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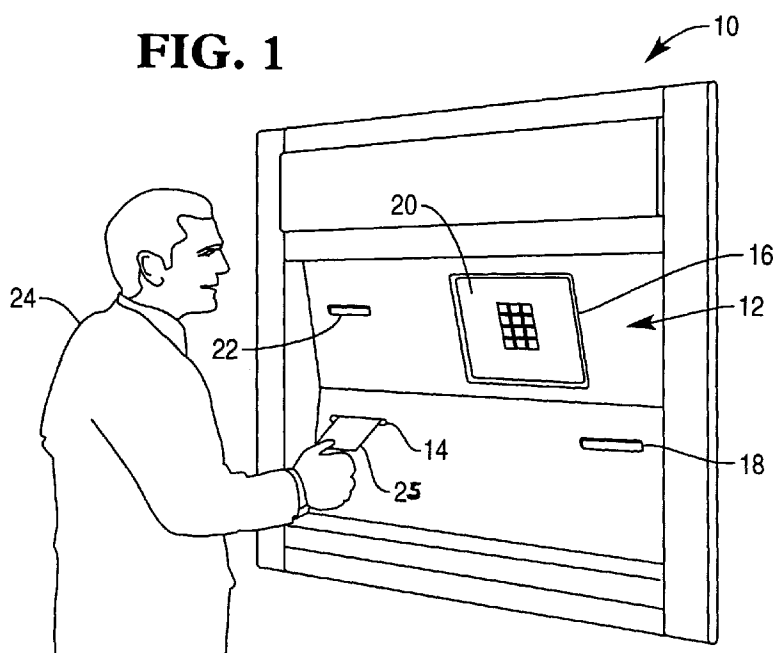
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### (54) Self service terminal display screen

(57) An automated teller machine (ATM) (10) comprises a cash dispenser (18) for dispensing bank notes to a customer (24) carrying out a banking transaction. It includes a display screen (20) and a touch-sensitive screen (16) overlying the display screen. A processing unit provides an image of a first pinpad on the display screen to enable a first customer to touch the touch-sensitive screen and gain access to the cash dispenser. The processing unit is also adapted to display on the display

screen an image of a second pinpad, which is different from the first pinpad image and enables a subsequent customer to gain access to the cash dispenser. This second pinpad image may have X and Y coordinates which are different from the X and Y coordinates of the first pinpad image and/or include a number of keys having sizes which are different from the sizes of a number of keys of the first pinpad image and/or have a pinpad layout which is different from a pinpad layout of the first pinpad image.

**FIG. 1**



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## Description

**[0001]** The present invention relates to providing an image of a keypad on a display screen, and is particularly directed to providing an image of a keypad on a display screen of a self-service terminal, such as an automated teller machine (ATM), to allow a customer at the ATM to gain access to services provided by the ATM.

**[0002]** The use of an image of a keypad or pinpad on a display screen of an ATM to allow a customer at the ATM to gain access to services provided by the ATM is known. Typically, to gain access to services provided by the ATM, the customer must touch a number of different locations in a particular sequence on a touch-sensitive screen which overlies the display screen. The locations on the touch-sensitive screen which the customer must touch in the particular sequence depend upon the layout of alphabetic and/or numeric characters contained in the image of the keypad appearing on the display screen. The particular sequence of characters the customer must touch is commonly referred to as a personal identification number (i.e., PIN number) associated with the particular customer.

**[0003]** A disadvantage in known ATMs is that the layout of the characters contained in the image of the keypad on the display screen and their locations on the display screen are the same for all customers desiring to gain access to services provided by the ATM. Since the layout and location of the characters contained in the image of the keypad are the same for all customers, it is possible for a thief fraudulently to establish the PIN number of a previous customer at the ATM. To accomplish this, the thief initially cleans a transparent surface of either the touch-sensitive screen or the display screen (depending upon the structure and operation of the particular touch-sensitive screen used) before a customer to be defrauded arrives at the ATM. After the customer to be defrauded arrives at the ATM, he enters his proper PIN number to gain access to services provided by the ATM, carries out a desired transaction, and leaves the vicinity of the ATM. The thief then closely examines the transparent surface for fingerprint residue left behind by the customer. The particular locations of fingerprint residue on the transparent surface and the different amounts of fingerprint residue at these particular locations provide valuable information to the thief in fraudulently establishing the PIN number of the customer.

**[0004]** More specifically, the particular locations on the transparent surface suggest which characters contained in the image of the keypad were touched. The different amounts of fingerprint residue at these particular locations suggest the order in which characters contained in the image of the keypad were touched. The order in which characters were touched is suggested because the first location which was touched by the customer will usually contain more fingerprint residue than the next location touched which, in turn, will usually contain more fingerprint residue than the next location

touched, and so on.

**[0005]** The invention consists in a self-service terminal comprising

5 a display screen,  
a touch-sensitive screen which overlies the display screen, and  
a processing unit for providing an image of a first keypad on the display screen to enable a user to  
10 touch the touch-sensitive screen and gain access to services provided by the self-service terminal, characterised in that the processing unit is adapted to display on the display screen an image of a second keypad which is different from the image of the  
15 first keypad to enable a subsequent user to gain access to services provided by the self-service terminal.

**[0006]** In order to differentiate the first image from the second image, the second image may have X and Y coordinates which are different from X and Y coordinates associated with the first image. Alternatively or additionally, the image may include a number of keys having sizes which are different from the sizes of a number of keys associated with the first image. Alternatively or additionally, the second image may have a keypad layout which is different from a keypad layout associated with the first image.

**[0007]** The invention also consists in method of providing an image of a keypad on a display screen of a self-service terminal to enable a user at the self-service terminal to gain access to services provided by the self-service terminal, characterised by the steps of:

35 (a) displaying an image of a first keypad on the display screen to enable a user to touch a touch-sensitive screen overlying the display screen and gain access to services provided by the self-service terminal; and  
40 (b) displaying on the display screen an image of a second keypad differentiated from the image of the first keypad to enable a subsequent user to touch the touch-sensitive screen and gain access to services provided by the self-service terminal.

**[0008]** In order that the present invention may be more easily understood, reference will now be made, by way of example, to the accompanying drawings, in which:

50 Fig. 1 is a perspective view of an automated teller machine (ATM) embodying the present invention;  
Fig. 2 is block diagram representation of the ATM of Fig. 1;

55 Fig. 3 is an enlarged view of an image of a keypad appearing on a display screen of the ATM of Figs. 1 and 2;

Figs. 4-9 are views similar to Fig. 3 and showing

different keypad images on the display screen of the ATM; and

Figs. 10 and 11 are flowcharts depicting operation of the ATM of Figs. 1 and 2 in accordance with the present invention.

**[0009]** In Figs. 1 and 2 of the accompanying drawings, the ATM 10 comprises a user interface in the form of a front panel 12. The front panel 12 includes a card reader 14, a touch-sensitive screen 16, a cash dispenser 18, a CRT display screen 20, and a receipt printer 22. The touch-sensitive screen 16 overlies the display screen 20 and provides signals on line 17 (Fig. 2) in response to a customer 24 "touching" a portion of the touch-sensitive screen 16. As an example, the touch-sensitive screen 16 may be of the type which detects interruption of horizontal and vertical light beams (i.e., along the "X" and "Y" directions) to provide an output signal indicative of the location at which the touch-sensitive screen 16 has been touched by the customer 24. Alternatively, the touch-sensitive screen 16 may be of the type which uses capacitive current to provide an output signal indicative of the location at which the touch-sensitive screen 16 has been touched by the customer 24.

**[0010]** The card reader 14 has a card slot through which the customer 24 can insert a user's identifying card 25 at the commencement of a transaction to be conducted by the customer 24. The cash dispenser 18 has a cash slot through which cash currency notes stored inside the ATM 10 can be delivered to the customer 24 during the transaction. The receipt printer 22 has a receipt slot through which a receipt of the transaction is delivered to the customer 24 at the termination of the transaction.

**[0011]** The ATM 10 includes a controller unit 30 which communicates with the components of the front panel 12. The controller unit 30 includes a processor 32, and a memory 34 connected via bus line 36 to the processor 32. The controller unit 30 also includes touch-screen control circuitry 40 which receives input signals on line 17 from the touch-sensitive screen 16 and provides signals on line 44 in response thereto. Touch-screen control circuitry 40 continually monitors the touch-sensitive screen 16 for sensing any touching event which occurs on the touch-sensitive screen 16. The processor 32 processes signals on line 44 from the touch-screen control circuitry 40 and provides signals on line 48 in response thereto. Display control circuitry 26 processes signals on line 48 and provides signals on line 49 which are displayed on the display screen 20. Accordingly, the processor 32 receives input signals from the touch-sensitive screen 16 and provides output signals to the display screen 20 in response to the input signals.

**[0012]** More specifically, the processor 32 receives input signals on line 44 from the touch-screen control circuitry 40, and processes these input signals in accordance with the instructions of a main control program 52 stored in the memory 34. The processor 32 processes

its input signals and generates output signals in accordance with the instructions of a coordinate translator 54 stored in the memory 34. The processor 32 also processes its input signals and generates output signals in accordance with the instructions of a key position generator 56 to be described later. The processor 32 then provides output signals on line 48 to the display control circuitry 26 in accordance with the instructions of a display driver 58 stored in the memory 34. The display control circuitry 26 then provides output signals on line 49 to the display screen 20 to be displayed. The structure and operation of the touch-screen circuitry 40 and the display control circuitry 26 are well known and, therefore, will not be described.

**[0013]** During operation of the ATM 10, the processor 32 receives input signals on lines 42, 44 from the card reader 14 and the touch screen control circuitry 40, respectively, and provides output signals on lines 46, 48, 50 to the cash dispenser 18, the display control circuitry 26, and the receipt printer 22, respectively, to control the amount of cash dispensed by the cash dispenser 18, the information displayed on the display screen 20, and the information printed by the receipt printer 22. The processor 32 may include a microcomputer, and the memory unit 34 may be non-volatile RAM. Suitable microcomputers and memories are readily available in the marketplace. Their structure and operation are well known and, therefore, will not be described.

**[0014]** When the customer 24 first arrives at the ATM 10 to carry out a desired transaction, the customer 24 inserts the user's identifying card 25 into the card slot of the card reader 14. The card reader reads data contained on the card. The customer 24 is then prompted on the display screen 20 to enter a personal identification number (PIN number) via the touch-sensitive screen 16 which overlies the display screen 20.

**[0015]** More specifically, the customer 24 is prompted to enter the PIN number using an image of a keypad, such as shown in Fig. 3, which appears on the display screen 20. The image of the keypad has a set of twelve different keys including the ten numeric digits, an "asterisk" key, and a "pound" key. The twelve keys are located in positions relative to each other as shown in Fig. 3. The layout of the twelve keys in the image of the keypad shown in Fig. 3 is like the layout of a telephone keypad without any alphabetic characters. The image of the keypad shown in Fig. 3 appears in the central portion of the display screen 20.

**[0016]** After the customer 24 enters the correct PIN number using the touch-sensitive screen 16 and the image of the keypad shown in Fig. 3, the customer 24 has gained access to services provided by the ATM 10. Menus are then displayed on the display screen 20 to enable the customer 24 to carry out the desired transaction. After the desired transaction is completed, the receipt printer 22 prints a receipt of the transaction and delivers the receipt through the slot of the receipt printer 22 to

the customer 24. Also, the card reader 14 returns the user's identifying card 25 to the customer 24. The customer 24 then takes the receipt and the user's identifying card 25 and walks away.

**[0017]** The ATM 10 awaits in an idle state until the next customer (referred to herein as the "second customer") arrives at the ATM 10 to carry out a desired transaction. The previous customer 24 who has already carried out a transaction is referred to herein as the "first customer". The second customer inserts a user's identifying card into the card slot of the card reader 14 to allow the card reader 14 to read data contained on the card. The second customer is then prompted on the display screen 20 to enter a PIN number via the touch-sensitive screen 16. More specifically, the second customer is prompted with an image of a keypad, such as shown in Fig. 4, which appears on the display screen 20. The image of the keypad shown in Fig. 4 appears on the display screen 20 at a location which is different from the location at which the image of the keypad shown in Fig. 3 appears on the display screen 20. The image of the keypad shown in Fig. 4 appears in the upper left quadrant of the display screen 20.

**[0018]** Referring to Fig. 10, a flowchart 100 depicts operation of the key position generator 56 in accordance with the present invention randomly to generate the image of the keypad shown in Fig. 4 on the display screen 20 for the second customer. In step 102, the card reader 14 initially receives the user's identifying card from the second customer to initiate the transaction. After the transaction is initiated, the "X" and "Y" coordinate positions of the image of the keypad to be displayed on the display screen 20 for the second customer are randomly generated as shown in step 104. The "X" and "Y" coordinates of the image of the keypad to be displayed on the display screen 20 for the second customer have been randomly generated such that these coordinates are farther to the left and farther to the top relative to the "X" and "Y" coordinates of the image of the keypad which was displayed on the display screen 20, as shown in Fig. 3, for the first customer. The image of the keypad to be displayed on the display screen 20 for the second customer is then generated in step 112 using the randomly generated "X" and "Y" coordinates from step 104. In step 114, the image of the keypad which was generated in step 112 is displayed on the display screen 20 to allow the second customer to enter the PIN number to gain access to services provided by the ATM 10.

**[0019]** Since the "X" and "Y" coordinates of an image of a keypad to be displayed on the display screen 20 for the second customer are randomly generated in step 104 as just described, an image of a keypad such as shown in Fig. 5 can be generated and displayed instead of the image of the keypad as shown in Fig. 4. The image of the keypad shown in Fig. 5 appears in the lower right quadrant of the display screen 20.

**[0020]** It is contemplated that the image of the keypad to be displayed on the display screen 20 for the second

customer can have the size of its keys randomly scaled instead of having the "X" and "Y" coordinates randomly generated. For example, the size of the keys in the image of the keypad to be displayed for the second customer can be scaled such that each of the twelve characters is substantially larger in size on the display screen 20, as shown in Fig. 6. It is also contemplated that the key layout of the image of the keypad to be displayed for the second customer can be randomly altered instead of having the size of its keys randomly scaled or the "X" and "Y" coordinates randomly generated. For example, the key layout of the image of the keypad to be displayed for the second customer can be randomly altered such that the key layout of the twelve keys appears almost like a mirror image of itself, as shown in Fig. 7.

**[0021]** It is also contemplated that the image of the keypad to be displayed for the second customer can have the "X" and "Y" coordinates randomly generated, the size of its keys randomly scaled, and the key layout randomly altered at the same time. Such an image of a keypad is shown in Fig. 8 for the second customer. The image of the keypad shown in Fig. 8 appears with relatively larger keys in a different key layout in the lower left quadrant of the display screen 20.

**[0022]** Referring to Fig. 11, a flowchart 200 depicts a method by which the image of the keypad shown in Fig. 8 is generated and displayed on the display screen 20 for the second customer. In step 202, the card reader 14 receives the user's identifying card from the second customer to initiate the transaction. After the transaction is initiated, the "X" and "Y" coordinate positions of the image of the keypad to be displayed on the display screen 20 for the second customer are randomly generated as shown in step 204. The "X" and "Y" coordinates of the image of the keypad to be displayed on the display screen 20 for the second customer are generated such that these coordinates are farther to the bottom and farther to the left relative to the "X" and "Y" coordinates of the image of the keypad shown in Fig. 3 for the first customer. In step 206, the size of keys in the image of the keypad to be displayed on the display screen 20 for the second customer is scaled such that each of the twelve characters is substantially larger in size on the display screen 20 than as shown in Fig. 3 for the first customer.

**[0023]** Then, in step 208, a determination is made as to whether a different key layout is desired in the image of the keypad to be displayed on the display screen 20 for the second customer. If the determination in step 208 is affirmative, the program proceeds to step 210 in which the key layout in the image of the keypad to be displayed on the display screen 20 for the second customer is randomly altered. As shown in Fig. 8, for example, the key layout is randomly altered for the second customer such that the twelve keys lie in two horizontal rows, instead of four horizontal rows, as shown in Fig. 3 for the first customer. The program then proceeds to step 212.

However, if the determination in step 208 is negative, the program proceeds directly to step 212. The image of the keypad to be displayed on the display screen 20 for the second customer is then generated in step 212 using the randomly generated "X" and "Y" coordinates from step 204, the randomly generated scaling factor in step 206, and the randomly generated key layout in step 210.

**[0024]** Since the "X" and "Y" coordinates, the size of keys scaling factor, and the key layout of an image of a keypad on the display screen 20 are randomly generated as just described, an image of a keypad such as shown in Fig. 9 can be generated and displayed instead of the image of the keypad shown in Fig. 8. The image of the keypad shown in Fig. 9 appears with relatively larger keys in a different key layout in the upper right quadrant of the display screen 20.

**[0025]** By providing a randomly generated image of a keypad on the display screen 20 for each subsequent customer at the ATM 10 desiring to gain access to services provided by the ATM to carry out a desired transaction, a potential thief would have a much more difficult time in fraudulently establishing the PIN number of a previous customer who has already carried out a transaction at the ATM 10.

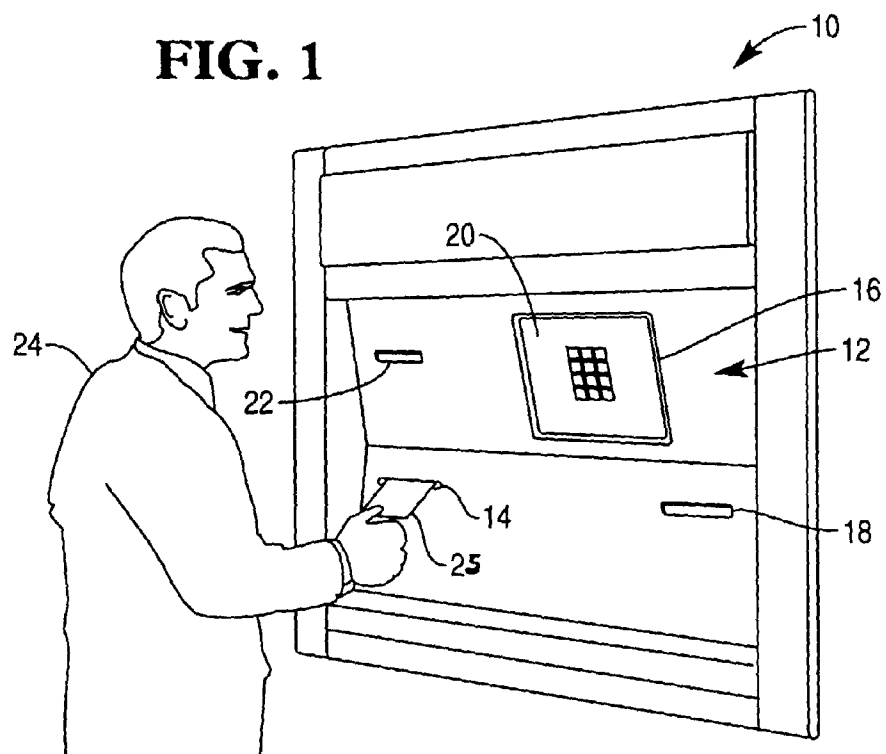
## Claims

1. A self-service terminal (10) comprising
  - a display screen (20),
  - a touch-sensitive screen (16) which overlies the display screen, and
  - a processing unit (32) for providing an image of a first keypad on the display screen to enable a user (24) to touch the touch-sensitive screen and gain access to services provided by the self-service terminal, characterised in that the processing unit (32) is adapted to display on the display screen (20) an image of a second keypad which is different from the image of the first keypad to enable a subsequent user to gain access to services provided by the self-service terminal.
2. A self-service terminal according to claim 1, characterised in that the image of the second keypad on the display screen (20) has X and Y coordinates which are different from X and Y coordinates associated with the image of the first keypad on the display screen.
3. A self-service terminal according to claim 1 or 2, characterised in that the image of the second keypad on the display screen (20) includes a number of keys having sizes which are different from the sizes of a number of keys associated with the image

of the first keypad on the display screen.

4. A self-service terminal according to claim 1, 2 or 3, characterised in that the image of the second keypad on the display screen (20) has a keypad layout which is different from a keypad layout associated with the image of the first keypad on the display screen.
5. A self-service terminal according to any preceding claim, which is an automated teller machine, characterised in that it includes a cash dispenser (18) for dispensing bank notes, and the images are images of pinpads.
6. A method of providing an image of a keypad on a display screen (20) of a self-service terminal (10) to enable a user at the self-service terminal to gain access to services provided by the self-service terminal, characterised by the steps of:
  - (a) displaying an image of a first keypad on the display screen to enable a user to touch a touch-sensitive screen (26) overlying the display screen and gain access to services provided by the self-service terminal; and
  - (b) displaying on the display screen an image of a second keypad differentiated from the image of the first keypad to enable a subsequent user to touch the touch-sensitive screen and gain access to services provided by the self-service terminal.
7. A method according to claim 6, characterised by displaying the image of the second keypad at X and Y coordinates of the display screen (20) which are different from the X and Y coordinates associated with the image of the first keypad.
8. A method according to claim 6 or 7, characterised by displaying the image of the second keypad with keys having sizes which are different from sizes of keys of the image of the first keypad.
9. A method according to claim 6, 7 or 8, characterised by displaying the image of the second keypad with a keypad layout which is different from a keypad layout of the image of the first keypad.

**FIG. 1**



**FIG. 3**

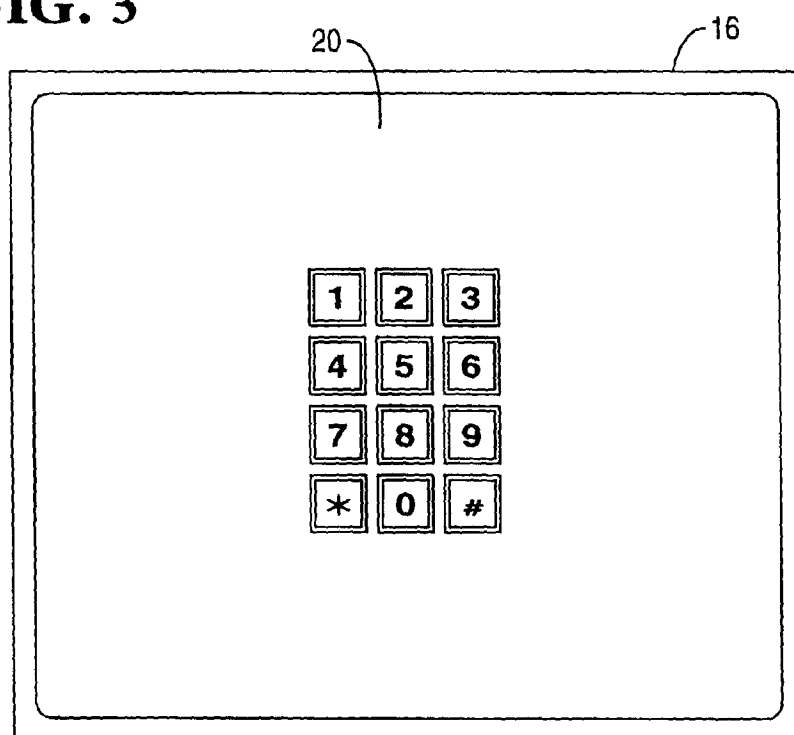
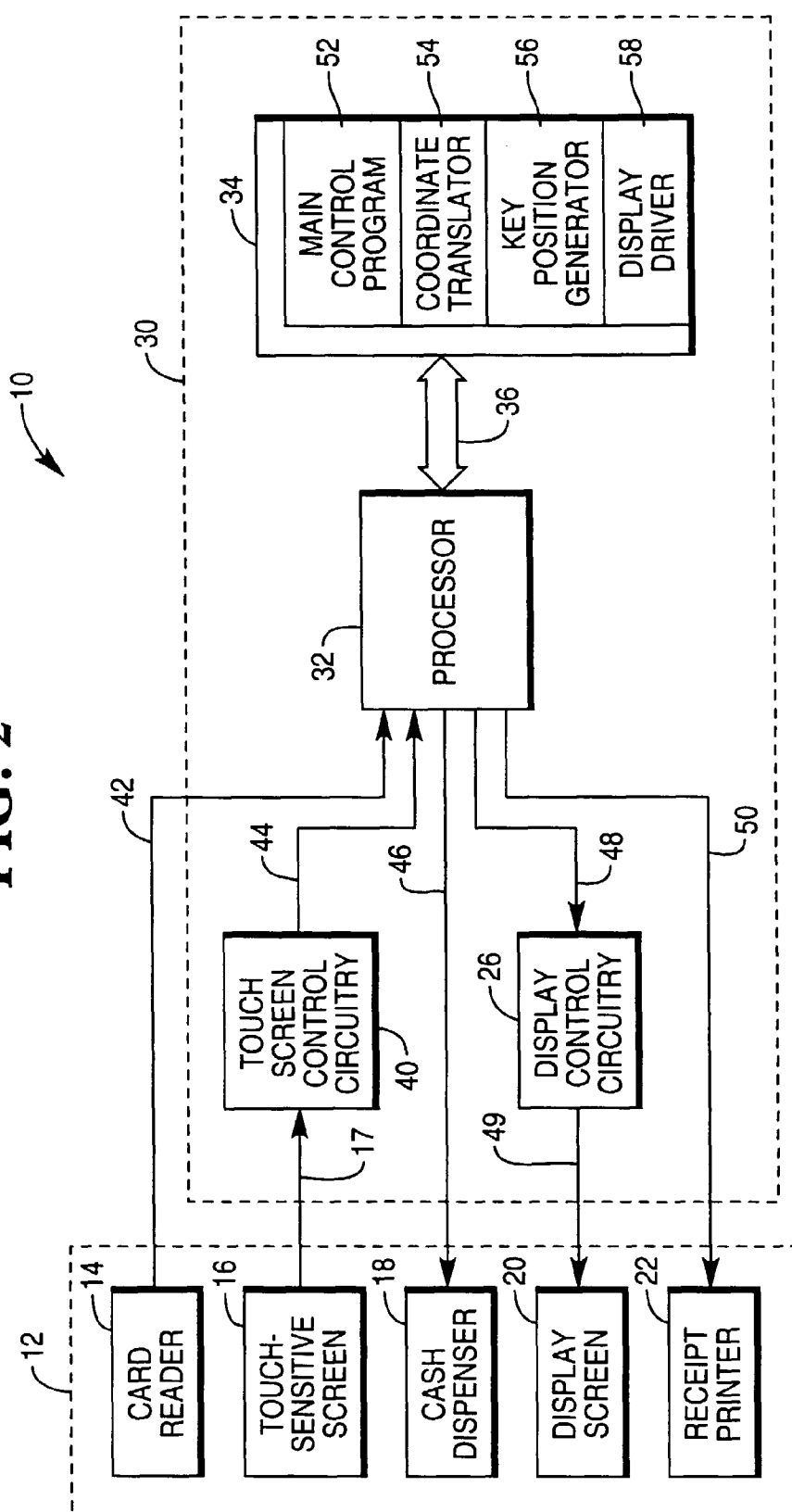
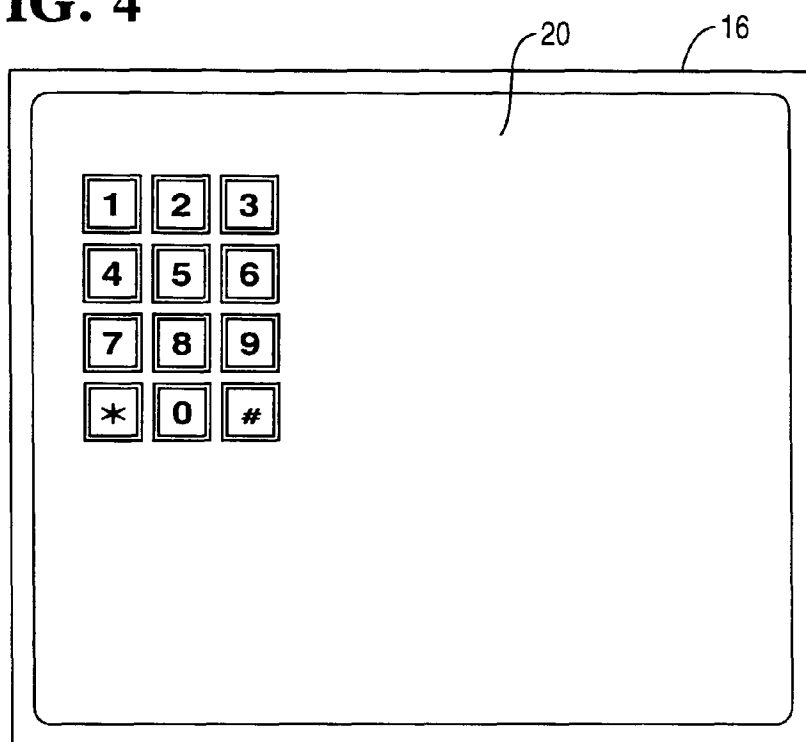


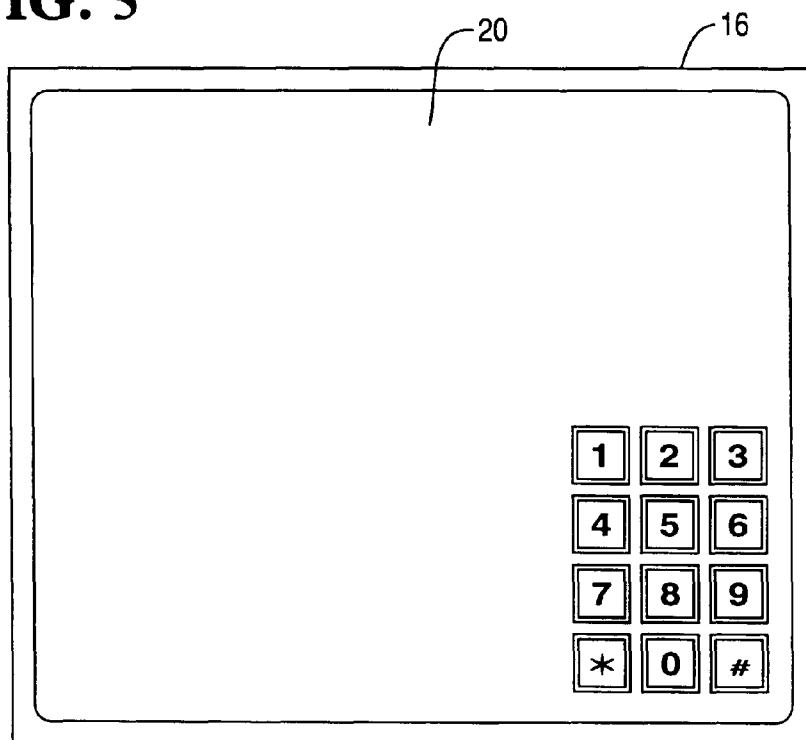
FIG. 2



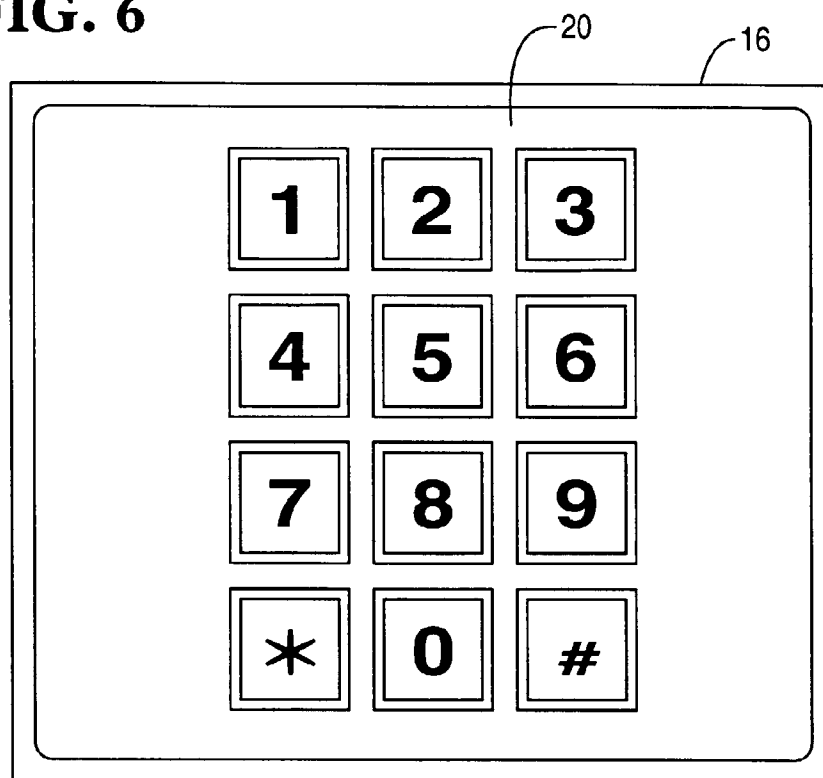
**FIG. 4**



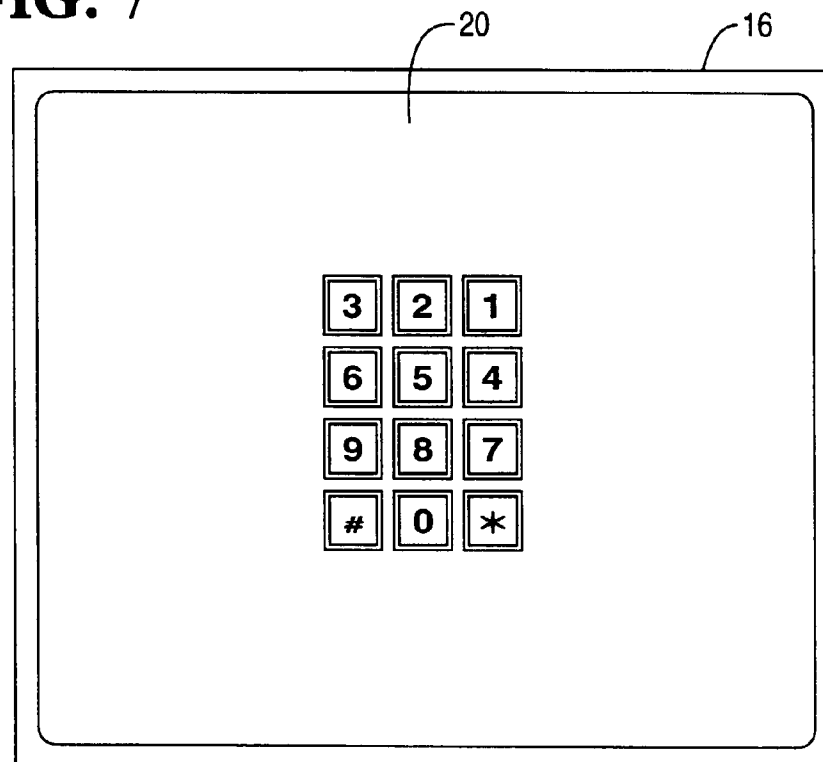
**FIG. 5**



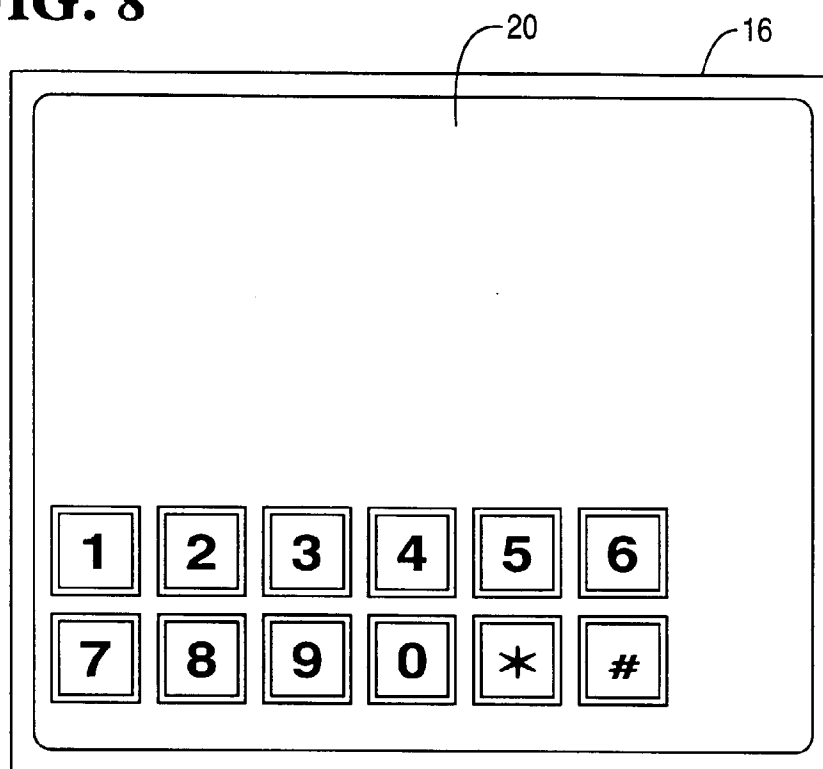
**FIG. 6**



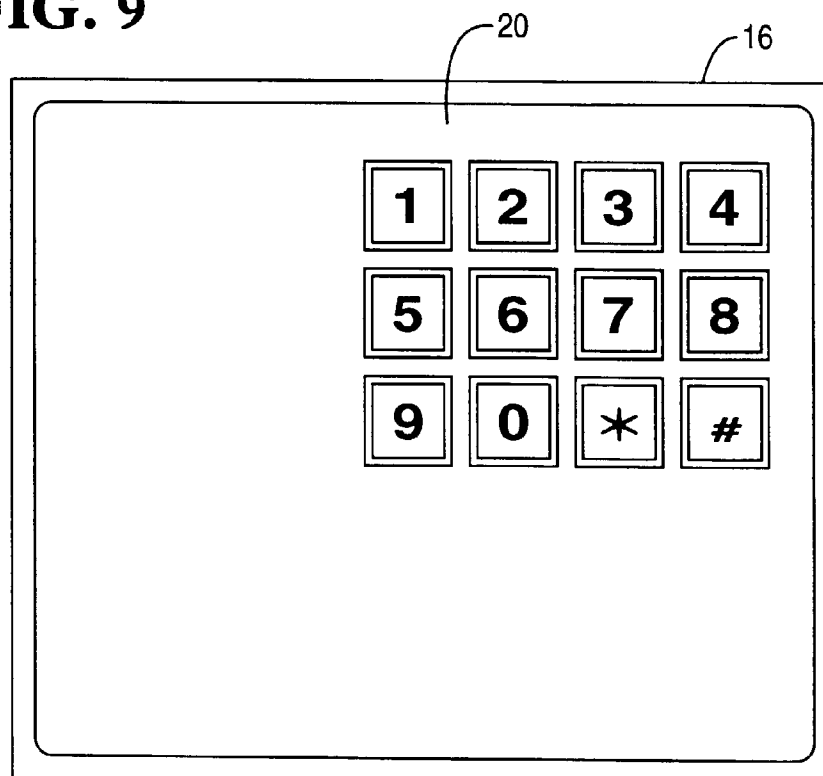
**FIG. 7**

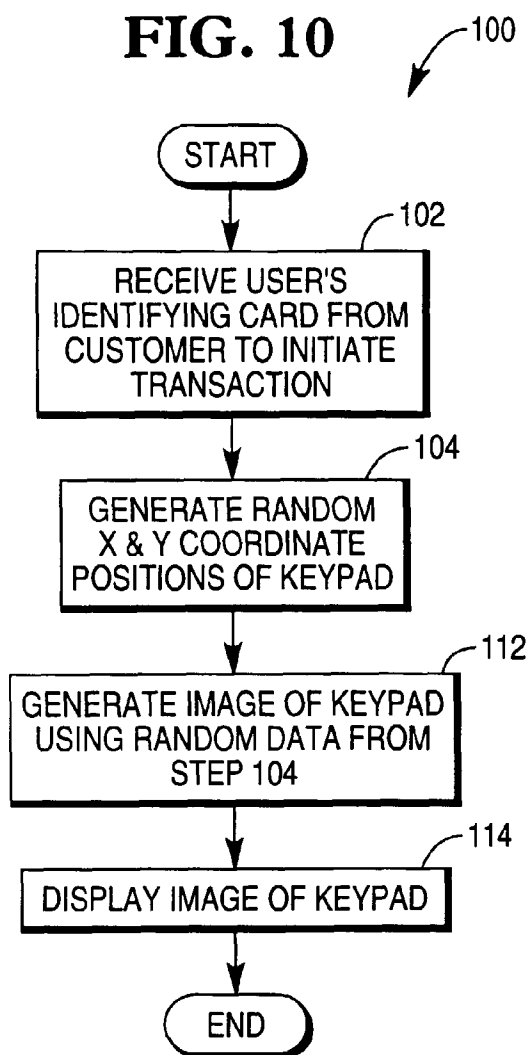
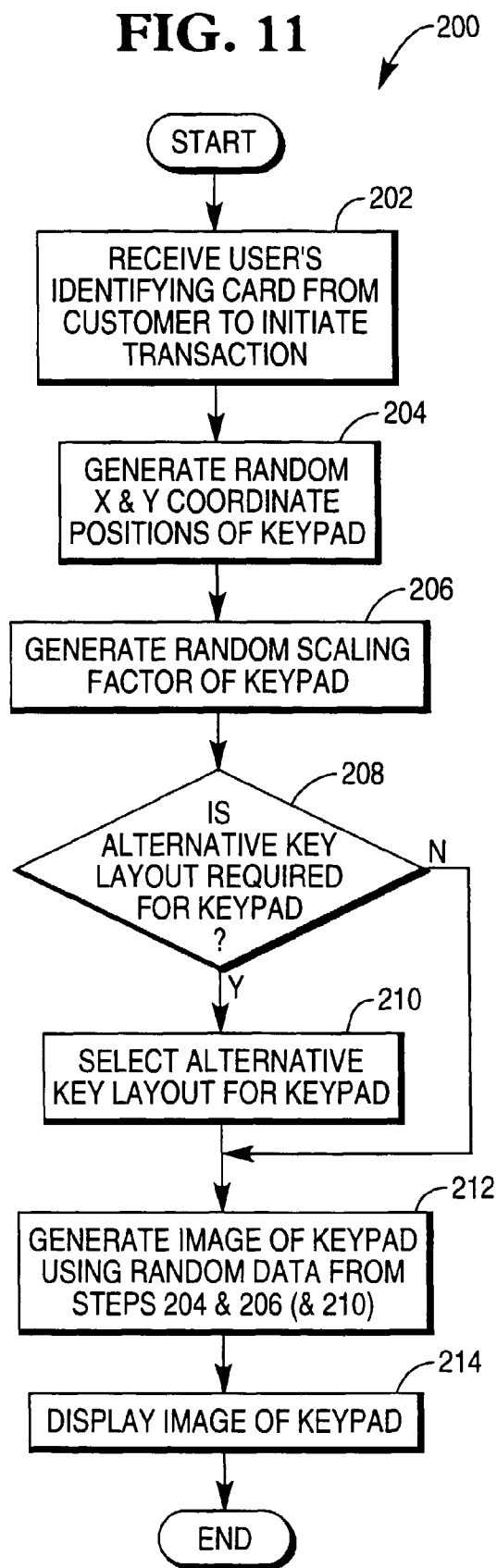


**FIG. 8**



**FIG. 9**



**FIG. 10****FIG. 11**



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# EUROPEAN SEARCH REPORT

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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                   |                                                             |                                              |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                   |                                                             | G07F<br>G06F<br>E05B                         |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                   |                                                             |                                              |
| Place of search<br><b>THE HAGUE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                   | Date of completion of the search<br><b>6 September 1999</b> | Examiner<br><b>Teutloff, I</b>               |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons<br/>&amp; : member of the same patent family, corresponding document</p> |                                                                                                                                                                   |                                                             |                                              |

EPO FORM 1503 03/82 (PudC01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 99 30 4603

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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06-09-1999

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82