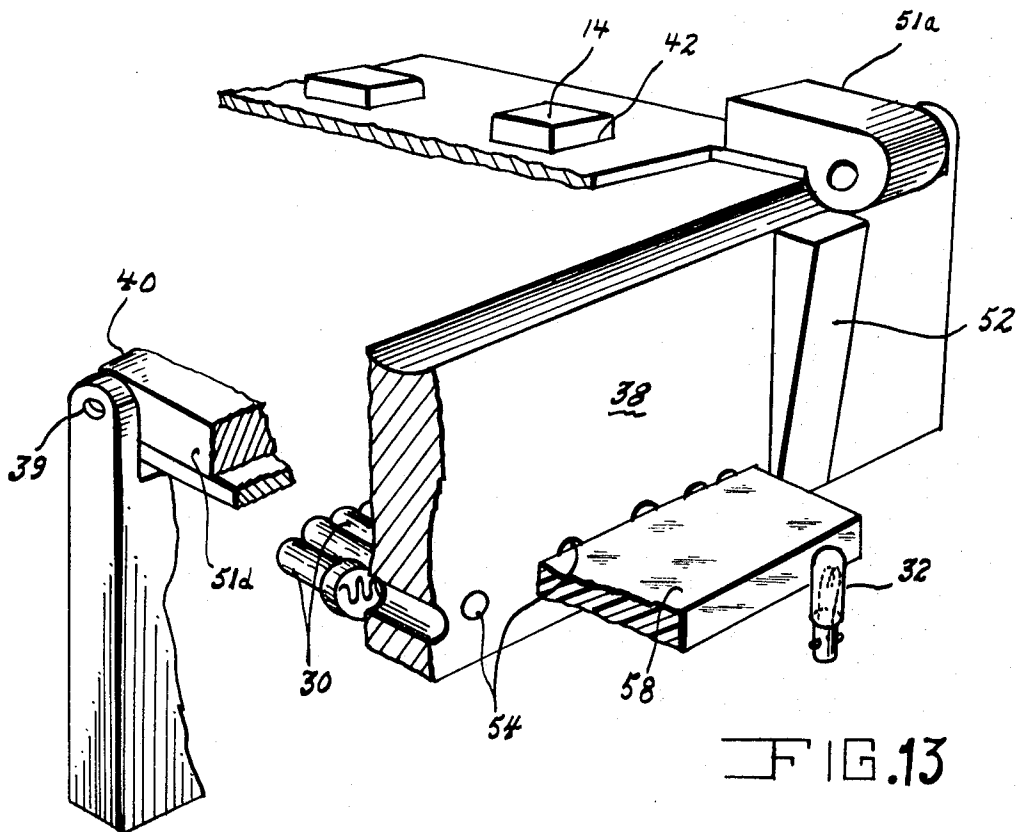
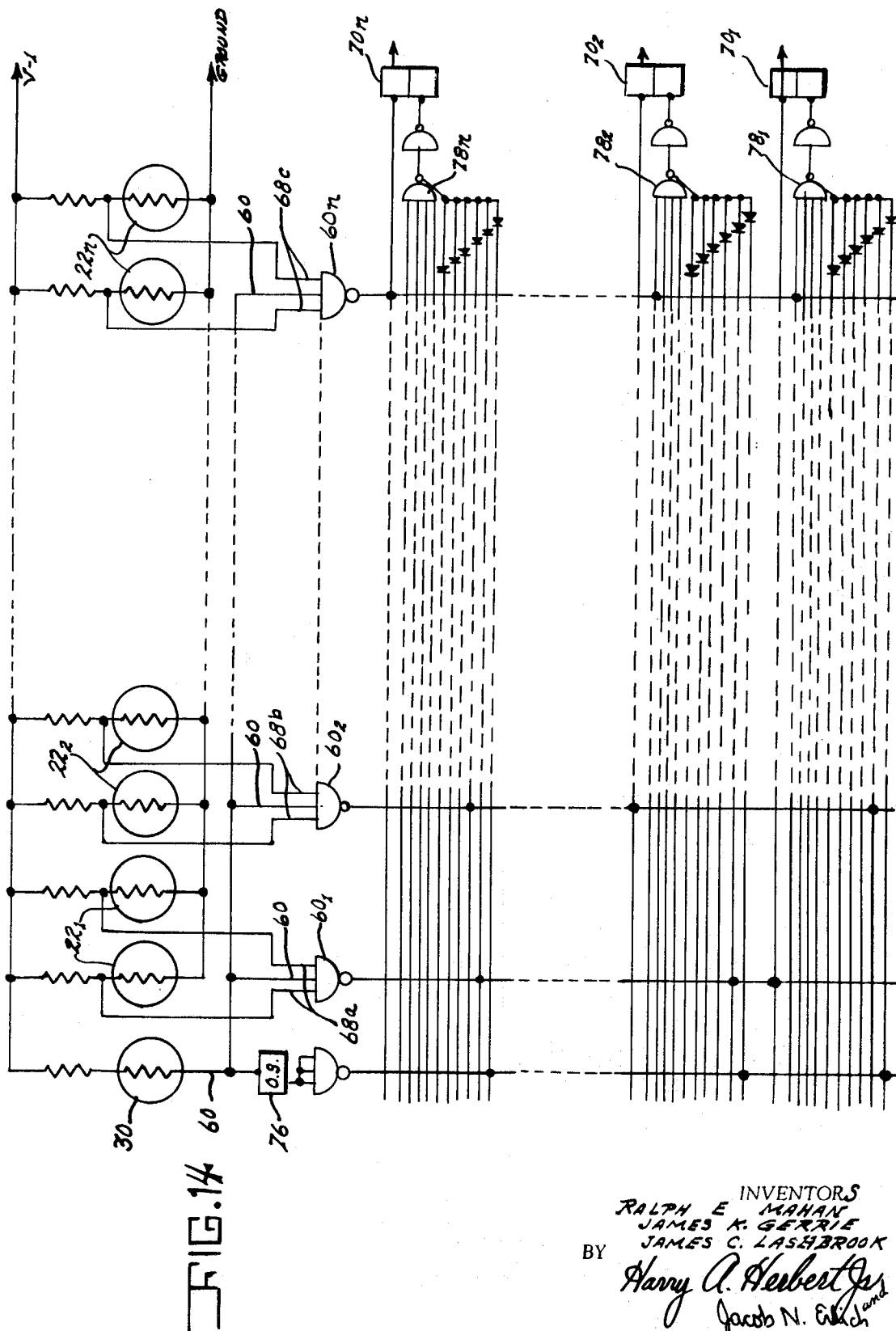


FIG. 13

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PHOTOSENSING FOLIO KEYED KEYBOARD

BACKGROUND OF THE INVENTION

This invention relates generally to a pushbutton keyboard for computer or processing systems, and more particularly to a pushbutton keyboard having a photoelectric sensing system which is utilized in conjunction with a folio.

Pushbutton keyboards find use in many areas, for example, in communication with computer systems, TV teaching systems, business systems, or other information call up and/or processing systems. The keyboards generally are used in conjunction with an information card or cards. These cards when properly placed on the keyboard give information as to the use of the particular pushbuttons located on the keyboard. In the past the particular card used, would be individually placed upon the keyboard with the specific information thereon being noted and mechanically processed into the keyboard by the operator.

The cards, besides being cumbersome, were usually held in place by removable bars which had to be removed before the next card could be used. As seen these type of prior art keyboard arrangements were extremely time consuming in operation and in many instances because of the human element involved, led to many errors in utilizing such a keyboard. There has heretofore been no rapid and accurate method with which these keyboard pushbuttons could be properly identified.

SUMMARY OF THE INVENTION

The instant invention overcomes the problems set forth hereinabove. This invention is made up of a pushbutton keyboard which houses a photoelectric sensing system and a folio. The folio being the book containing the desired information is used in conjunction with the keyboard. Each folio is made up of pages and a binder. The binder is inserted into a slot in the face of the keyboard and the pages carry the information setting forth the operation of each of the pushbutton keys. When inserted into the keyboard, the binder of the folio either breaks or does not brake several light source photocell links. In so doing, it sends a binary number to the logic which identifies the folio. This corresponds to a certain area of information storage or to a group of computer programs, etc.

As individual pages of a folio are turned, another group of light source photocell links are broken or not broken. The combination of which identifies the page of this folio being used. The open page labels each pushbutton with a specific function within the areas or groups mentioned hereinabove. Each page of the folio has a tab located at its top edge, with no two pages in a folio having this tab in the same horizontal location. It is this tab which breaks the light source photocell links for page identification.

It is essential that the pages lay flat on the keyboard so that little or no light reaches the photocell which is blocked by that page tabbed. This is accomplished by a novel hinging of the folio pages and by making the pages of a semirigid material.

The operator who utilizes the keyboard and folio of this invention need only insert the folio binder in the keyboard face, turn to the desired page, and because of the operation of the photocells in the manner set forth hereinabove merely press the button designated by the information on the folio page. The amount of information which can be accessed through the keyboard of this invention is limited only by the amount of information storage and folio storage capability.

It is therefore an object of this invention to provide a photosensing folio keyed keyboard which "tells" the logic of a computer system when a folio is inserted therein, and then what page is being used.

It is another object of this invention to provide a photosensing folio keyed keyboard which is extremely rapid acting and accurate.

It is a further object of this invention to provide a folio which is to be used in conjunction with the photosensing folio

keyed keyboard of this invention. It is another object of this invention to provide a photosensing folio keyed keyboard which utilizes conventional, currently available components that lend themselves to standard mass producing manufacturing techniques.

For a better understanding of the present invention together with other and further objects thereof, reference is made to the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a pictorial view of the face of the pushbutton keyboard of this invention;

FIG. 2 is a pictorial view of the face of the pushbutton keyboard of this invention with the folio about to be inserted therein;

FIG. 3 is a pictorial view of the face of the pushbutton keyboard of this invention with the folio in place;

FIG. 4 is a pictorial view of a portion of the folio of this invention shown partly in cross section;

FIG. 5 is a pictorial view of the binder of the folio of this invention;

FIG. 6 is a pictorial view of one of the photosensing elements of the keyboard of this invention shown partly in cross section;

FIG. 7 is a pictorial view of the folio of this invention with the binder in place;

FIG. 8 is a plan view of a portion of the top page of the folio of this invention;

FIG. 9 is a plan view of a portion of the second page of the folio of this invention;

FIG. 10 is a plan view of a portion of the third page of the folio of this invention;

FIG. 11 is a plan view of a portion of the bottom page of the folio of this invention;

FIG. 12 is a pictorial view of another of the photosensing elements of this invention shown partly in cross section;

FIG. 13 is a pictorial view of a portion of the folio located adjacent the photosensing element of FIG. 12 and shown partly in cross section; and

FIG. 14 is a circuit diagram of the page sensing system of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Reference is now made to FIG. 1 which shows the face 12 of the pushbutton keyboard 10 of this invention. The face 12 has a plurality of pushbuttons 14 thereon; these pushbuttons 14 are connected in any conventional manner with a computer system, TV teaching system, business system, or other informational system. The pushbuttons 14 are arranged in a pair of groups of buttons 15 and 17, although any number of groups may be used with this invention. A pair of raised portions 16 and 18 are located adjacent each of the groups of buttons 15 and 17, respectively, the only restriction being that each raised portion accompany each group of buttons. The raised portions 16 and 18 contain a plurality of indentations 20 therein, each indentation 20 containing a suitable photosensing means, such as photocell 22 and light source 24 (see FIG. 6). The operation of the photosensing means will be explained in detail hereinbelow. The face 12 of the keyboard 10 further has a slot 26 located in the center thereof and positioned so as to separate the groups of pushbuttons 15 and 17. This slot has a keyway 28 located at one end thereof and any suitable photosensing means such as photocells 30 and light source 32 located therein (see FIGS. 12 and 13). The operation of this photosensing means will also be described in detail hereinbelow.

Referring now to FIGS. 2 and 3, a folio or book 34 is shown being inserted within the slot 26. This folio 34 is made up of a plurality of pages 36 and a binder 38. The binder 38 contains a plurality of binder elements 40 to which the pages 36 are fix-

edly secured (see FIGS. 4 and 7). The pages 36 have a plurality of apertures 42 therein which are positioned in such a manner as to permit all the pushbuttons 14 to protrude therethrough as best shown in FIG. 3. Information pertaining to each button 14 is written adjacent the apertures 42 and 44 (only one of such information is shown in FIG. 3). Page identification tabs 46 are located on the upper edge of pages 36 and these tabs 46 when the folio 34 is in position on keyboard face 12 fit into indentations 20, as shown in FIG. 3. No two pages 36 in the folio 34 have this tab 46 in the same horizontal location. It is this tab 46 which breaks the light source photocell 22 (FIG. 6) for page identification. A plurality of page label and handling tabs 48 are located on the outer page of pages 36 and are utilized for turning the pages when the folio 34 is in place. These handling tabs 48 may also, if desired, cover another plurality of photosensing means 50 shown in FIGS. 1—3. These photosensing means 50 may be arranged and connected electrically to any other suitable device (not shown).

Referring now to FIGS. 4, 5 and 7, the folio 34 is clearly shown. This folio 34 has a binder 38 shown in FIG. 5 which is pivotally connected at 39 by any suitable connecting means to a plurality of binder elements 40. These binder elements 40 are fixedly secured to outstanding elements 51 formed on pages 36 of the folio 34. The binder 38 has a key 52 located thereon which engages the keyway 28 within slot 26 of keyboard 10 when the binder 38 is positioned correctly within slot 26. This key 52 and keyway 28 or any other such device prevents incorrect positioning of folio 34 within slot 26. A plurality of openings 54 are also located on binder 38, and these openings 54 allow light from light source 32 (see FIG. 13) from reaching photocells 30. The binder 38 with openings 54 either breaks or does not break the several light source photocell links (30—32). In so doing, it sends a binary number to the logic which identifies the type and presence of folio 34.

As shown in FIGS. 4 and 7, the pages 36 are secured in any suitable manner to binder elements 40. Each page 36 has a pair of outstanding elements 51 thereon, and these elements 51 are fixedly secured to a corresponding protruding portion on the binder elements 40. There are two binder elements 40 having identical protruding portions (51a, 51b, 51c, 51d) for each page 36. In order for the folio 34 to be utilized with a keyboard 10 of this invention the folio pages 36 must be arranged in the manner shown in FIGS. 8—11. For example, the pair of outstanding elements 51 of the top page shown in FIG. 8 engage the top of the protruding portions 51a of binder elements 40 as shown in FIG. 7. Each pair of protruding portions going in the same horizontal direction away from the first pair of portions 51a allows for the mounting of another page 36 one page thickness t lower than the preceding page 36. For example, the second page 36 shown in FIG. 9 has outstanding elements 51 which engage the top of protruding portions 51b shown in FIG. 7. In FIG. 10 the third page 36 is shown and these outstanding elements 51 engage the top of protruding portions 51c shown in FIG. 7. The bottom page 36 shown in FIG. 11 has its outstanding elements 51, therefore, engaging the bottom of protruding portions 51d of binder elements 40 as shown in FIG. 7. Although only four such pages 36 are shown, any number may be used with this invention as long as they are arranged similar to FIGS. 7—11. In this manner when the pages 36 of the folio 34 are turned or in the open position as shown in FIG. 13 the pages 36 lay perfectly flat as shown in FIG. 3. The pages 36 are preferably made of any suitable semirigid material such as thick glass reinforced epoxy.

Referring once again to FIG. 6, one of the indentations 20 is shown with the photocell 22 and the light source 24 in place. The light source 24 has its light directed by means of light guide 56 so as to direct the light onto photocell 22 when there is no obstruction such as tab 46 in the indentation 20.

FIG. 12 represents the photocells 30 located within slot 26 and a light source 32 shown in FIG. 13. This light source 32 is directed by any suitable light guide 58 to shine on photocells 30 when unobstructed. In the unobstructed position the aper-

tures 54 are so positioned to allow the light to shine therethrough.

FIG. 14 represents the circuit for the page sensing logic of this invention. When a folio 34 is inserted within slot 26 a photocell 30 detects the presence of the folio 34 and conditions one input 60 of a plurality of NAND gates 60₁—60_n. For simplicity, in FIG. 14, only three such NAND gates 60₁—60_n are shown. Opening of the folio 34 causes the pages 36 to lay flat on the face 12 of keyboard 10 so that certain tabs 46 cover photocells 22 (as shown in FIG. 3). The positive sense of any pair of photocells 22, such as photocells 22₁, photocells 22₂ or photocells 22_n, conditions the remaining two inputs 68a, or 68b, or 68c, respectively. It should be noted that any number of pairs of photocells 22_n may be utilized, again for simplicity only three such pairs are shown in FIG. 14. The specific NAND gate 60₁, 60₂ or 60_n, that is enabled, sets the specific flip-flop 70₁, 70₂ or 70_n, that is connected thereto, causing the output of that flip-flop to indicate a page selection. Simultaneously, the enabled NAND gate resets all other flip-flops. Again only the three corresponding flip-flops are shown, a through any number corresponding to the photocells and NAND gates may be used.

Removal of the folio 34 from slot 26 is sensed once again by photocell 30 which will then trigger one-shot multivibrator 76. The change of state of multivibrator 76 is felt at all gates 78₁—78_n and these gates reset all the flip-flops 70₁—70_n.

MODE OF OPERATION

The following example illustrates a use of the pushbutton photosensing folio keyed keyboard 10 of this invention in which it calls up prerecorded information for, for example, TV teaching. The operator selects a folio 34 entitled "English Grammar" and inserts the binder 38 of folio 34 (as shown in FIG. 2) into the slot 26 in the face 12 of the keyboard 10. In the proper position the key 52 mates with keyway 28.

Referring now to FIG. 3, the operator allows the folio 34 to lay flat on the keyboard 10 with the pushbuttons 14 protruding through the apertures 42 within the pages 36. The operator then selects (via the label tabs 48 along the edges of the pages 36) the page entitled, for example, "Verb Types," and opens the folio 34 to that page 36. Any or all of the pushbuttons 14 now have specific labels 44 adjacent thereof (see FIG. 3) and the operator can call upon the precise information he wants by depressing the proper button.

The logic circuit corresponding to the pushbuttons 14 on the keyboard 10 can now be activated. When the folio 34 was inserted within the slot 26 a photocell 30 within slot 26 detected its presence therein and, along with properly identifying that folio 34 (in a manner not part of this invention) conditioned one input 60 of a plurality of a NAND gates 60₁—60_n (see FIG. 14). The positive sense of any pair of photocells 22₁—22_n, conditions the other two inputs 68a, 68b, or 68c, however the case may be. The specific NAND gate 60₁—60_n, that is enabled sets one of the flip-flops 70₁—70_n, causing the output of that flip-flop to indicate a page selection to the logic associated with the keyboard 10.

Removal of the folio 34 from slot 26 is once again sensed by a photocell 30 and in a manner described hereinabove resets all the flip-flops 70₁—70_n, enabling the keyboard 10 and the logic associated therewith to be utilized with another folio 34.

With the utilization of the keyboard 10 and folio 34 of the instant invention the operator's mechanical functions may be eliminated. It is only necessary for the operator of the keyboard 10 of this invention to have the ability to place the proper folio 34 onto the keyboard 10 and push the buttons labeled by the pages 36 of that folio 34. All other functions have been taken over by the photosensing means of this invention.

Although the information has been described with reference to a particular embodiment, it will be understood to those skilled in the art that the invention is capable of a variety of alternate embodiments within the spirit and scope of the appended claims.

We claim:

1. A photosensing folio keyed keyboard comprising a keyboard having a face, a plurality of pushbuttons on said keyboard face to be operated in accordance with instructions on a folio, a slot in said keyboard face for receiving a portion of said folio therein, a first photosensing means in said slot for detecting the presence and type of folio and for producing an output in response thereto, and a second photosensing means in said face adjacent said pushbuttons for detecting the page said folio is opened to and for producing an output in response thereto.

2. A photosensing folio keyed keyboard as defined in claim 1 further comprising at least one raised portion on said keyboard face adjacent said pushbuttons, said raised portion having a plurality of indentations therein and said second photosensing means being located in said indentations.

3. A photosensing folio keyed keyboard as defined in claim 2 wherein said first photosensing means comprises a photocell and a light source and said photocell being electrically connected to an activating means.

4. A photosensing folio keyed keyboard as defined in claim 3 wherein said second photosensing means comprises another photocell and another light source, said other photocell being electrically connected to said activating means, whereby concurrent interrupting of both said photocell-light source links energizes said activating means.

5. A photosensing folio keyboard as defined in claim 4 wherein said activating means is a flip-flop.

6. The combination of a photosensing folio keyed keyboard and a folio, said folio having a binder and a plurality of pages attached thereto, said keyboard having a face, a plurality of pushbuttons on said keyboard face to be operated in accordance with instructions on said folio, a slot in said keyboard face for receiving said binder of said folio therein, a first photosensing means in said slot for detecting the presence

and type of folio and for producing an output in response thereto, and a second photosensing means in said face adjacent said pushbuttons for detecting the page said folio is opened to and for producing an output in response thereto.

7. The combination of a photosensing folio keyed keyboard and a folio as defined in claim 6 wherein said binder has at least one opening indicative of the type of folio, each of said plurality of pages has a tab thereon indicative of the page, said keyboard face further comprising a raised portion adjacent said pushbuttons, said raised portion having a plurality of indentations therein for receiving said tabs, and said second photosensing means located within said indentations.

8. A folio adapted to be used with a pushbutton keyboard comprising a binder, a plurality of binder elements pivotally secured to said binder, each of said binder elements having a protruding portion thereon, a plurality of pages, each of said pages have an outstanding element thereon, said protruding portion of each of said binder elements being fixedly secured to a respective outstanding element of each of said pages, said binder having at least one opening therein indicative of the type of folio, said pages having at least one aperture therein to allow a pushbutton to protrude therethrough, and a tab protruding from each of said pages indicative of said page.

9. A folio as defined in claim 8 wherein said binder elements are in pairs, each binder elements in said pair of binders elements having identical protruding portions thereon, each of said pages being of a predetermined thickness and having a pair of outstanding elements thereon, each of said pair of outstanding elements on each of said pages being fixedly secured to each of said identical protruding portions on identical pairs of binder elements, and each of said binder elements adjacent said pair of identical elements having protruding portions thereon which allow for the mounting thereon of another page at one page thickness difference than the preceding page.

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