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(54) Title: AUTOMATIC BANK TELLER MACHINE FOR THE BLIND AND VISUALLY IMPAIRED			
(57) Abstract An automatic bank teller machine (ATM) that uses a combination of simple visual cues, large-type visual displays, audio, and a touch-sensitive display screen to facilitate use of the ATM by the blind and visually impaired, while still being useful for the sighted. In particular, the ATM uses a touch-sensitive display screen that has a fixed, easy to locate touch scanning zone. The display screen operates by contacting the screen, with a fingertip, for example, and slidingly moving to a location on the touch scanning zone corresponding to an item to be input, such as one of the numbers 0 to 9, for example.			

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**AUTOMATIC BANK TELLER MACHINE
FOR THE BLIND AND VISUALLY IMPAIRED**

5 Field of the invention:

This invention relates to automatic bank teller machines ("ATMs"), and particularly relates to an ATM that is specially adapted to facilitate use by the blind and visually impaired.

10 Description of related art:

Automatic bank teller machines (ATMs) are becoming increasingly popular because they make banking functions available to customers virtually around the clock, and at a variety of locations, in addition to bank branches.

15 However, conventional ATMs are typically operable through the use of keypads and visual display screens, both of which typically use displays, lettering, or labelling that are so small as to create difficulties for those with vision impairment, not to mention for those who are substantially blind. The use of Braille

20 instructions placed on ATMs is generally known. However, this does not address the difficulty that a blind or visually impaired person has in terms of knowing, for example, when to enter a withdrawal amount, when (and where) to insert a deposit envelope, etc., in the course of operating the ATM.

Commonly owned U.S. Patent No. 5,589,855 to Blumstein et al., discloses a method and apparatus by which a multidigit number may be entered, using a touch screen. According to Blumstein et al., a touch screen is divided into a plurality locations, whereby a first location is touch a number of times equal to a digit of the multidigit number, followed by touching a second location. When all of the digits of the multidigit number are entered in this manner, a third location on the screen is touched.

Touch screens can be most generally considered coordinate tracking devices, in the sense of tracking contact with the screen relative to, for example, a representation of a "button" displayed on the screen. Commonly owned U.S. Patent Appln. No. 08/655,922 to Yokomoto et al., the disclosure of which being incorporated herein by reference, describes one embodiment of a touch screen that uses emitters and corresponding sensors on the left and right sides and top and bottom sides of the screen. By registering where, for example, a finger blocks a sensor in both vertical (top/bottom) and horizontal (left/right) positions, the position of the touch on the screen can be mapped in terms of X-Y coordinates.

Summary of the invention:

Accordingly, it is an object of the present invention to provide an ATM that facilitates use thereof by both the blind and the visually impaired.

5 Generally, the ATM according to the present invention provides a plurality of audible cues, including verbal instructions, to guide a blind or visually impaired customer through the steps of the operating the ATM. These audible cues may be supplemented by providing a plurality of coarse visual cues to further guide the
10 use of the ATM. The term "coarse" here refers to visual cues, such as light-emitting indicators associated with respective parts of the ATM (the cash dispenser slot, the bank card reader, the transaction record printer, etc.) or large-type text displays, which are relatively easy to perceive and which are well-suited for visually impaired
15 persons with diminished visual acuity.

 The basic feature of the ATM, however, is the provision of a touch-sensitive visual display screen. The visual display screen acts as a customer input/output interface. In particular, the visual display screen is adapted to recognize an input corresponding to
20 the action of contacting the screen, then, while maintaining contact with the screen, moving to a location on the screen that corresponds to a specific input selection. Thereafter, when contact

is broken at that location, the given input selection is recognized. Preferably, the screen displays an icon or the like at the mapped location so as to visually indicate the input selection.

5 **Brief Description of the Drawings:**

The present invention is described hereinbelow with reference to the figures appended hereto, in which:

Figure 1 is a front view of an ATM according to the present invention;

10 Figure 2 is a schematic view of the touch-sensitive display screen according to the present invention;

Figure 3 illustrates an initial display on the display screen, prior to a customer beginning a transaction;

15 Figure 4 illustrates a variant of the initial display shown in Figure 3, wherein at least some of the text is enlarged;

Figure 5 illustrates a fully-enlarged screen display;

Figure 6 illustrates a screen display associated with prompting an input, using a touch scanning zone on the edge of the display screen;

20 Figure 7 illustrates a screen display similar to that shown in Figure 6, but using large-type text;

Figure 8 illustrates a screen display associated with the actual process of entering an input selection.

Description of the preferred embodiment:

5 Generally, the ATM according to the present invention includes a number of standard components that are conventionally associated with ATMs. These include an access control device like a magnetic stripe card reader, a cash dispensing mechanism, a deposit intake mechanism, a transaction record printer, and a
10 customer input/output interface. The ATM as a whole is connected in a conventional manner to a financial data network (not illustrated), by which the ATM is connected to a bank's central computers and the like.

 Figure 1 is a front view of an ATM 1 according to the present
15 invention. Although ATM 1 is shown as having a cabinet-type construction, the present invention equally applies to an ATM built into a wall portion. Indeed, the particular physical configuration of the ATM, within the bounds of the description set out below, is immaterial to the nature of the present invention.

20 A customer can access ATM functions via an access control device, such as a magnetic stripe card reader. ATM 1, according to the present invention, includes one or both of a conventional

transport-type card reader 24, and a conventional dip-type card reader 26.

ATM 1 also includes a customer input/output interface through which a customer interacts with the ATM. The input
5 interface includes a touch-sensitive screen 10, which is described in detail below. The output interface includes an audio device (not shown here) which emits sound through at least one speaker. In Figure 1, right and left channel speakers 12 are provided to broadcast a welcoming greeting, initial instructions for using the
10 ATM, etc. ATM 1 is further provided with a speaker provided in a handset 14, whereby more private information, such as specific transaction details, and the like, are made audible only to the customer currently using the ATM. Speakers 12 may be omitted as desired, such that the handset 14 is additionally used to broadcast
15 a welcome message, etc. Handset 14 is mounted in, for example, a retaining compartment 16.

ATM 1 further includes a conventional cash dispensing mechanism 18 that dispenses cash via a cash dispensing slot. ATM
1 may additionally, or alternatively, include a conventional deposit
20 intake mechanism 20.

Finally, a conventional transaction record printer 22 is provided for printing a record or receipt of a customer's banking transaction.

ATM 1 is particularly adapted for use by the blind and visually impaired using a combination of simple, relatively easy to visually perceive indicators that indicate when the respective components of the ATM are in use, a visual display screen 10 actuable by a simple sliding motion, and audio feedback to the customer.

The card readers 24, 26, the cash dispensing mechanism 18, the deposit intake mechanism 20, and the transaction record printer 22 may be provided with corresponding Braille text labels 28, 30, 32, 34, 36, respectively, to help identify each component, in contrast to providing a generic, non-specific set of Braille text instructions, as is conventionally known. The visual display screen 10 is also identified by a corresponding Braille text label 38.

The card readers 24, 26, the cash dispensing mechanism 18, the deposit intake mechanism 20, and the transaction record printer 22 are each additionally provided with a selectively actuable visual signaling indicator 40, 42, 44, 46, 48, respectively. In particular, these signaling indicators take the form of selectively actuable lights, such as, for example, conventionally-known light

emitting diodes. It is a particular feature of the present invention to provide signaling indicators 40, 42, 44, 46, and 48 that are actuated in correspondence with activity taking place at a respective component of the ATM. For example, when the customer
5 is supposed to take cash from the cash dispensing mechanism 18, the signaling indicator 44 associated therewith is illuminated. Or, for example, when the transaction record printer 22 prints out a transaction record, the signaling indicator 48 associated therewith is illuminated.

10 Preferably, the signaling indicators are illuminated in a sequence corresponding to the steps of a given banking transaction, such as making a deposit, withdrawing money, etc., thereby guiding the customer through operating the ATM. More specifically, it will be appreciated that a simple illuminated
15 indicator is more readily perceived by a visually impaired customer, compared to, for example, text displays of instructions for use. Accordingly, a visually impaired customer can readily benefit from this feature.

20 This above-described effect of the signaling indicators may be supplemented by verbal instructions (for example, "Please take your cash now.") transmitted via the handset 14, or via speakers 12.

Figure 2 illustrates more closely illustrates display screen 10. In particular, Figure 2 schematically illustrates portions 10a of the display screen 10 that are adapted to display visual information (e.g., text or icons), and a touch scanning zone 10b.

5 Touch scanning zone 10b generally operates like known touch-sensitive display screens, wherein pressure on the surface of the screen establishes an electrical contact with an underlying substrate, thereby generating a manipulable electrical signal. Also, the aforementioned emitter-sensor arrangement of Yokomoto et al.
10 could be used. Touch scanning zone 10b according to the present invention more particularly operates by contacting the zone 10b, using, for example, a fingertip, and thereafter sliding the fingertip along the surface of the zone 10b to an area corresponding to a desired input item. Thereafter, the step of breaking contact (i.e.,
15 lifting the fingertip) from the zone 10b at that area corresponding to the desired input, generates a signal corresponding to that input. Thus, according to the present invention, the touch screen sense a “track” of coordinates along which the sliding contact is maintained, rather than a single coordinate corresponding to a
20 “pushing a button”-type contact.

In Figure 8, for example, the fingertip is slidably moved down the touch scanning zone onto or adjacent to, in this case, the

numeral "7" displayed therealong. The action of lifting the fingertip from the screen at that point causes the ATM to recognize that a "7" has been input.

It will be further appreciated from Figure 8 that inputs
5 corresponding to "readback", "enter", and "exit" are provided.

The readback input obtains a read back (using a visual (preferably large-type) display, or an audio playback) of what was entered prior to inputting the "readback" command.

The "enter" command causes the group of input items to be
10 recognized as a collective whole. This is used, for example, after inputting all of the digits of a PIN code, in the manner described above, so that the PIN code can be recognized as a whole.

The "exit" command simply exits from the current mode of the display screen (for example, moving from a deposit screen back to a
15 main menu type display).

As before, the use of the display screen 10 may be supplemented by audio feedback provided by a conventional sound generating device (not shown) that emits sound through one or both the handset 14 and speakers 12, such a conventional,
20 commercially available, computer sound card. This is particularly helpful for a blind customer using the touch screen, so that he/she

can gauge where to stop along the touch scanning zone 10b, so as to input a desired item.

Visual feedback can also be provided by the display screen 10 itself, either using normal sized text, as in Figure 3, for example, or enlarged text, as in Figure 5, for example, or a combination thereof, as in Figure 4. for example.

Of course, a combination of audio and visual feedback can also be provided.

It can be seen that by providing an elongate touch scanning zone 10b along, for example, one edge of the display screen 10, allows a blind or visually impaired customer to "expect" where to contact the screen. Conventional touch sensitive screens, however, frequently use representations of keypads or the like. Therefore, in order to properly use such a touch sensitive screen, one must be able to know where and when to place one's finger(s) across the whole expanse of the screen. This is obviously a hardship for those who cannot see or who have difficulty seeing.

Finally, the features of the present invention that make it easier for the blind and visually impaired to use an ATM are also useful to a sighted person using the same ATM. Therefore, an ATM according to the present invention is equally useful to the sighted, the blind, and the visually impaired. In this regard, a provision

could be made to enable a customer to indicate his need for features such as large-type visual displays. The other features of the invention described above are generally expected to be unobtrusive to a sighted customer using the same ATM.

5 In use, therefore, a customer would see a display on display screen 10 such as shown in Figure 3. This display, as mentioned above, may be supplemented by a recorded welcome message, or the like, broadcast through one or both of speakers 12 and handset 14.

10 As mentioned before, the visual display could also a combination of large-type and normal text, as shown in Figure 4, or all large-type text, as shown in Figure 5.

 Simultaneously with or after displaying the prompt to insert a magnetic stripe access card, the signaling indicator 40,42 on the
15 card reader 24, 26 would be illuminated to indicate the location where the card is to be inserted.

 Figures 6-8 illustrate, as an example of using the display screen 10 according to the present invention, the process of entering a PIN code.

20 Figure 6 illustrates an initial display prompting the customer to enter a PIN code. To the extent that the customer might be blind, or otherwise unable to read the display screen 10, a

corresponding verbal prompt is transmitted through the speakers 12 (not illustrated in this Figure) or through handset 14.

As mentioned above, the display screen 10 is provided with a touch scanning zone that extends along a known, easy to recognize portion of the display screen 10, such as along the right side edge, as seen in Figure 6. Therefore, a blind or visually impaired customer can assuredly expect where to place a fingertip. Preferably, display screen 10 also visually indicates the selection items along the touch scanning zone, such as the numbers 0-9 and three commands, as seen in Figures 6-8. This makes the display screen 10 also useful for sighted people.

Figure 7 illustrates a step of initially contacting the display screen 10, at one end of the plurality of selection items, for example.

Figure 8 illustrates a step of sliding a fingertip down the surface of the screen until reaching, for example, the number 7, and then removing the fingertip from the surface of the screen, whereby the number 7 is recognized by the ATM.

After entering the entire PIN code, the customer can input the readback command, as described above, so that the entire PIN code is repeated to the customer (either audibly, visually, or both) for verification.

Once the customer is satisfied that the PIN code is accurate, the enter command is input, so that the PIN code is fed to the ATM, thereby permitting access to banking functions.

If the customer changes his mind, for example, the exit
5 command can be input, so that the display changes to, for example, a main menu display.

While the present invention has been described with respect to what are believed to be the most practical embodiments thereof, it is particularly noted that this is by way of example only, and
10 appropriate modifications and variations thereof are possible within the spirit and scope of the claims appended hereto. For example, it will be recognized to those skilled in the art that the touch-sensitive screen need not be a "display" screen *per se*, especially in the context of use by a blind customer. Therefore, according to the
15 present invention, the input interface may be a touch-sensitive screen that does not display images, words, etc. It will be appreciated, however, that using a touch-sensitive visual display advantageously enhances the usefulness of the ATM across a spectrum of sighted, visually impaired, and blind customers.

WHAT IS CLAIMED IS:

1 1. An automatic bank teller machine comprising:
2 a customer input/output interface, including a touch-
3 sensitive screen constructed and arranged to recognize an input
4 corresponding to an action of contacting said touch-sensitive
5 screen, maintaining contact with said touch-sensitive screen while
6 moving to a location corresponding to a desired input, and breaking
7 contact from said touch-sensitive screen at said location;
8 an access control device;
9 a cash dispensing mechanism; and
10 a transaction record printer.

1 2. The automatic bank teller machine as claimed in claim
2 1, further comprising a deposit intake mechanism.

1 3. The automatic bank teller machine as claimed in claim
2 1, wherein said access control device is provided with an indicator
3 constructed and arranged to selectively signal a customer that
4 attention thereto is required.

1 4. The automatic bank teller machine as claimed in claim
2 3, wherein said access control device is a transport-type magnetic
3 stripe card reader.

1 5. The automatic bank teller machine as claimed in claim
2 3, wherein said access control device is a dip-type magnetic stripe
3 card reader.

1 6. The automatic bank teller machine as claimed in claim
2 1, wherein said access control device is identified by a Braille label
3 provided at least adjacent thereto.

1 7. The automatic bank teller machine as claimed in claim
2 3, wherein said access control device is identified by a Braille label
3 provided at least adjacent thereto.

1 8. The automatic bank teller machine as claimed in claim
2 1, wherein said cash dispensing mechanism is provided with an
3 indicator constructed and arranged to selectively signal a customer
4 that attention thereto is required.

1 9. The automatic bank teller machine as claimed in claim
2 1, wherein said cash dispensing mechanism is identifiable by a
3 Braille label provided at least adjacent thereto.

1 10. The automatic bank teller machine as claimed in claim
2 8, wherein said cash dispensing mechanism is identifiable by a
3 Braille label provided at least adjacent thereto.

1 11. The automatic bank teller machine as claimed in claim
2 2, wherein said deposit intake mechanism is provided with an
3 indicator constructed and arranged to selectively signal a customer
4 that attention thereto is required.

1 12. The automatic bank teller machine as claimed in claim
2 2, wherein said deposit intake mechanism is indentifiable by a
3 Braille label provided at least adjacent thereto.

1 13. The automatic bank teller machine as claimed in claim
2 11, wherein said deposit intake mechanism is identifiable by a
3 Braille label provided at least adjacent thereto.

1 14. The automatic bank teller machine as claimed in claim
2 1, wherein said transaction record printer is provided with an
3 indicator constructed and arranged to selectively signal a customer
4 that attention thereto is required.

1 15. The automatic bank teller machine as claimed in claim
2 1, wherein said transaction record printer is identifiable by a Braille
3 label provided at least adjacent thereto.

1 16. The automatic bank teller machine as claimed in claim
2 14, wherein said transaction record printer is identifiable by a
3 Braille label provided at least adjacent thereto.

1 17. The automatic bank teller machine as claimed in claim
2 1, wherein said customer input/output interface is identifiable by a
3 Braille label provided at least adjacent thereto.

1 18. The automatic bank teller machine as claimed in claim
2 2, wherein said access control device, said cash dispensing
3 mechanism, said deposit intake mechanism, and said transaction
4 record printer are provided with first, second, third, and fourth
5 indicators, respectively, each of said indicators being constructed
6 and arranged to selectively signal to a customer that a respective
7 one of said access control device, said cash dispensing mechanism,
8 said deposit intake mechanism, and said transaction record printer
9 require attention.

1 19. The automatic bank teller machine as claimed in claim
2 18, wherein said first, second, third, and fourth indicators are each
3 constructed and arranged to sequentially signal the customer in
4 correspondence with a sequence of steps that the customer
5 performs in completing a banking transaction.

1 20. The automatic bank teller machine as claimed in claim
2 1, wherein said customer input/output interface further includes
3 an audio device having at least one speaker and being constructed
4 and arranged to make certain information audible to a customer.

1 21. The automatic bank teller machine as claimed in claim
2 20, wherein said audio device includes an external speaker.

1 22. The automatic bank teller machine as claimed in claim
2 20, wherein said audio device includes a speaker provided in a
3 handset.

1 23. The automatic bank teller machine as claimed in claim
2 21, wherein said audio device further includes a speaker provided
3 in a handset.

1 24. The automatic bank teller machine as claimed in claim
2 20, wherein said audio device is constructed and arranged to
3 provided audible instructions for using at least one of said
4 customer input/output interface, said access control device, said
5 cash dispensing mechanism, and said transaction record printer.

1 25. The automatic bank teller machine as claimed in claim
2 20, wherein said touch-sensitive screen is constructed and
3 arranged to display visual images.

1 26. The automatic bank teller machine as claimed in claim
2 25, wherein said touch-sensitive screen is divided into plurality of
3 zones, including a touch scanning zone.

1 27. The automatic bank teller machine as claimed in claim
2 26, wherein said touch scanning zone includes a plurality of
3 visually perceivable items displayed along a length of said touch
4 scanning zone.

1 28. The automatic bank teller machine as claimed in claim
2 27, wherein said touch-sensitive screen is constructed and
3 arranged to recognize a selection of a given said visually perceivable
4 item, said selection corresponding to an action of contacting said

5 touch scanning zone and maintaining a sliding contact while
6 moving to a predetermined location in said touch scanning zone
7 corresponding to said given visually perceivable item, and thereafter
8 breaking contact from said predetermined location, whereby said
9 corresponding given visually perceivable item is recognized.

1 29. The automatic bank teller machine as claimed in claim
2 2, wherein said customer input/output interface further includes
3 an audio device having at least one speaker and being constructed
4 and arranged to make certain information audible to a customer.

1 30. The automatic bank teller machine as claimed in claim
2 29, wherein said audio device is constructed and arranged to
3 provided audible instructions for using at least one of said
4 customer input/output interface, said access control device, said
5 cash dispensing mechanism, said deposit intake mechanism, and
6 said transaction record printer.

1 31. In a touch-sensitive screen having a touch scanning
2 zone, a method of selecting one item from among a plurality of
3 items, the method comprising the steps of:
4 contacting the touch scanning zone;

5 maintaining contact with said touch scanning zone while
6 moving to a location corresponding to the one item; and
7 breaking contacting with the touch scanning zone.

1 32. The method as claimed in claim 31, wherein said steps
2 of contacting and maintaining contact includes using a fingertip.

1 33. The method as claimed in claim 31, wherein said touch
2 sensitive screen includes a plurality of visible images corresponding
3 to respective ones of the plurality of items, wherein said step of
4 maintaining contact and moving to a location corresponding to the
5 one item comprises moving to a location on or adjacent to the
6 visible image corresponding to the one item.

1/8

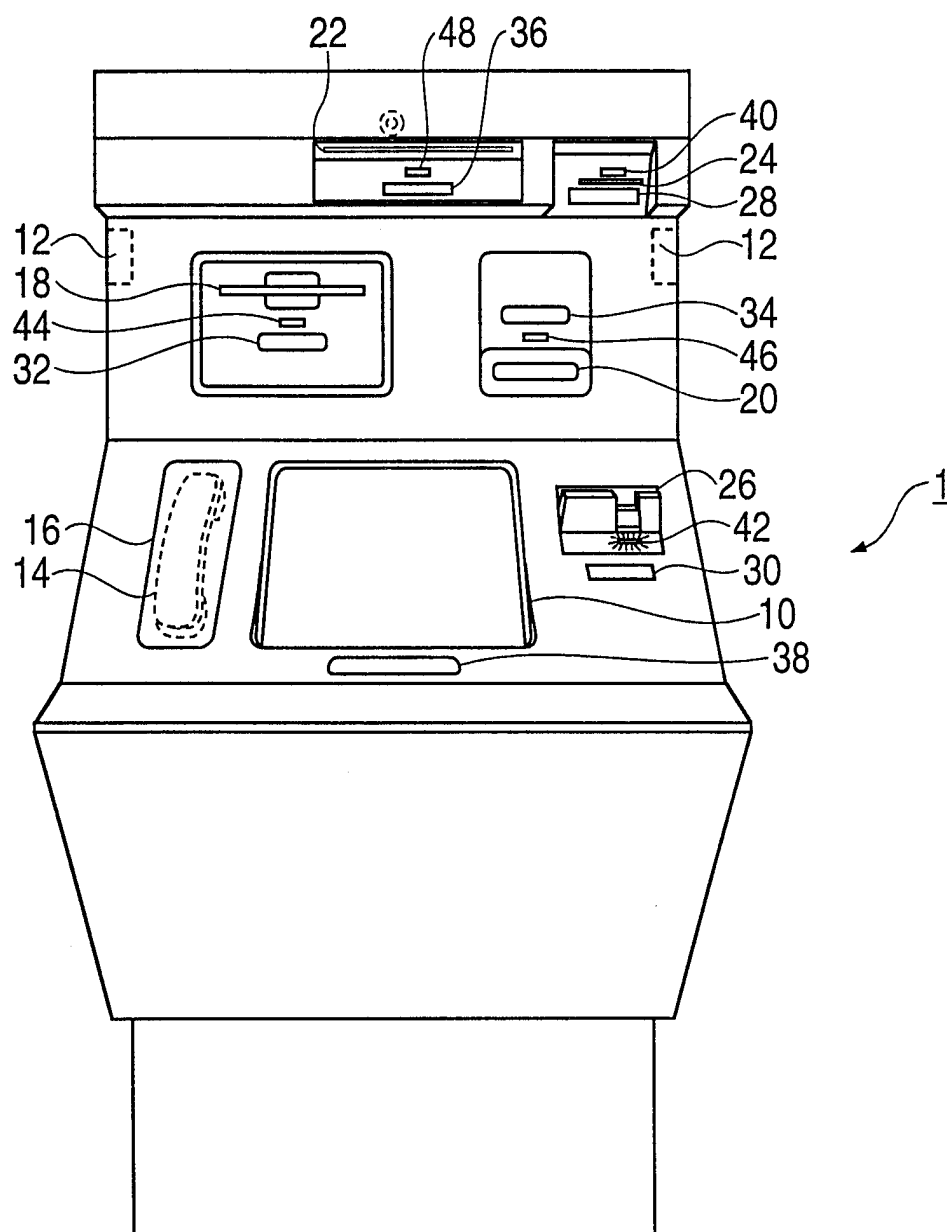
FIG. 1

FIG. 2

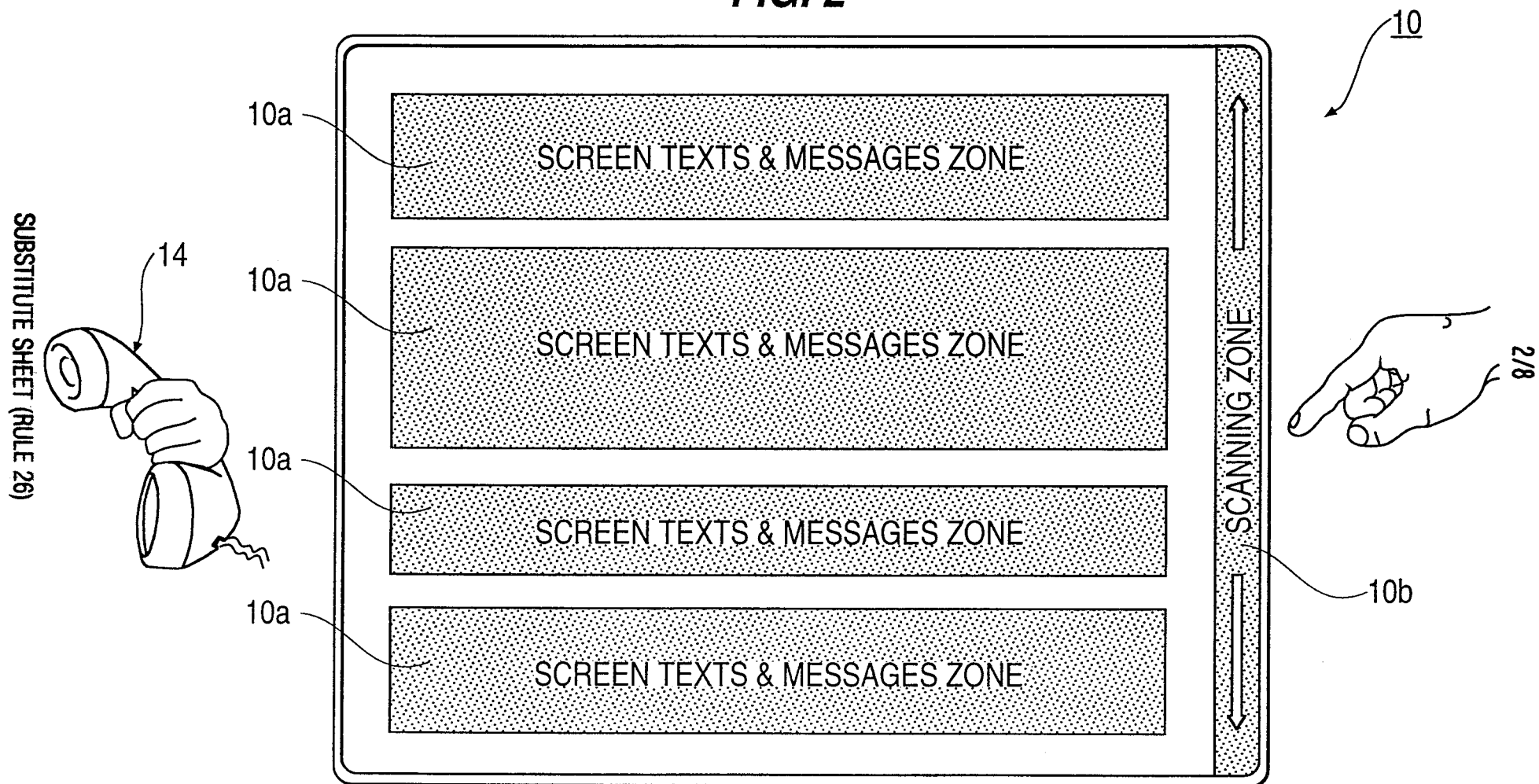


FIG. 3

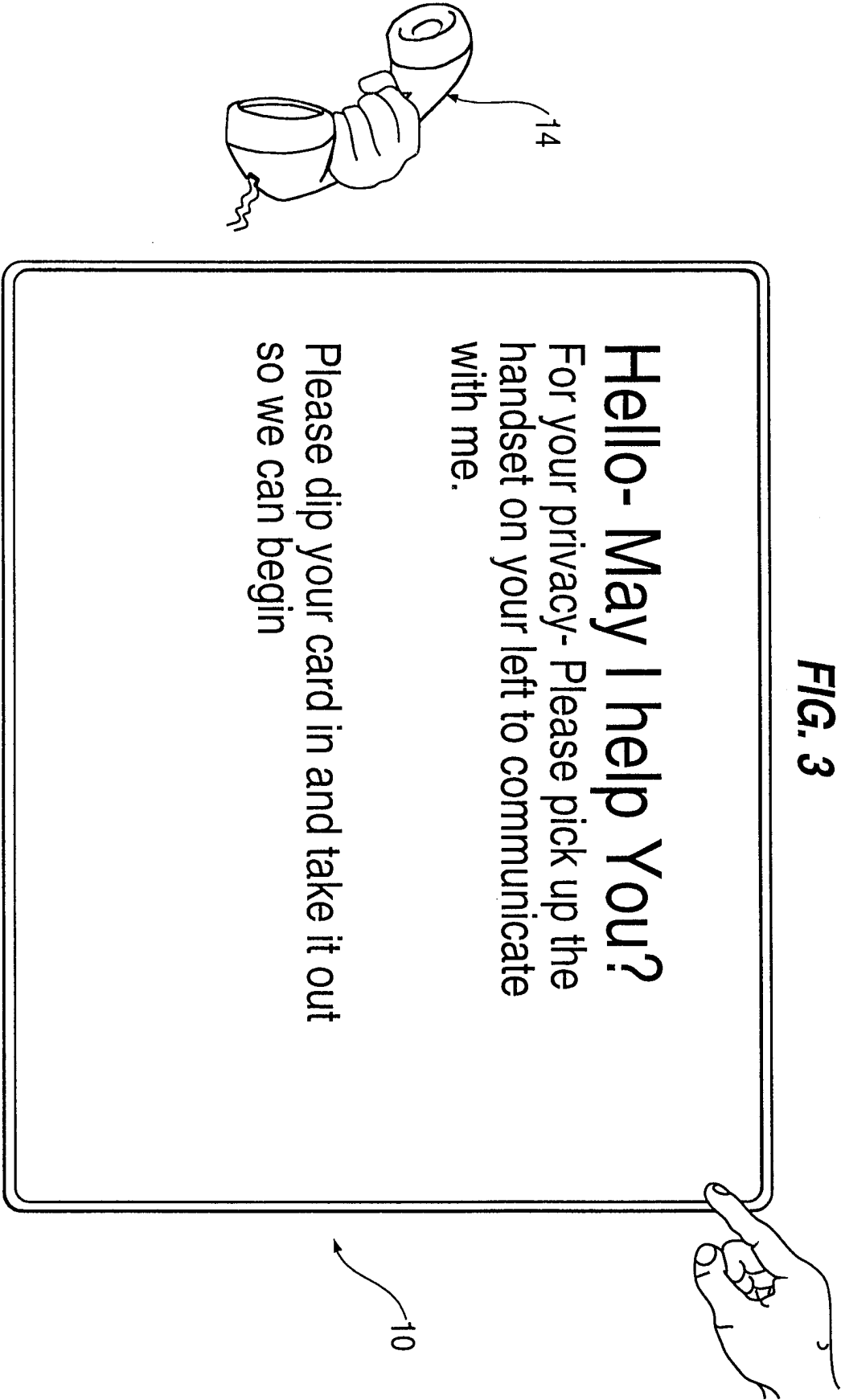


FIG. 4

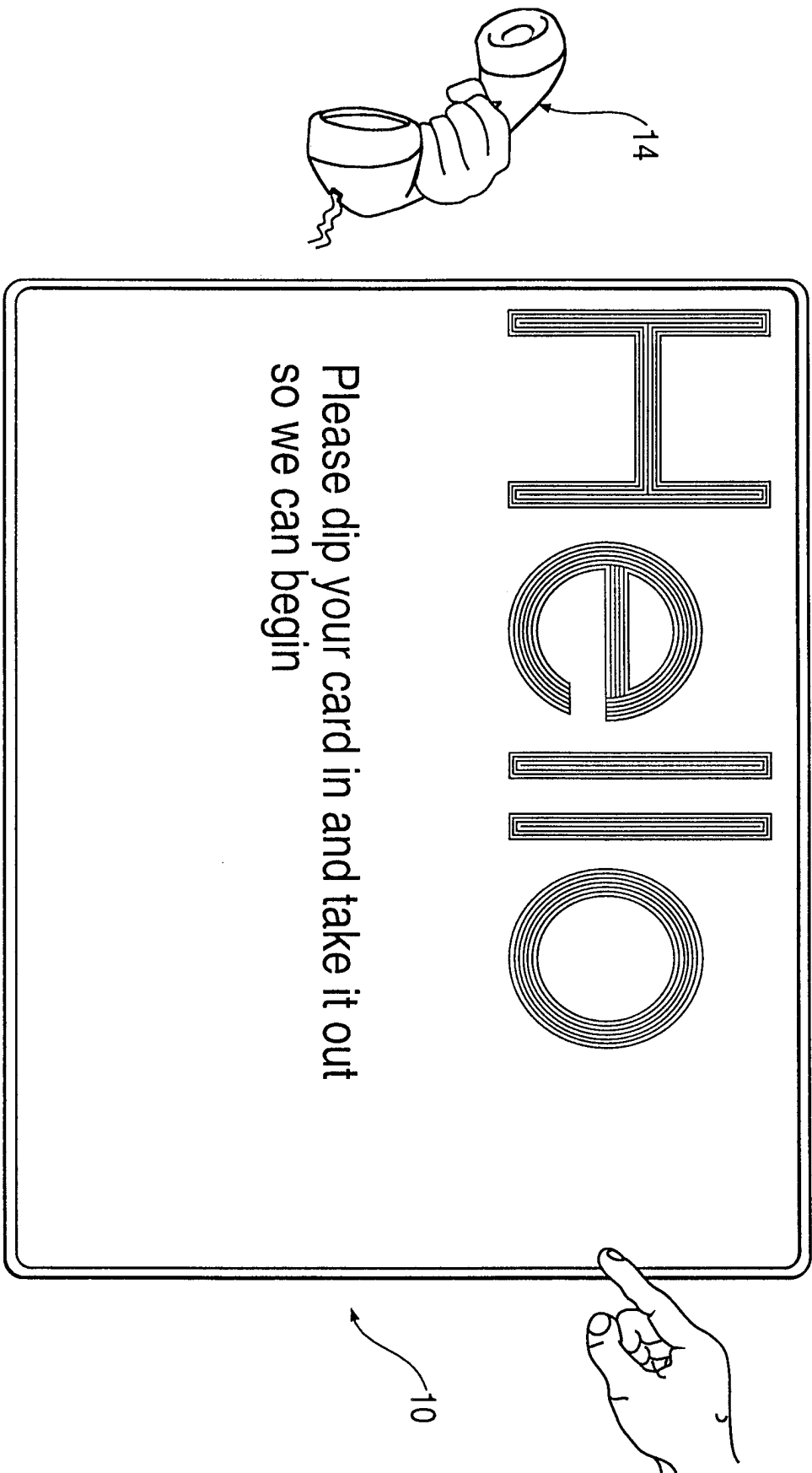


FIG. 5

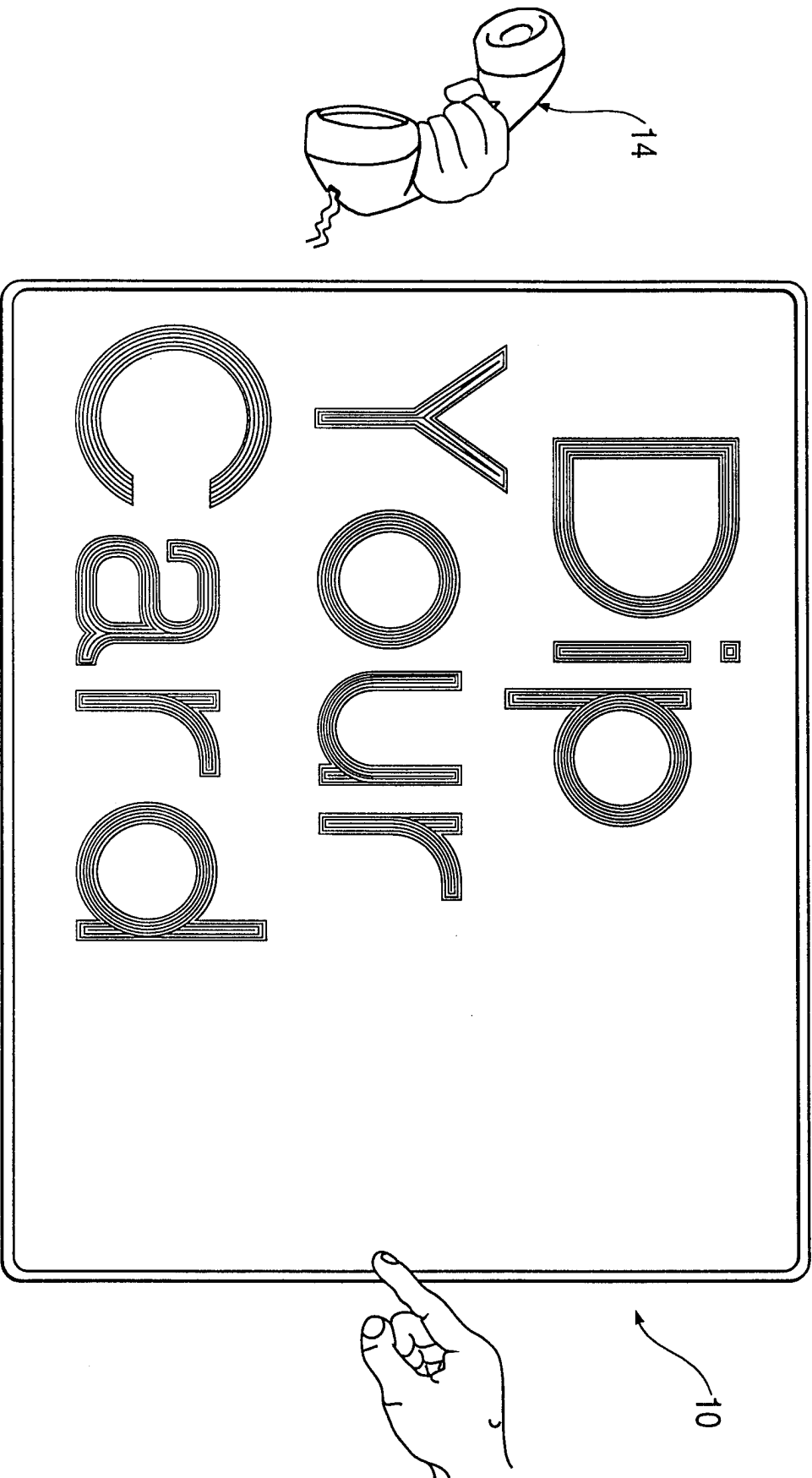
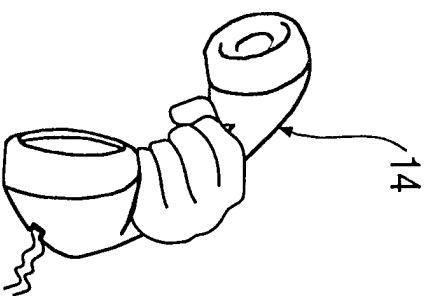
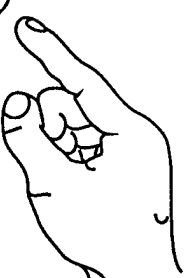
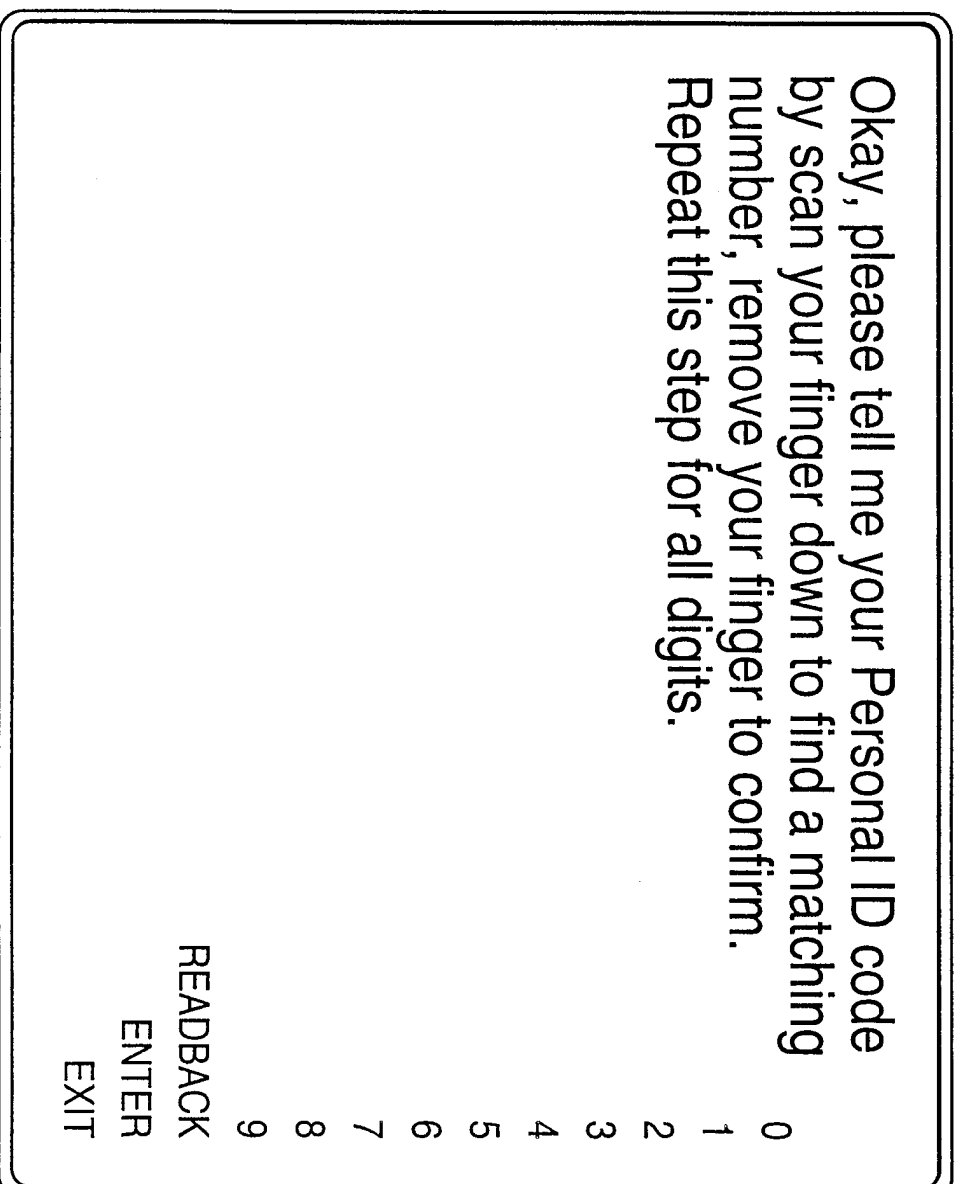
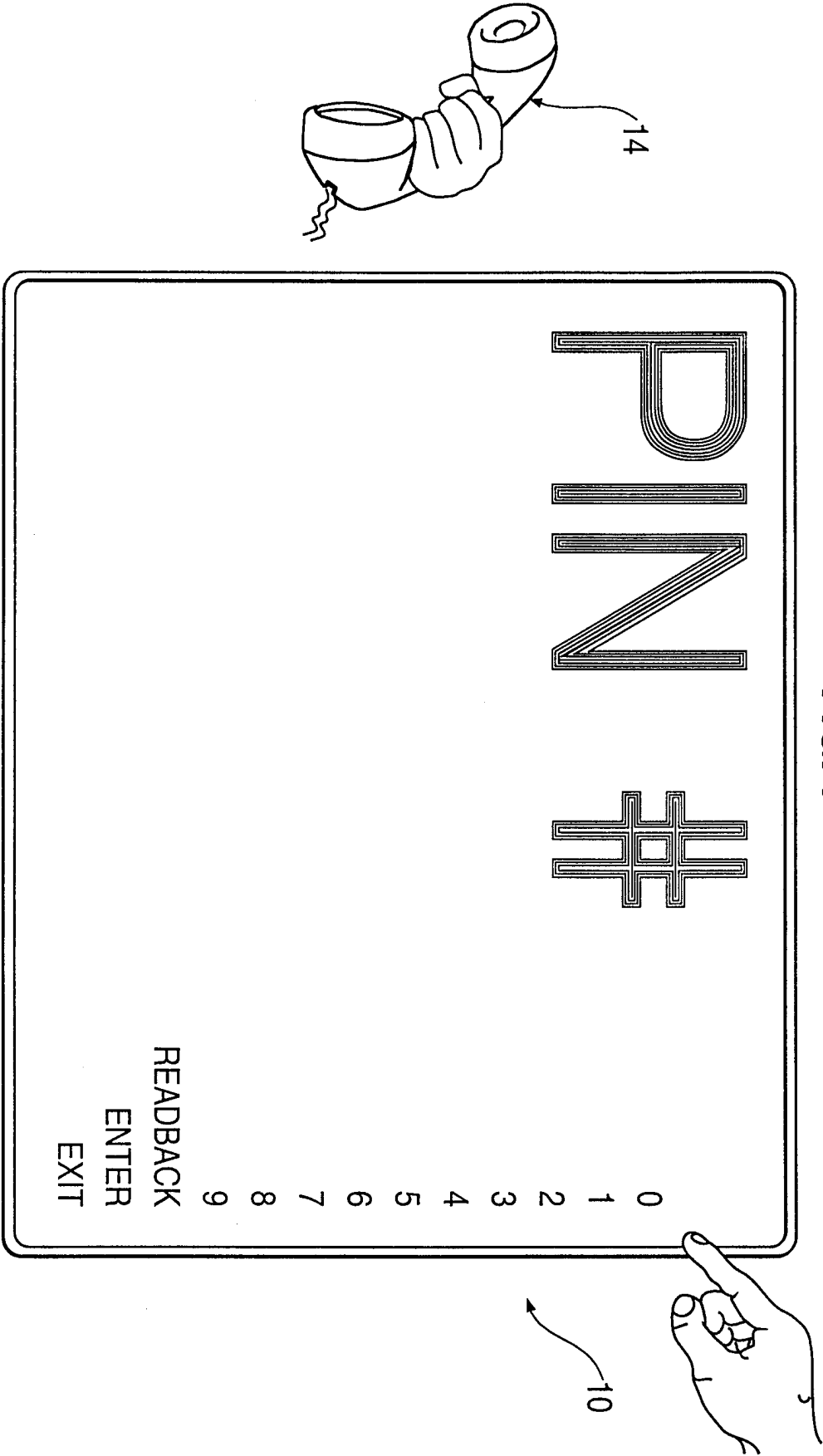


FIG. 6



SUBSTITUTE SHEET (RULE 26)

FIG. 7



8/8

FIG. 8