US 20020194074A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2002/0194074 A1**

**Jacobs** (43) **Pub. Date: Dec. 19, 2002**

(54) **SELF-CHECKOUT METHOD AND APPARATUS**

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(21) Appl. No.: **10/150,146**

(22) Filed: **May 17, 2002**

**Related U.S. Application Data**

(63) Continuation-in-part of application No. 09/710,137, filed on Nov. 10, 2000.

(60) Provisional application No. 60/244,234, filed on Oct. 30, 2000.

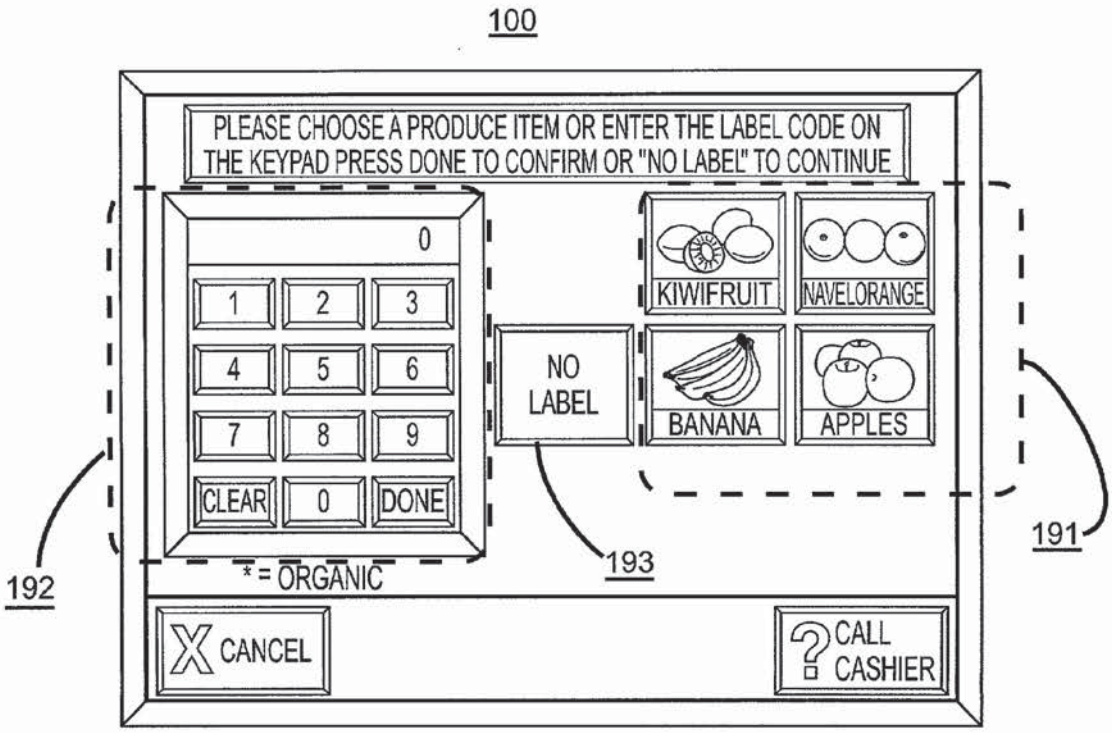
**Publication Classification**

(51) **Int. Cl.**[7] ..... **G06F 17/60**

(52) **U.S. Cl.** ..... **705/16**

(57) **ABSTRACT**

A point-of-sale self-checkout terminal includes a code reader device for automated entry of a product identification code present on items for purchase and a customer input device for receipt of data from a customer. A customer can initiate a purchase of a non-scannable item and, in response, a database is queried to identify items based on a prediction of purchase of the items, and the identified items are displayed for selection by the customer to purchase the item. Inage processing and voice processing, can also be implemented to assist customers with the purchase of non-scannable items.



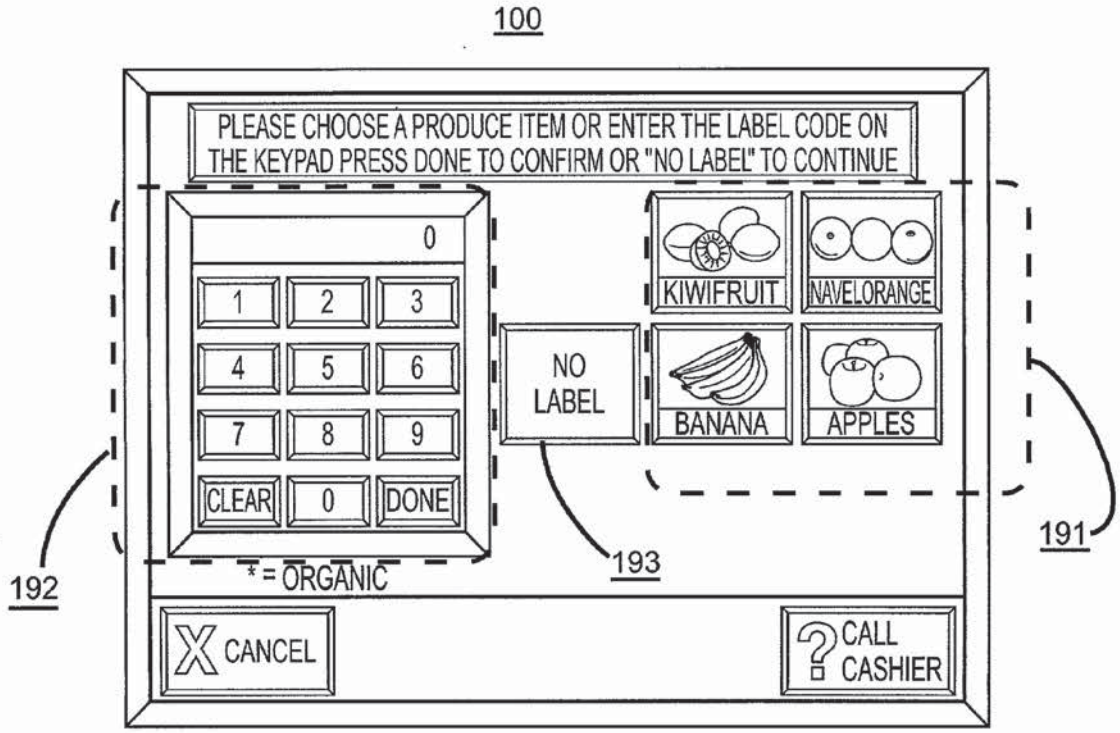

100
PLEASE CHOOSE A PRODUCE ITEM OR ENTER THE LABEL CODE ON THE KEYPAD PRESS DONE TO CONFIRM OR "NO LABEL" TO CONTINUE
0
1
2
3
4
5
6
7
8
9
CLEAR
0
DONE
* = ORGANIC
NO LABEL
KIWIFRUIT
NAVELORANGE
BANANA
APPLES
CANCEL
CALL CASHIER
191
192
193

FIG. 1

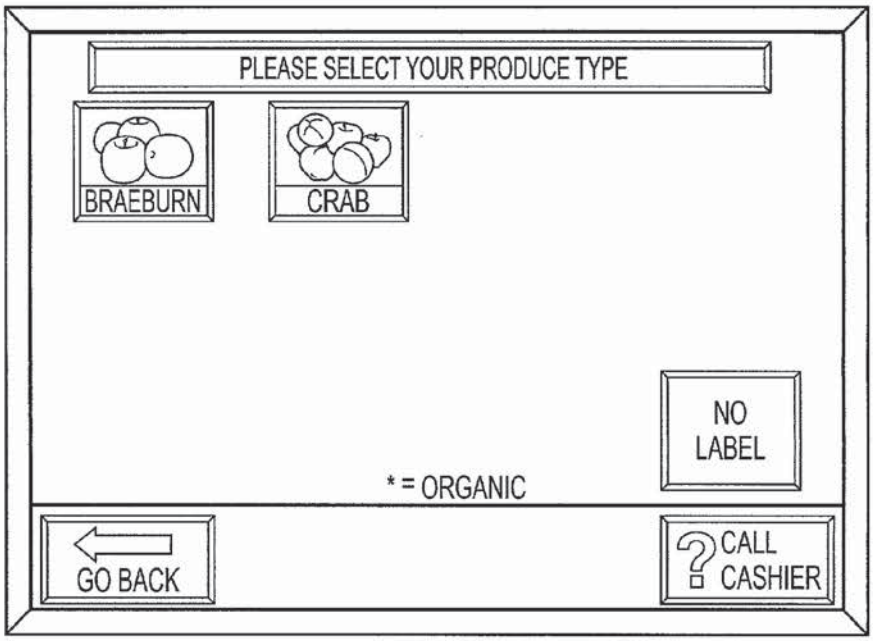

PLEASE SELECT YOUR PRODUCE TYPE
BRAEBURN
CRAB
NO LABEL
* = ORGANIC
GO BACK
CALL CASHIER

FIG. 2

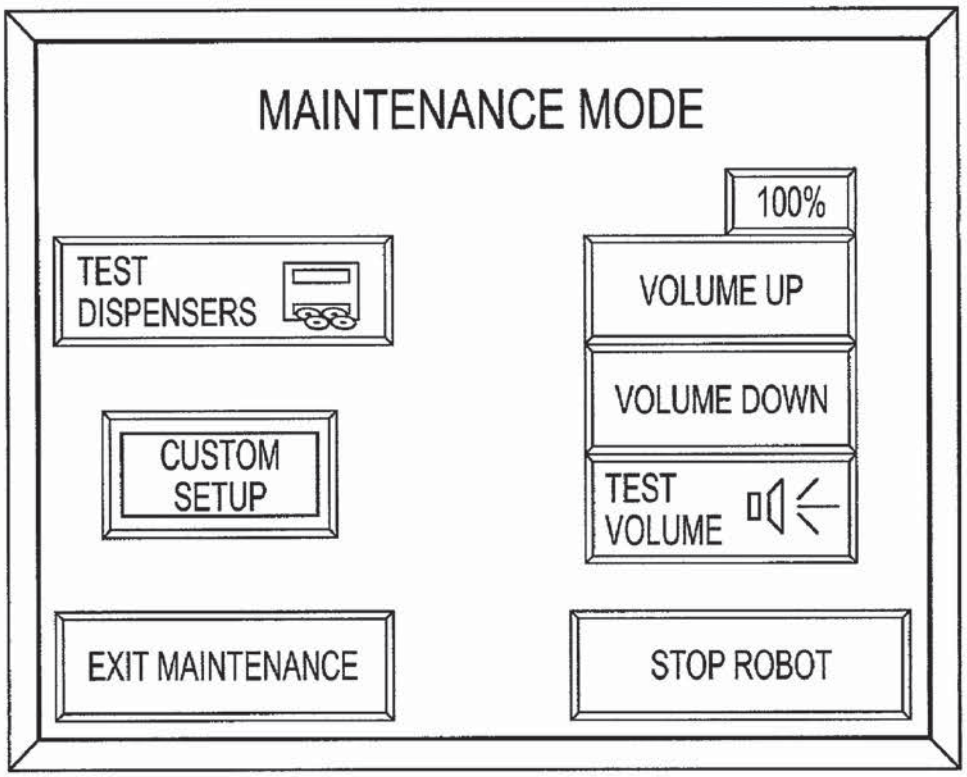

MAINTENANCE MODE
100%
TEST DISPENSERS
VOLUME UP
VOLUME DOWN
CUSTOM SETUP
TEST VOLUME
EXIT MAINTENANCE
STOP ROBOT

FIG. 3

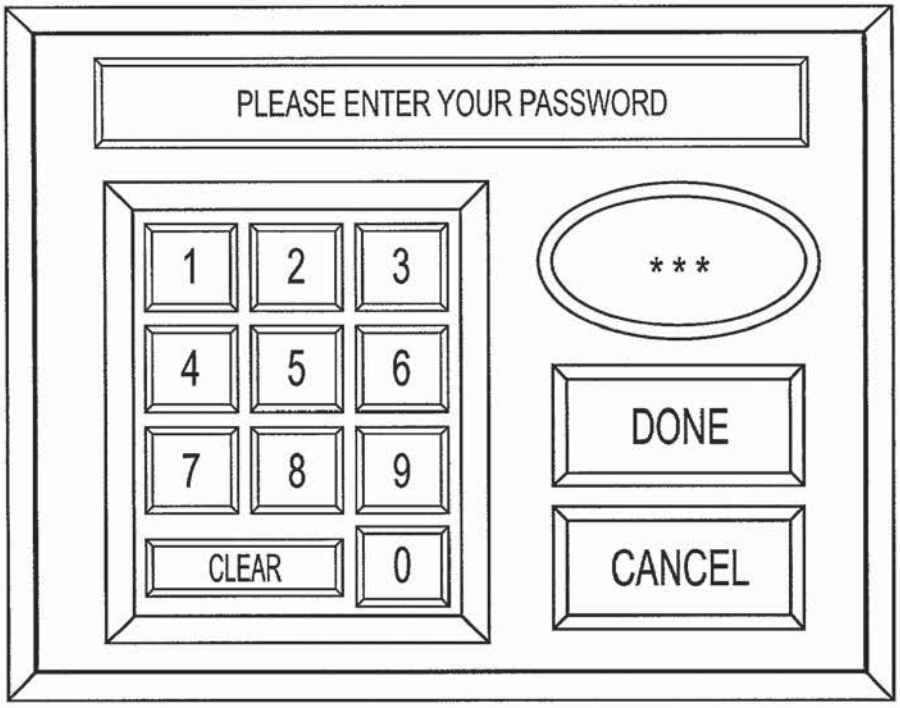

PLEASE ENTER YOUR PASSWORD
1
2
3
4
5
6
7
8
9
CLEAR
0
***
DONE
CANCEL

FIG. 4

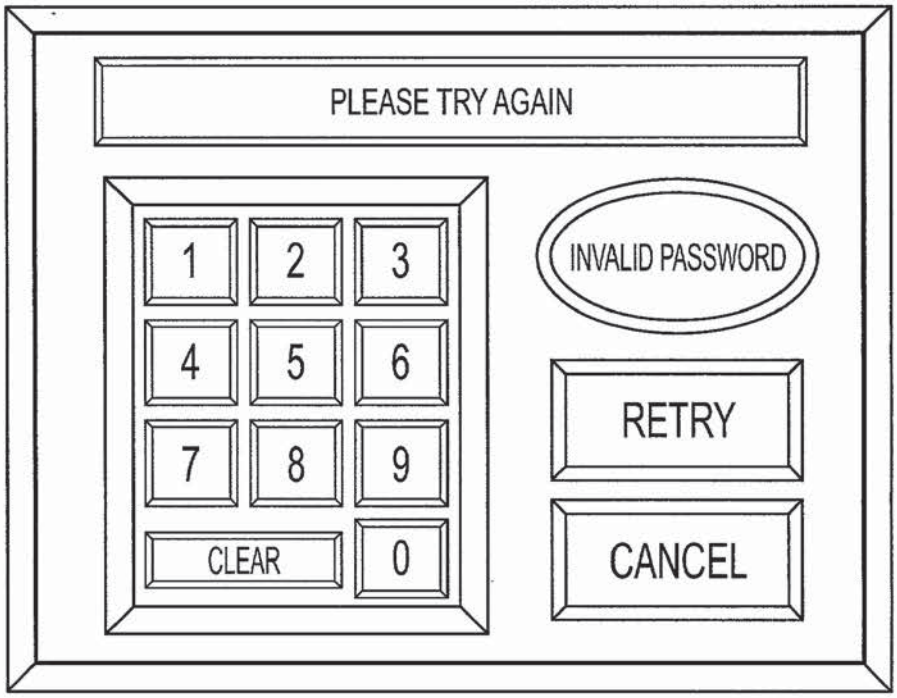

PLEASE TRY AGAIN
1
2
3
4
5
6
7
8
9
CLEAR
0
INVALID PASSWORD
RETRY
CANCEL

FIG. 5

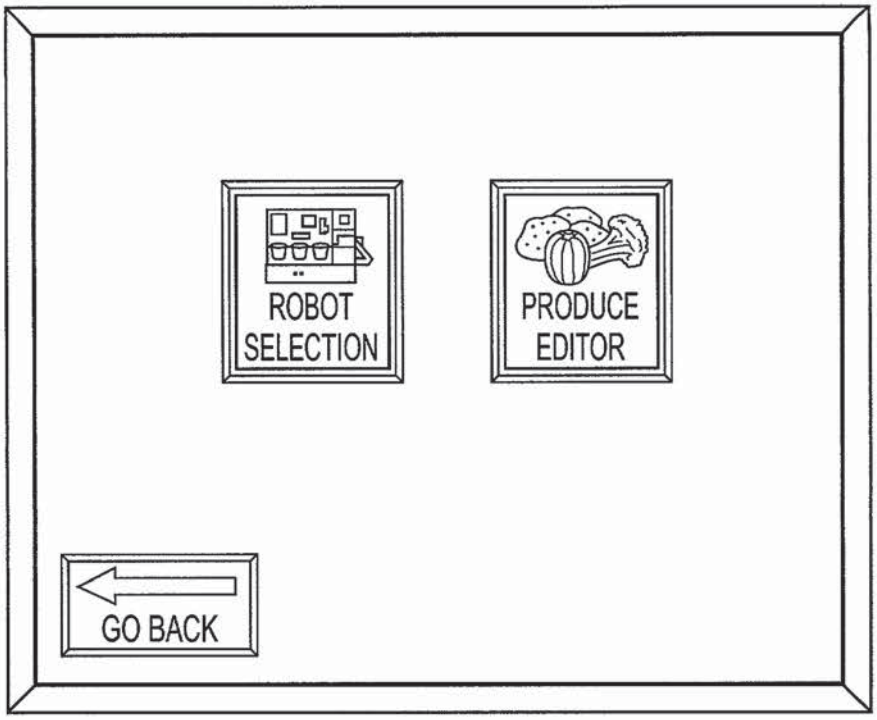

ROBOT SELECTION
PRODUCE EDITOR
GO BACK

FIG. 6

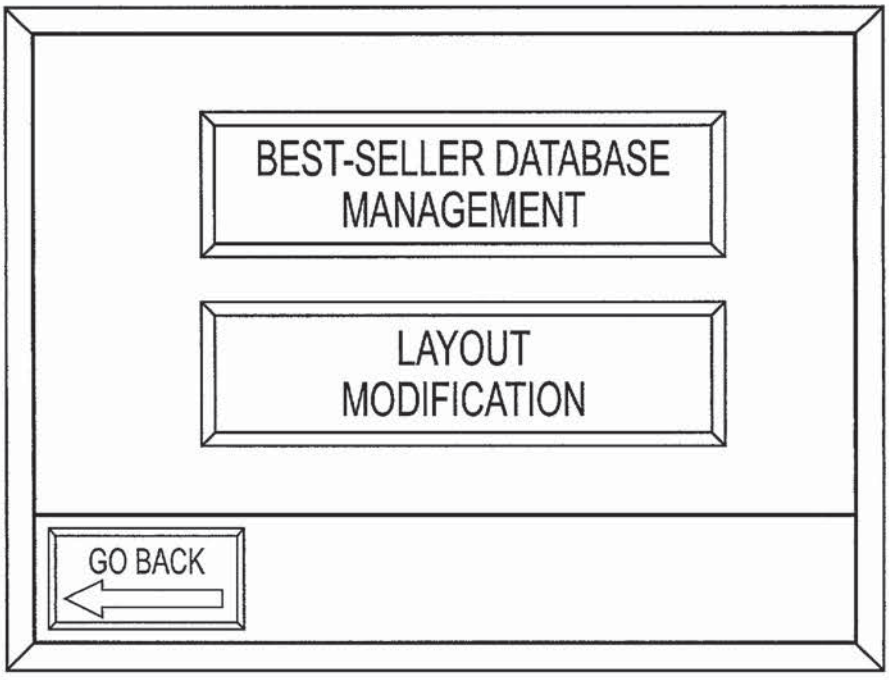

BEST-SELLER DATABASE MANAGEMENT
LAYOUT MODIFICATION
GO BACK

FIG. 7

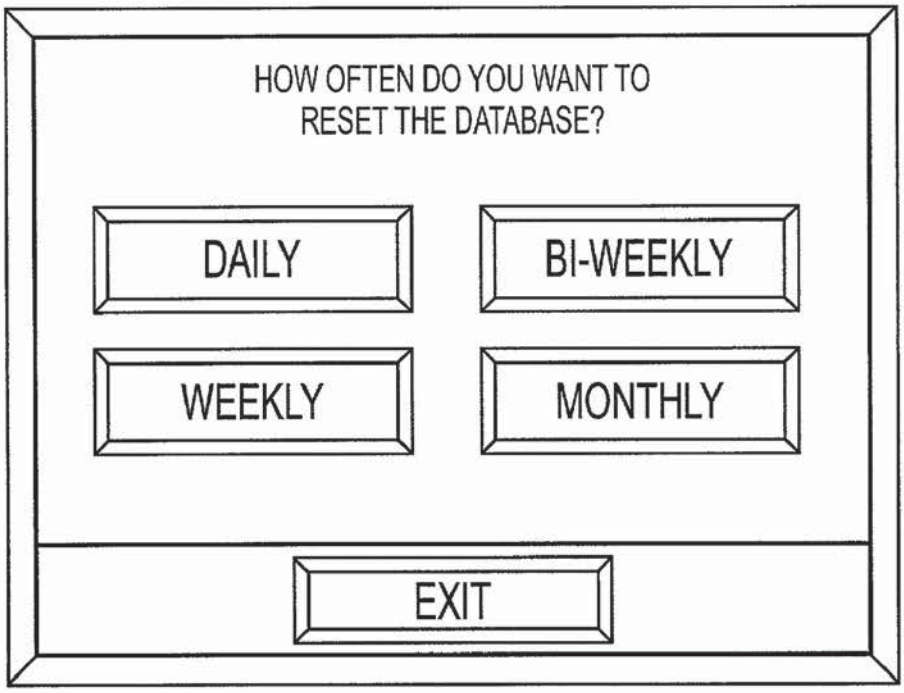

HOW OFTEN DO YOU WANT TO
RESET THE DATABASE?
DAILY
BI-WEEKLY
WEEKLY
MONTHLY
EXIT

FIG. 8

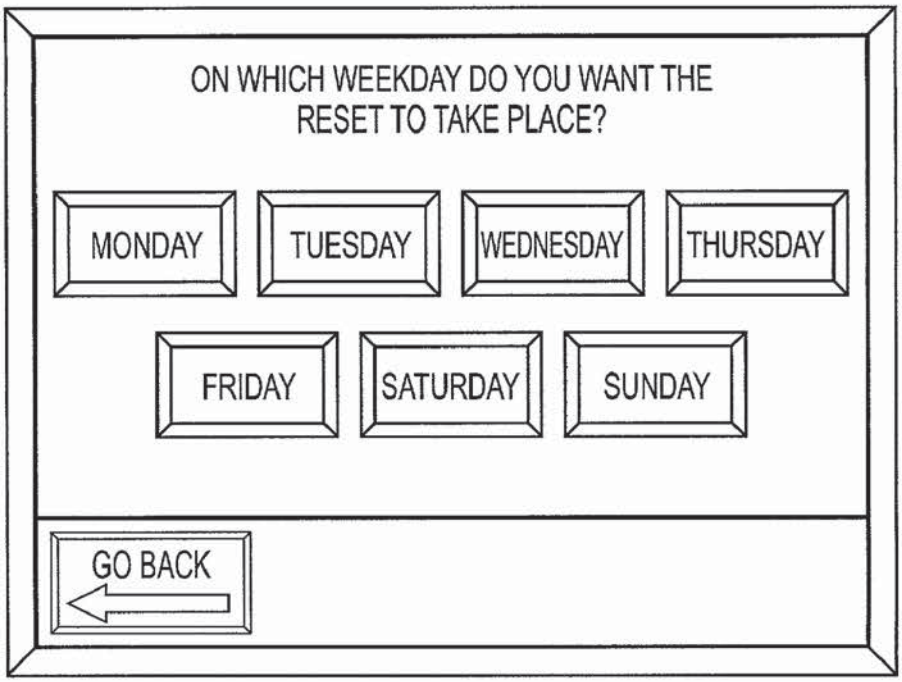

ON WHICH WEEKDAY DO YOU WANT THE
RESET TO TAKE PLACE?
MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
SATURDAY
SUNDAY
GO BACK

FIG. 9

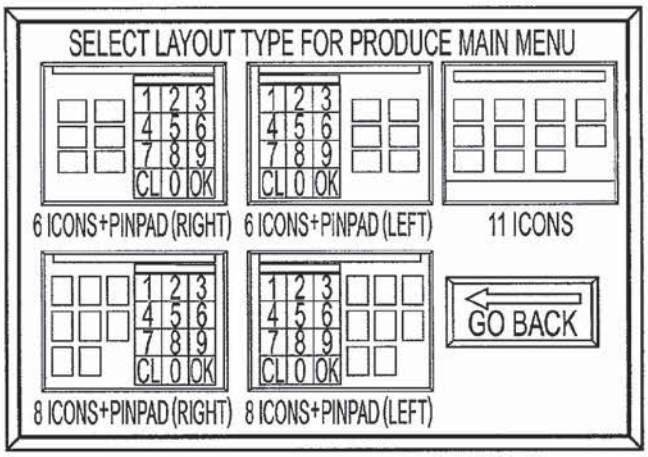



FIG. 10

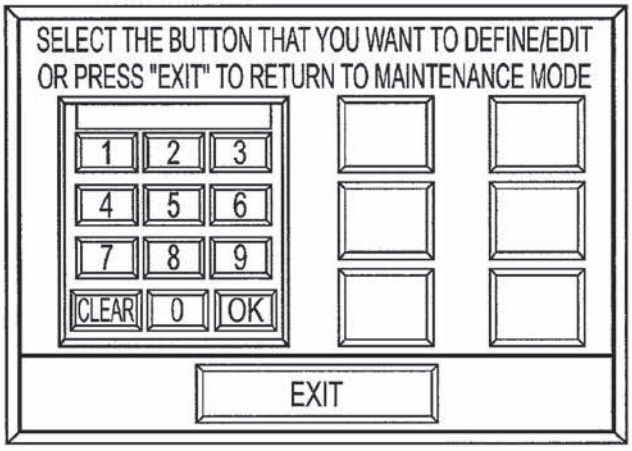



FIG. 11

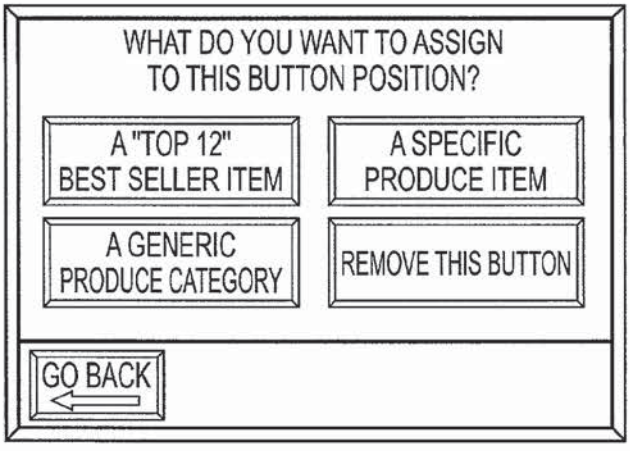



FIG. 12

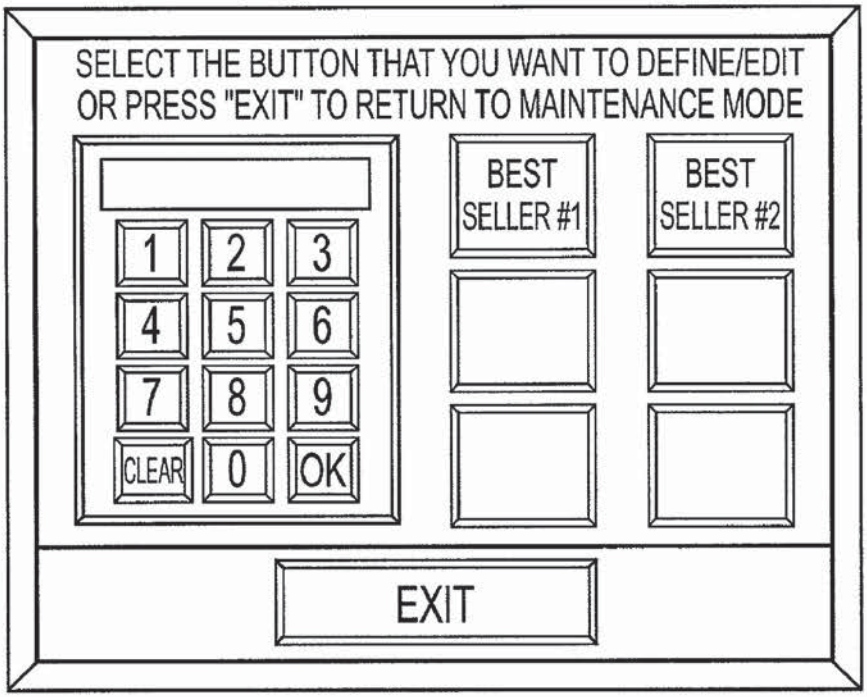

SELECT THE BUTTON THAT YOU WANT TO DEFINE/EDIT
OR PRESS "EXIT" TO RETURN TO MAINTENANCE MODE
1
2
3
4
5
6
7
8
9
CLEAR
0
OK
BEST SELLER #1
BEST SELLER #2
EXIT

FIG. 13

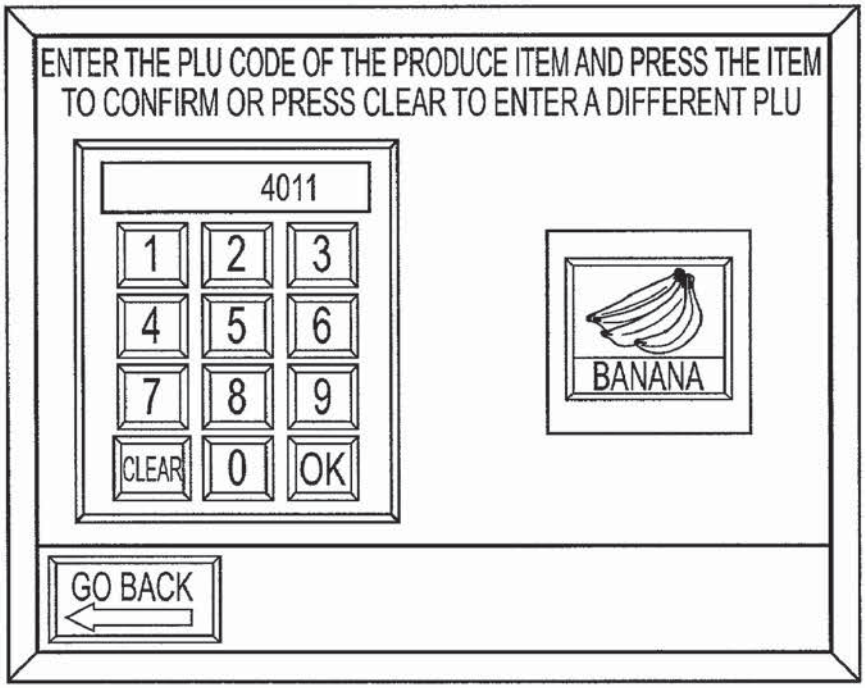

ENTER THE PLU CODE OF THE PRODUCE ITEM AND PRESS THE ITEM
TO CONFIRM OR PRESS CLEAR TO ENTER A DIFFERENT PLU
4011
1
2
3
4
5
6
7
8
9
CLEAR
0
OK
BANANA
GO BACK

FIG. 14

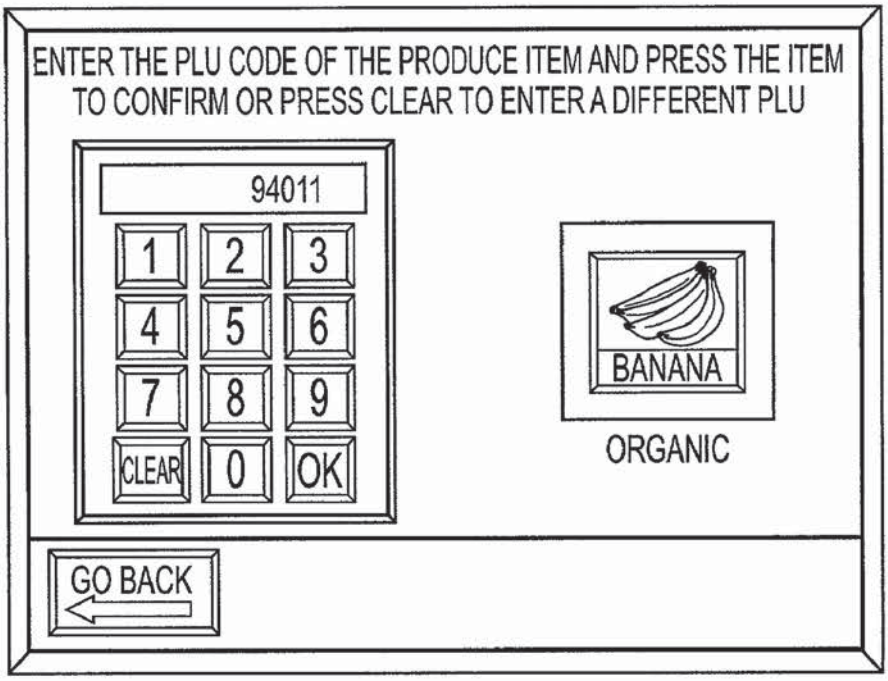

ENTER THE PLU CODE OF THE PRODUCE ITEM AND PRESS THE ITEM TO CONFIRM OR PRESS CLEAR TO ENTER A DIFFERENT PLU
94011
1
2
3
4
5
6
7
8
9
CLEAR
0
OK
BANANA
ORGANIC
GO BACK

FIG. 15

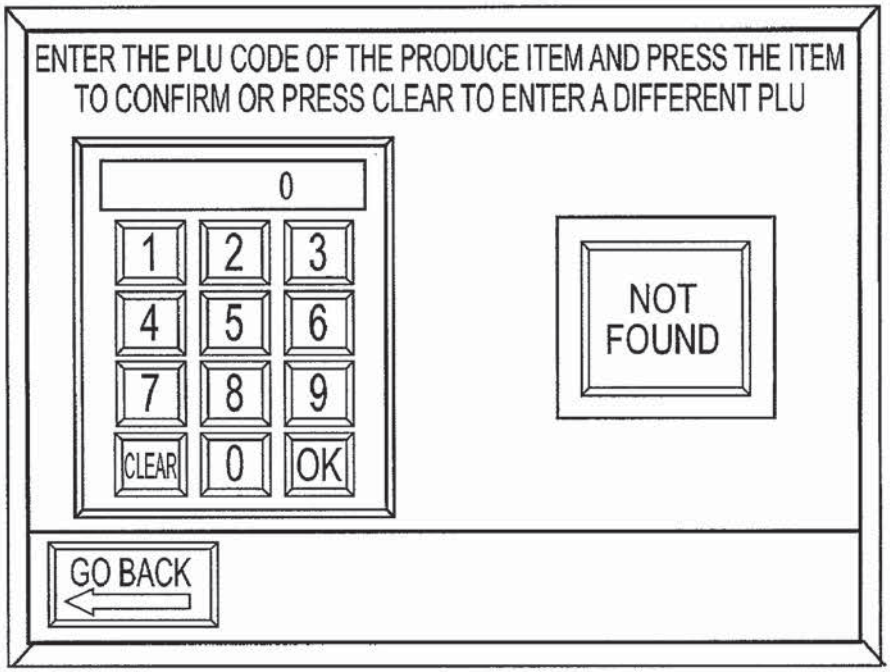

ENTER THE PLU CODE OF THE PRODUCE ITEM AND PRESS THE ITEM TO CONFIRM OR PRESS CLEAR TO ENTER A DIFFERENT PLU
0
1
2
3
4
5
6
7
8
9
CLEAR
0
OK
NOT FOUND
GO BACK

FIG. 16

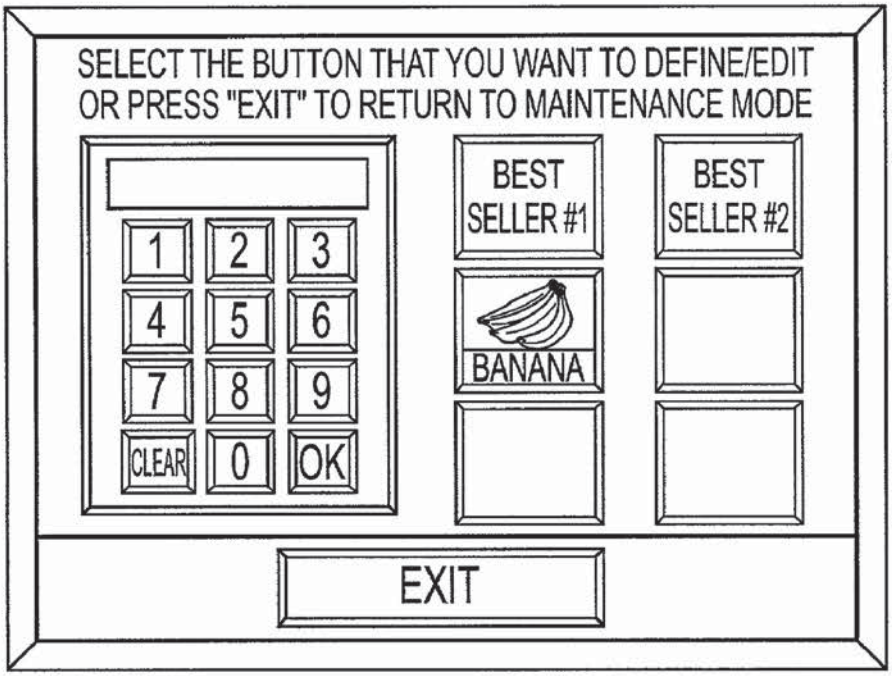

SELECT THE BUTTON THAT YOU WANT TO DEFINE/EDIT
OR PRESS "EXIT" TO RETURN TO MAINTENANCE MODE
1
2
3
4
5
6
7
8
9
CLEAR
0
OK
BEST SELLER #1
BEST SELLER #2
BANANA
EXIT

FIG. 17

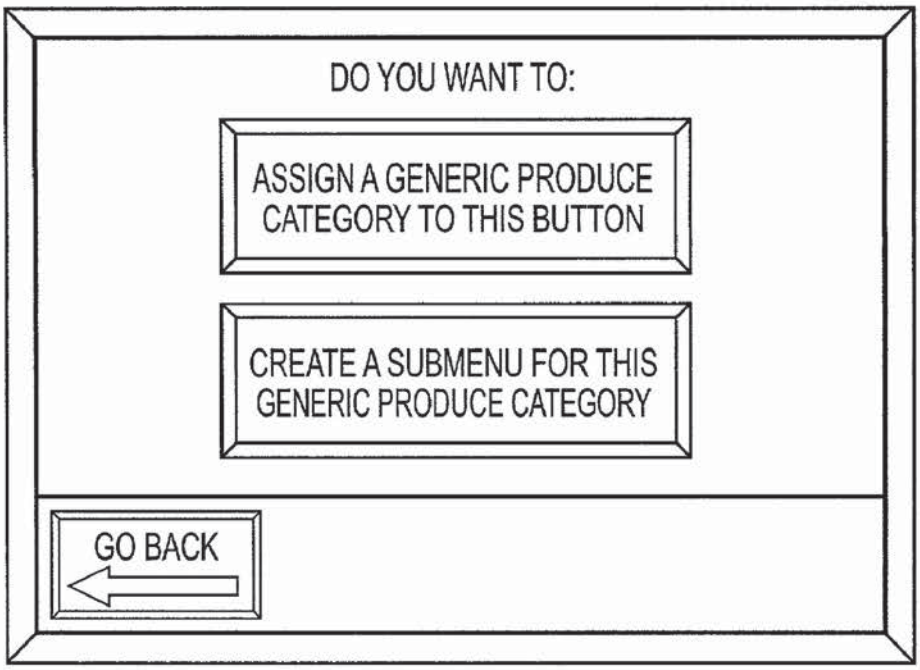

DO YOU WANT TO:
ASSIGN A GENERIC PRODUCE CATEGORY TO THIS BUTTON
CREATE A SUBMENU FOR THIS GENERIC PRODUCE CATEGORY
GO BACK

FIG. 18

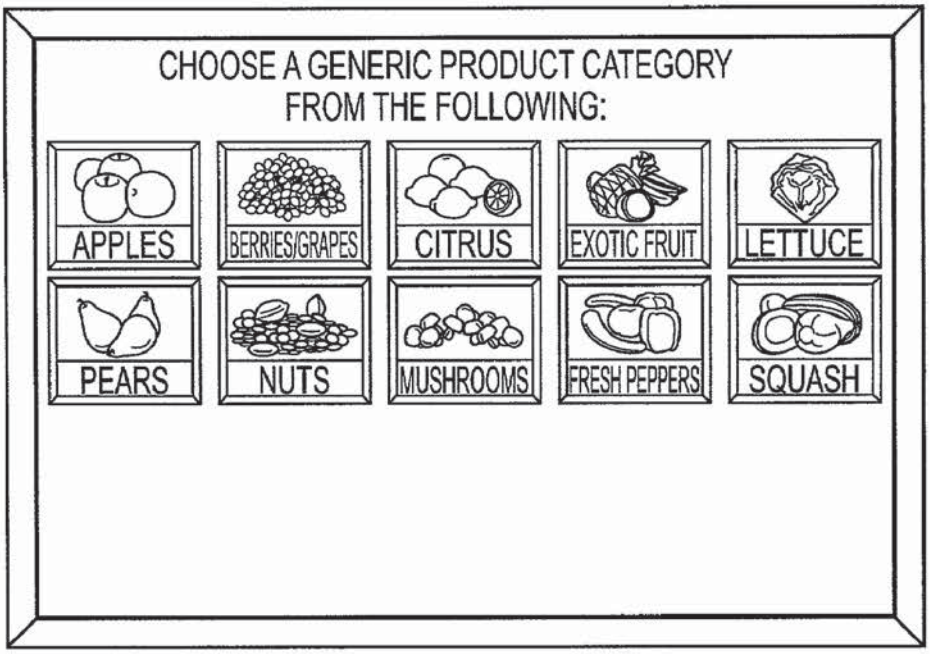

CHOOSE A GENERIC PRODUCT CATEGORY
FROM THE FOLLOWING:
APPLES
BERRIES/GRAPES
CITRUS
EXOTIC FRUIT
LETTUCE
PEARS
NUTS
MUSHROOMS
FRESH PEPPERS
SQUASH

FIG. 19

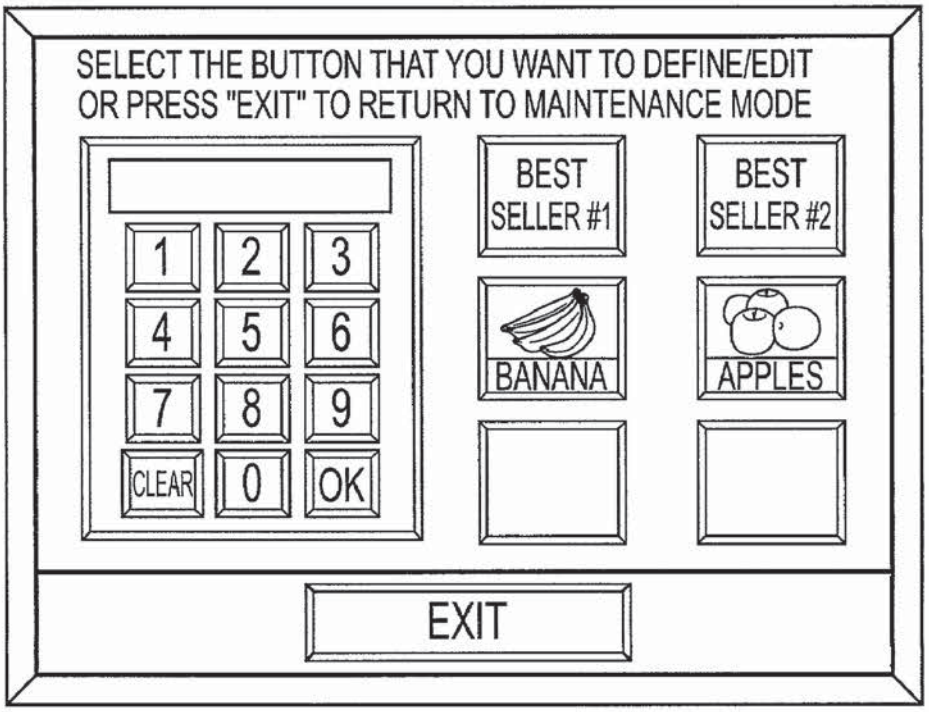

SELECT THE BUTTON THAT YOU WANT TO DEFINE/EDIT
OR PRESS "EXIT" TO RETURN TO MAINTENANCE MODE
1
2
3
4
5
6
7
8
9
CLEAR
0
OK
BEST SELLER #1
BEST SELLER #2
BANANA
APPLES
EXIT

FIG. 20

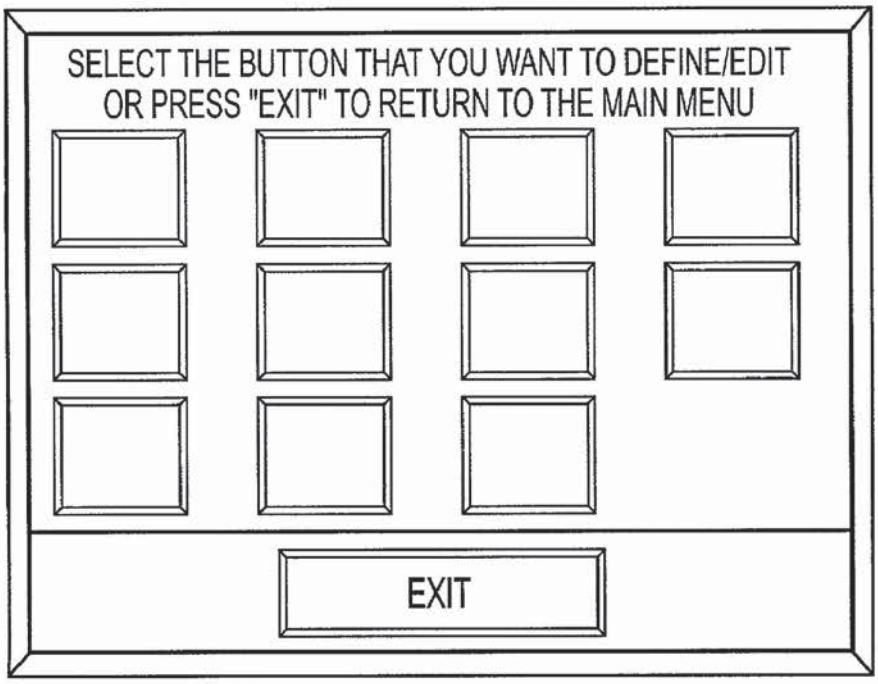

SELECT THE BUTTON THAT YOU WANT TO DEFINE/EDIT
OR PRESS "EXIT" TO RETURN TO THE MAIN MENU
EXIT

FIG. 21

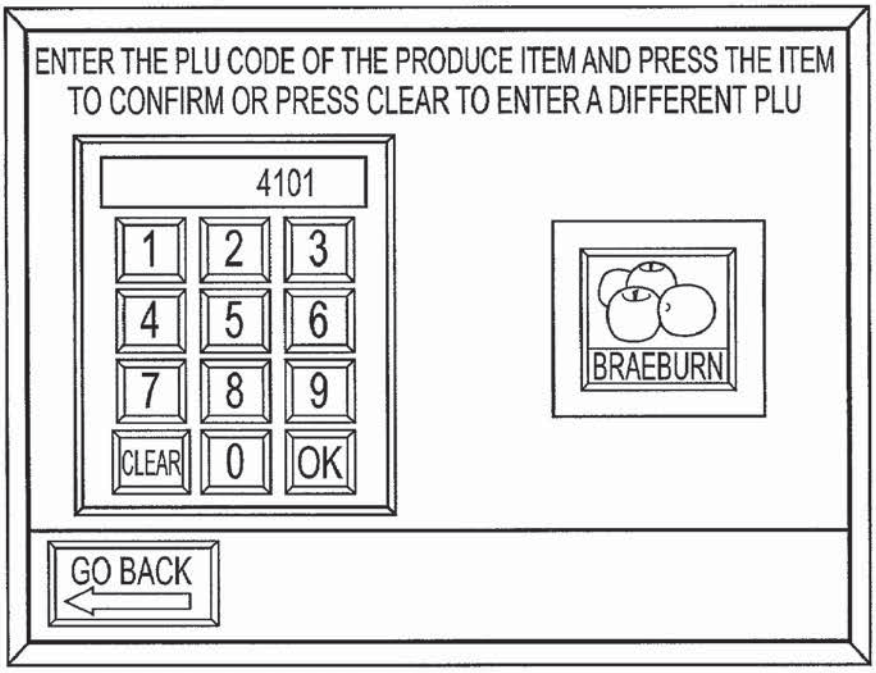

ENTER THE PLU CODE OF THE PRODUCE ITEM AND PRESS THE ITEM
TO CONFIRM OR PRESS CLEAR TO ENTER A DIFFERENT PLU
4101
1
2
3
4
5
6
7
8
9
CLEAR
0
OK
BRAEBURN
GO BACK

FIG. 22

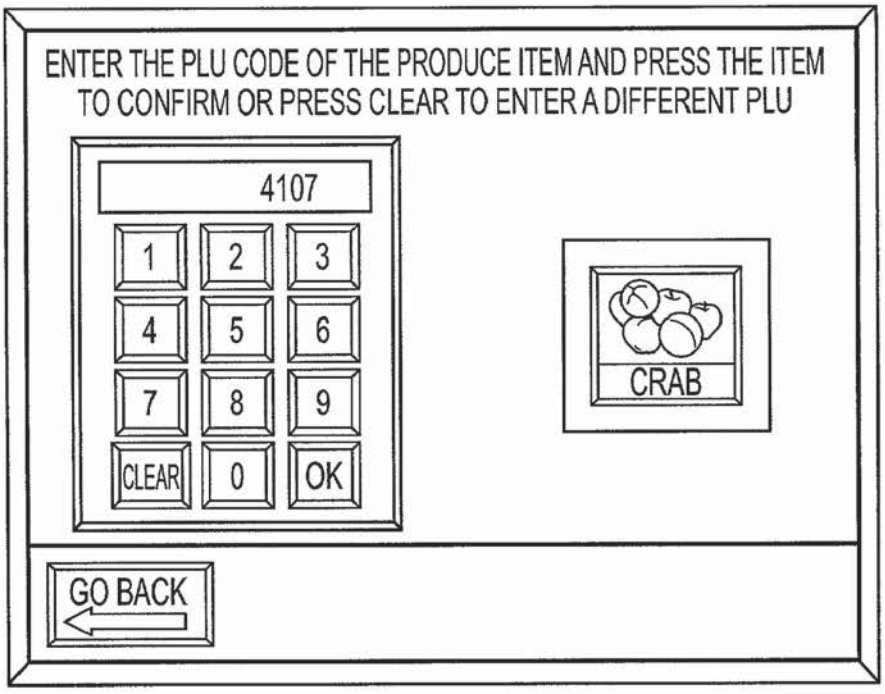

ENTER THE PLU CODE OF THE PRODUCE ITEM AND PRESS THE ITEM TO CONFIRM OR PRESS CLEAR TO ENTER A DIFFERENT PLU
4107
1
2
3
4
5
6
7
8
9
CLEAR
0
OK
CRAB
GO BACK

FIG. 23

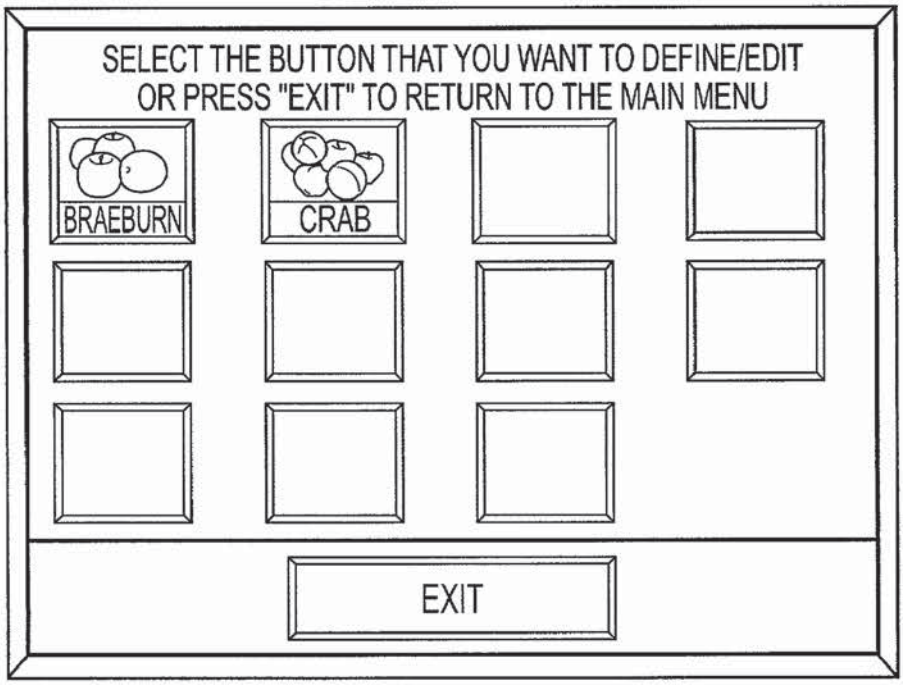

SELECT THE BUTTON THAT YOU WANT TO DEFINE/EDIT OR PRESS "EXIT" TO RETURN TO THE MAIN MENU
BRAEBURN
CRAB
EXIT

FIG. 24

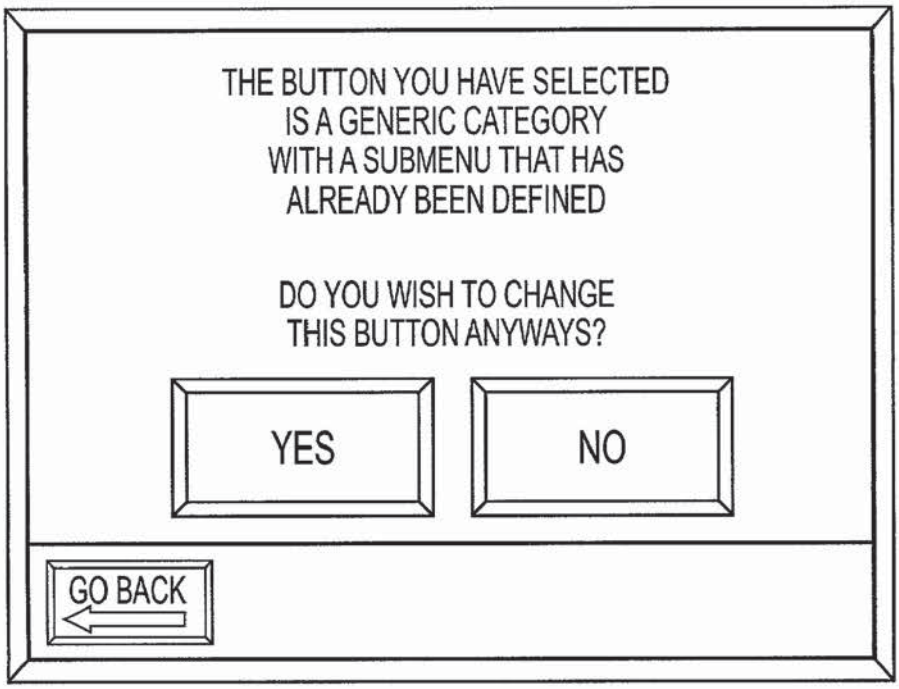

THE BUTTON YOU HAVE SELECTED
IS A GENERIC CATEGORY
WITH A SUBMENU THAT HAS
ALREADY BEEN DEFINED
DO YOU WISH TO CHANGE
THIS BUTTON ANYWAYS?
YES
NO
GO BACK

FIG. 25

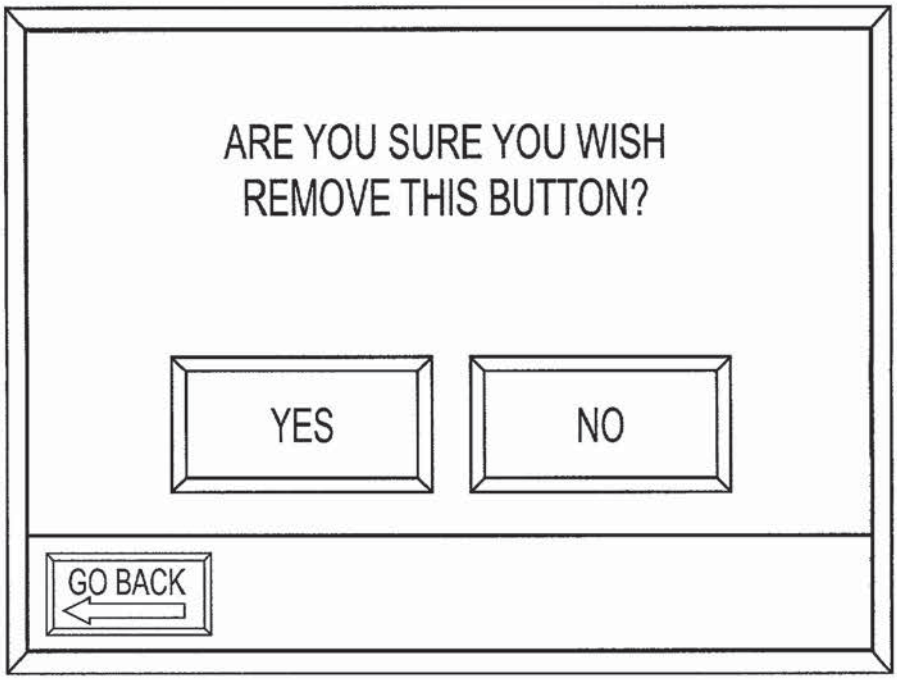

ARE YOU SURE YOU WISH
REMOVE THIS BUTTON?
YES
NO
GO BACK

FIG. 26

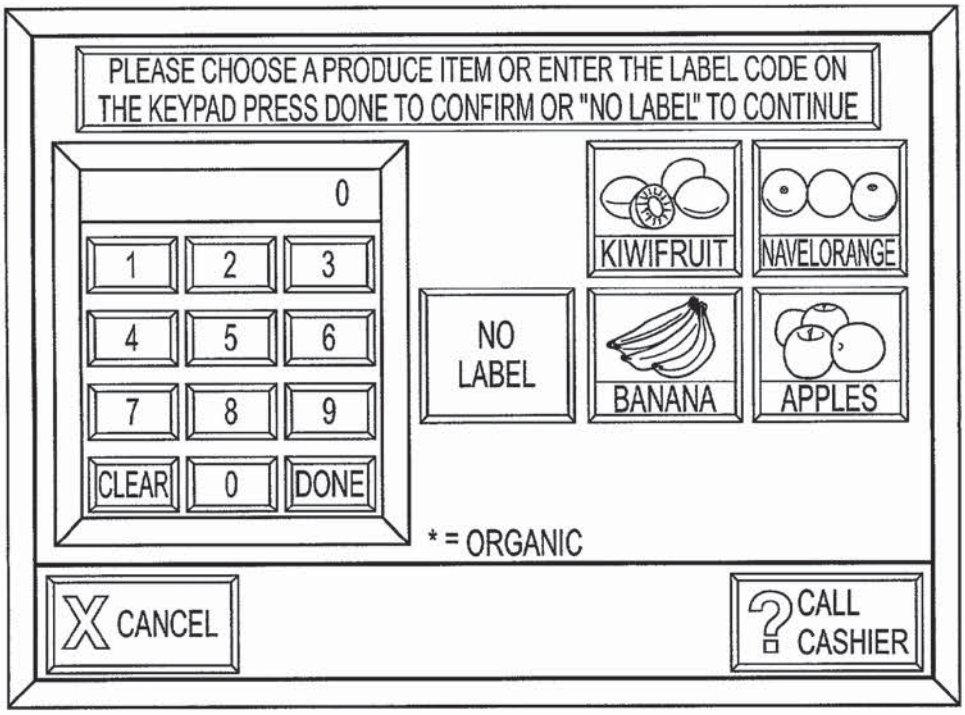

PLEASE CHOOSE A PRODUCE ITEM OR ENTER THE LABEL CODE ON THE KEYPAD PRESS DONE TO CONFIRM OR "NO LABEL" TO CONTINUE
0
1
2
3
4
5
6
7
8
9
CLEAR
0
DONE
KIWIFRUIT
NAVELORANGE
NO LABEL
BANANA
APPLES
* = ORGANIC
CANCEL
CALL CASHIER

FIG. 27

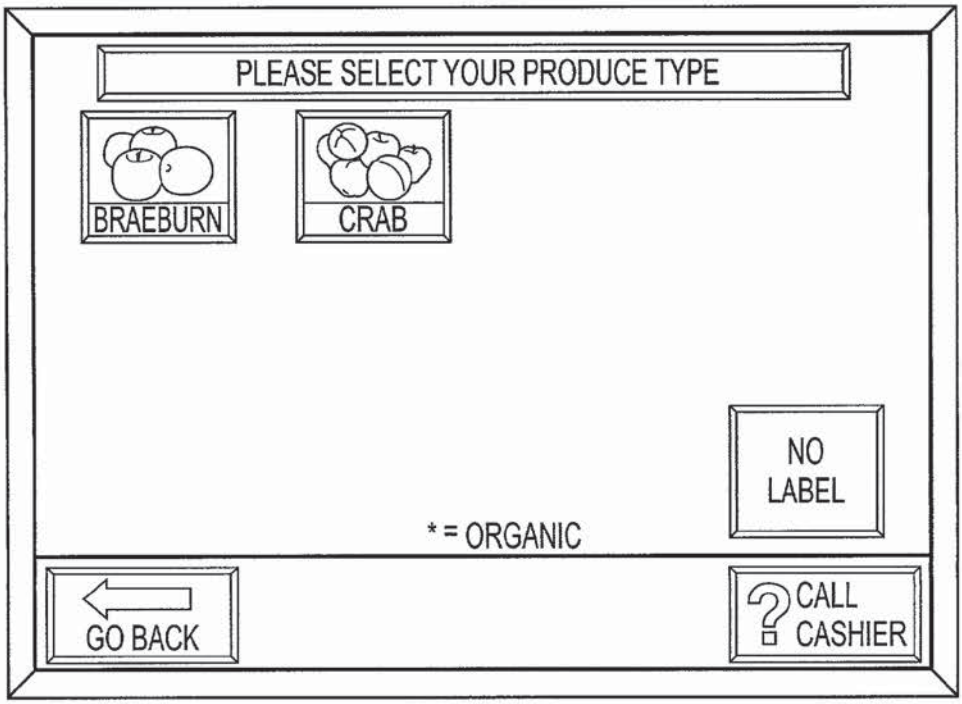

PLEASE SELECT YOUR PRODUCE TYPE
BRAEBURN
CRAB
NO LABEL
* = ORGANIC
GO BACK
CALL CASHIER

FIG. 28

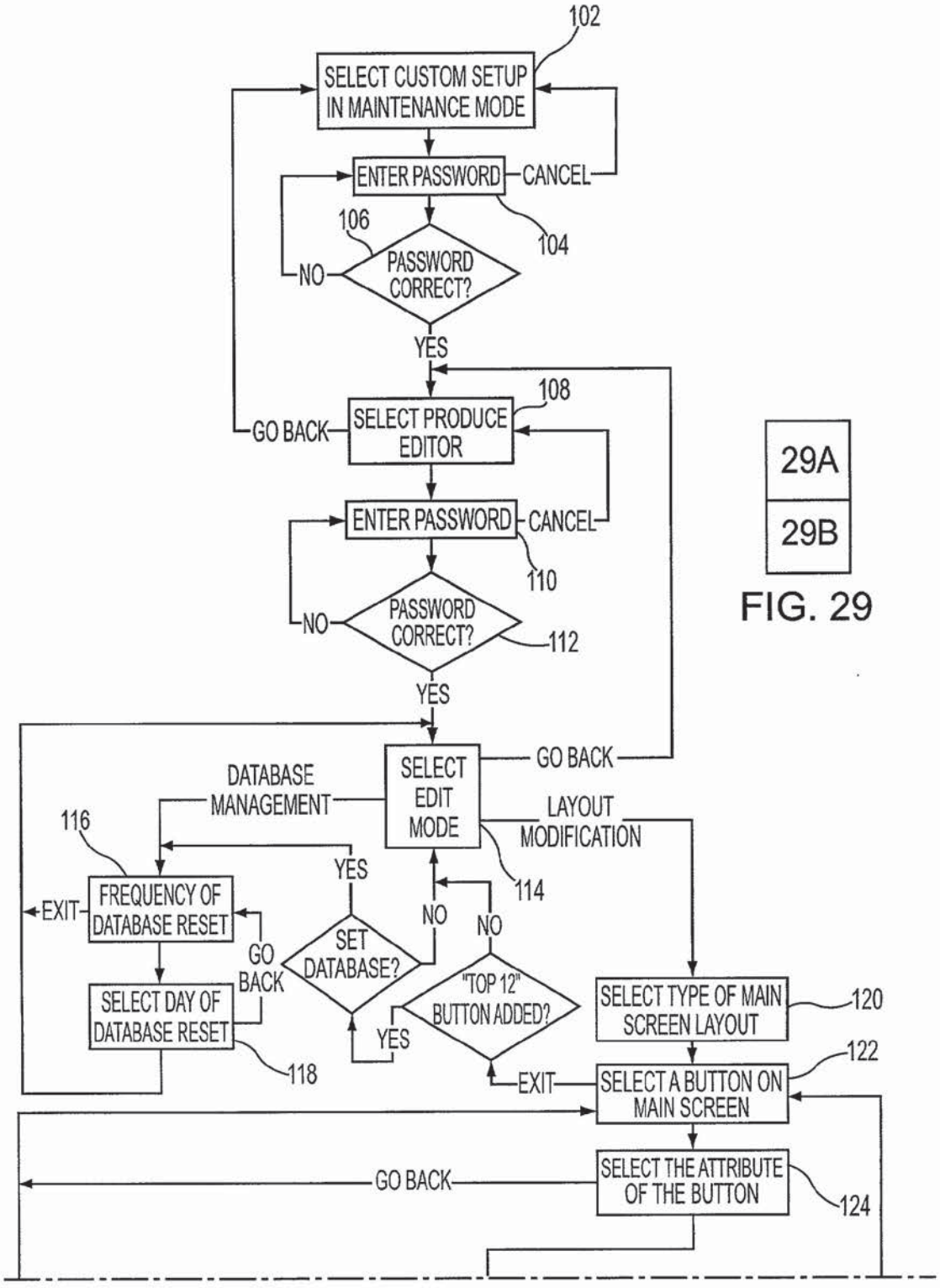



FIG. 29A

29A
29B

FIG. 29

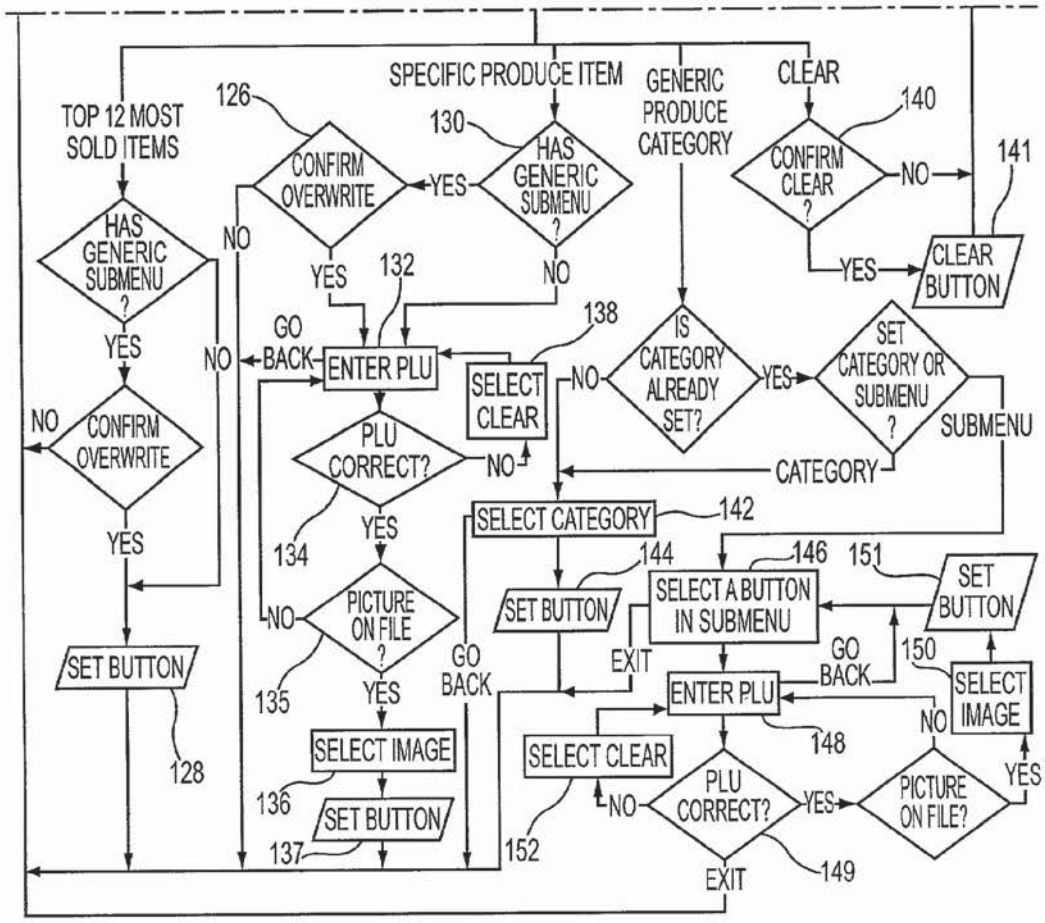

TOP 12 MOST SOLD ITEMS
SPECIFIC PRODUCE ITEM
GENERIC PRODUCE CATEGORY
CLEAR
126
130
140
141
CONFIRM OVERWRITE
HAS GENERIC SUBMENU ?
CONFIRM CLEAR ?
CLEAR BUTTON
YES
NO
132
138
GO BACK
ENTER PLU
SELECT CLEAR
IS CATEGORY ALREADY SET?
SET CATEGORY OR SUBMENU ?
SUBMENU
CATEGORY
PLU CORRECT?
134
SELECT CATEGORY
142
144
146
151
SET BUTTON
SELECT A BUTTON IN SUBMENU
PICTURE ON FILE ?
135
EXIT
150
SELECT IMAGE
136
148
128
137
152
149

FIG. 29B

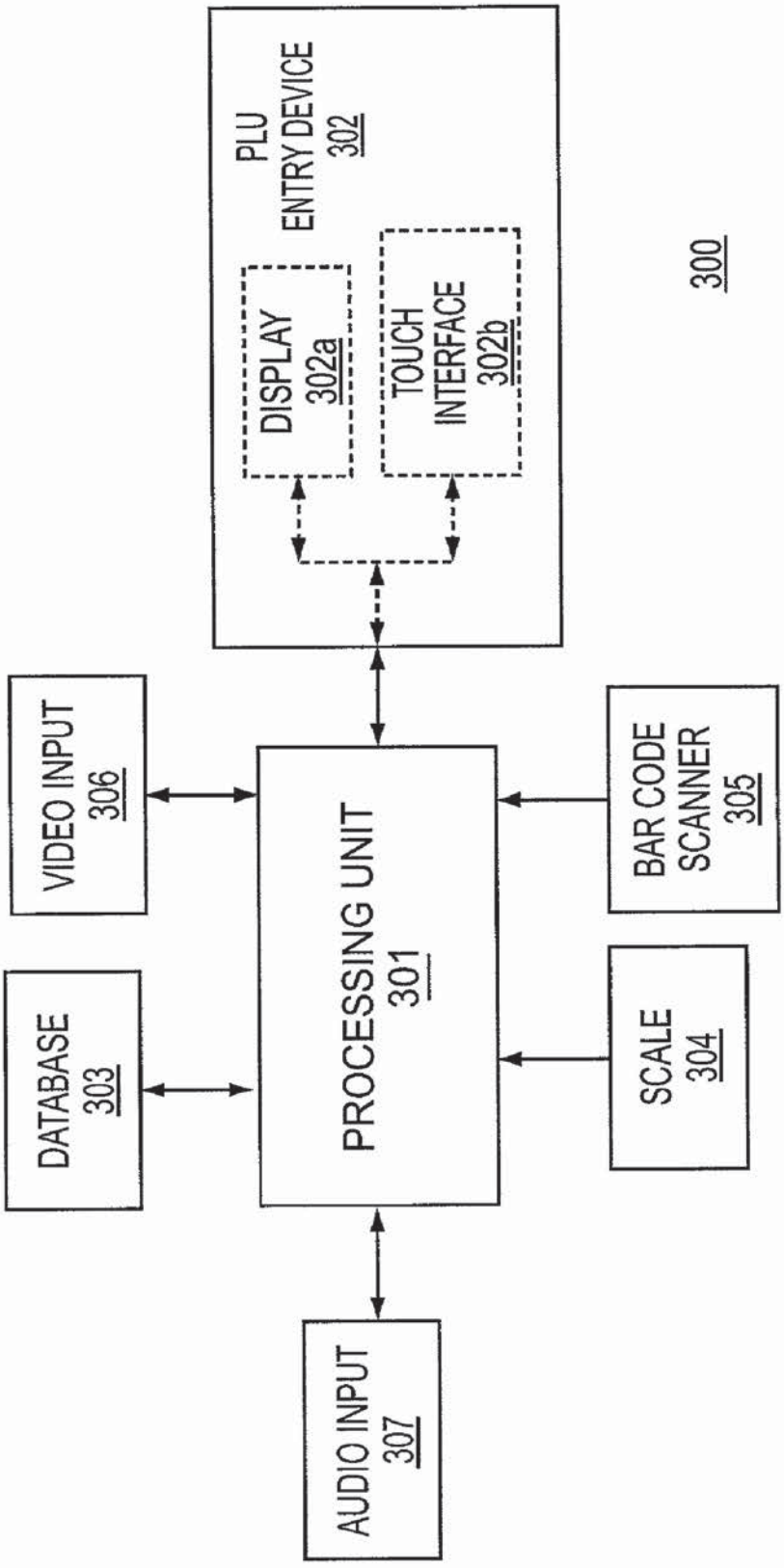

PLU
ENTRY DEVICE
302
DISPLAY
302a
TOUCH
INTERFACE
302b
300
VIDEO INPUT
306
PROCESSING UNIT
301
BAR CODE
SCANNER
305
DATABASE
303
SCALE
304
AUDIO INPUT
307

FIG. 30

3100

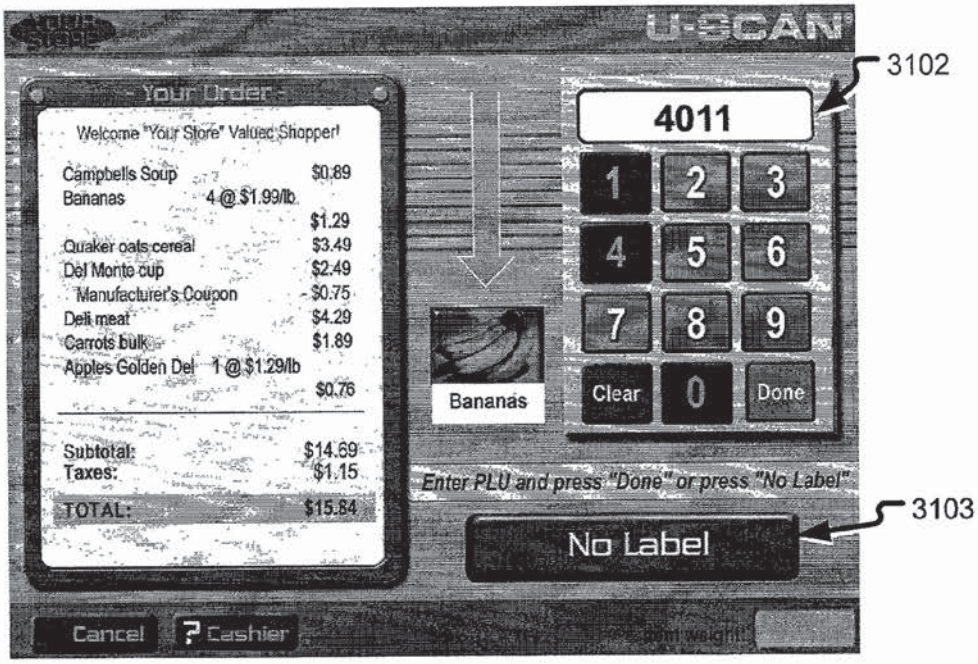



FIG. 31

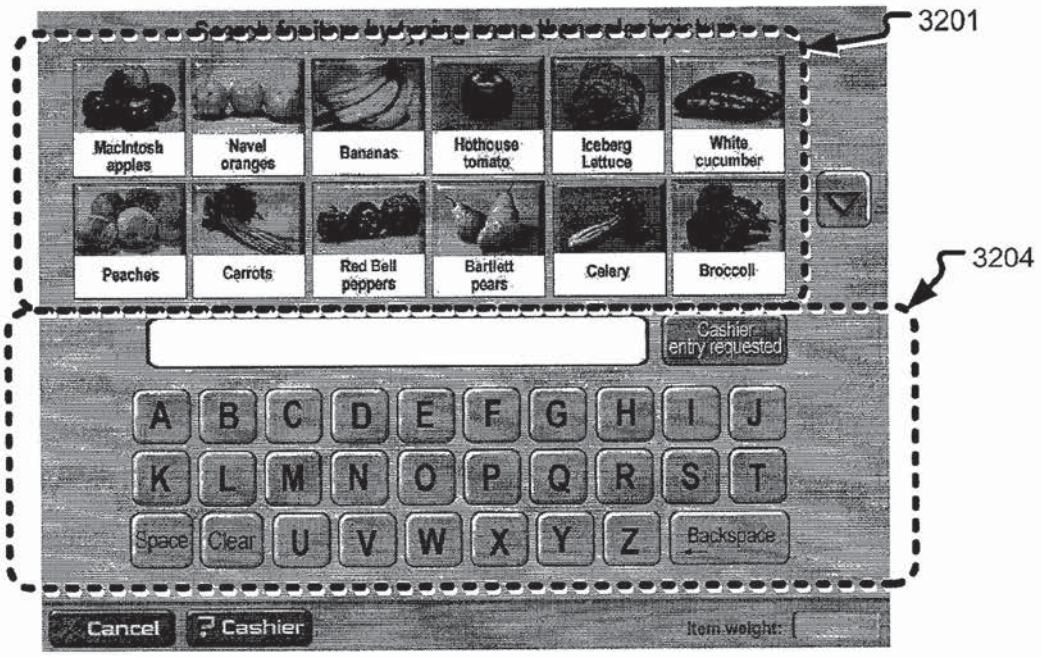



FIG. 32

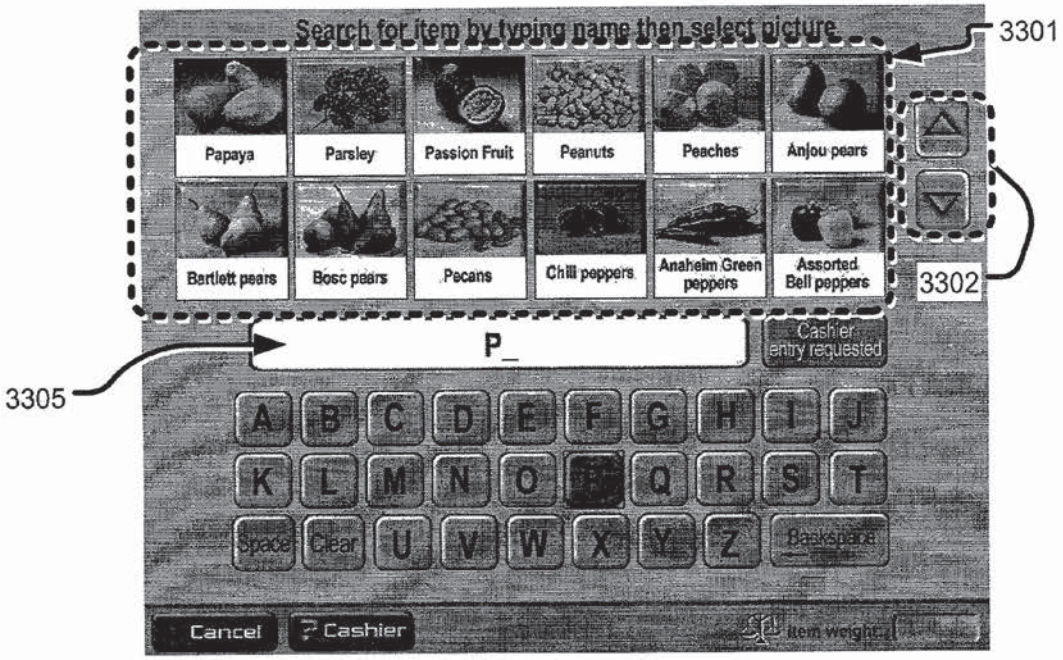

Search for item by typing name then select picture
3301
Papaya
Parsley
Passion Fruit
Peanuts
Peaches
Anjou pears
Bartlett pears
Bosc pears
Pecans
Chili peppers
Anaheim Green peppers
Assorted Bell peppers
3302
P_
Cashier entry requested
3305
A B C D E F G H I J
K L M N O P Q R S T
Space Clear U V W X Y Z Backspace
Cancel
Cashier
item weight

FIG. 33

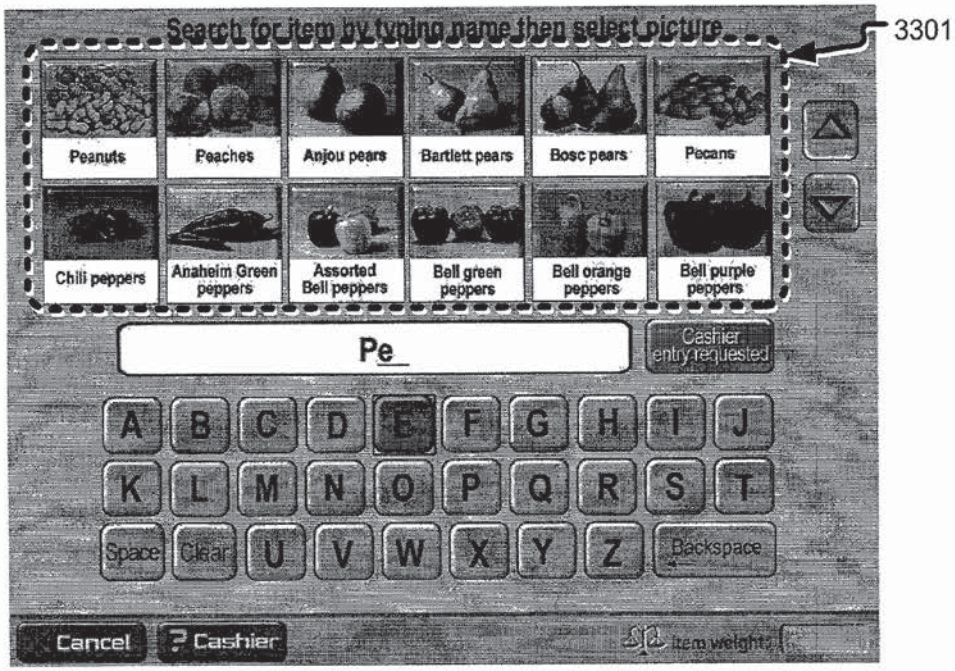

Search for item by typing name then select picture
3301
Peanuts
Peaches
Anjou pears
Bartlett pears
Bosc pears
Pecans
Chili peppers
Anaheim Green peppers
Assorted Bell peppers
Bell green peppers
Bell orange peppers
Bell purple peppers
Pe_
Cashier entry requested
A B C D E F G H I J
K L M N O P Q R S T
Space Clear U V W X Y Z Backspace
Cancel
Cashier
item weight

FIG. 34


U-SCAN
3501
Your Order
Welcome "Your Store" Valued Shopper!
Campbells Soup $0.89
Bananas 4 @ $1.99/lb $1.29
Quaker oats cereal $3.49
Del Monte cup $2.49
Manufacturer's Coupon -$0.75
Deli meat $4.29
Carrots bulk $1.89
Apples Golden Del 1 @ $1.29/lb $0.76
Subtotal: $14.69
Taxes: $1.15
TOTAL: $15.84
1 2 3
4 5 6
7 8 9
Clear 0 Done
Enter the Quantity
Enter more PLUs
Return to scanning
Cancel
Cashier

FIG. 35

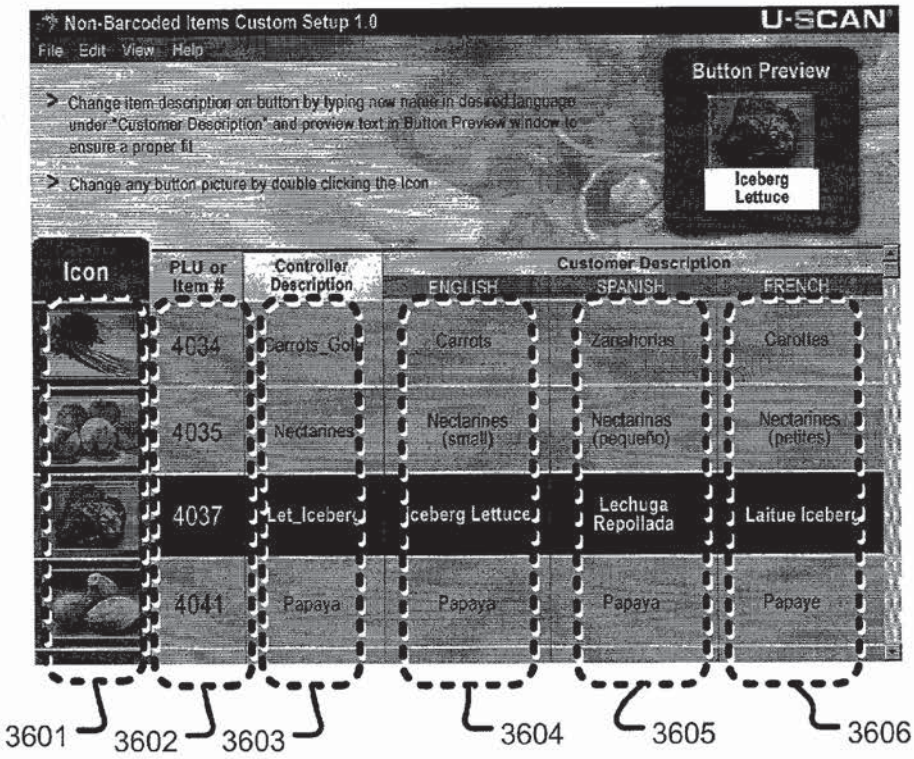

Non-Barcoded Items Custom Setup 1.0
U-SCAN
File Edit View Help
Change item description on button by typing new name in desired language under "Customer Description" and preview text in Button Preview window to ensure a proper fit
Change any button picture by double clicking the Icon
Button Preview
Iceberg Lettuce
Icon
PLU or Item #
Controller Description
Customer Description
ENGLISH
SPANISH
FRENCH
4034
Carrots_Gol
Carrots
Zanahorias
Carottes
4035
Nectarines
Nectarines (small)
Nectarinas (pequeño)
Nectarines (petites)
4037
Let_Iceberg
Iceberg Lettuce
Lechuga Repollada
Laitue Iceberg
4041
Papaya
Papaya
Papaya
Papaye
3601
3602
3603
3604
3605
3606

FIG. 36

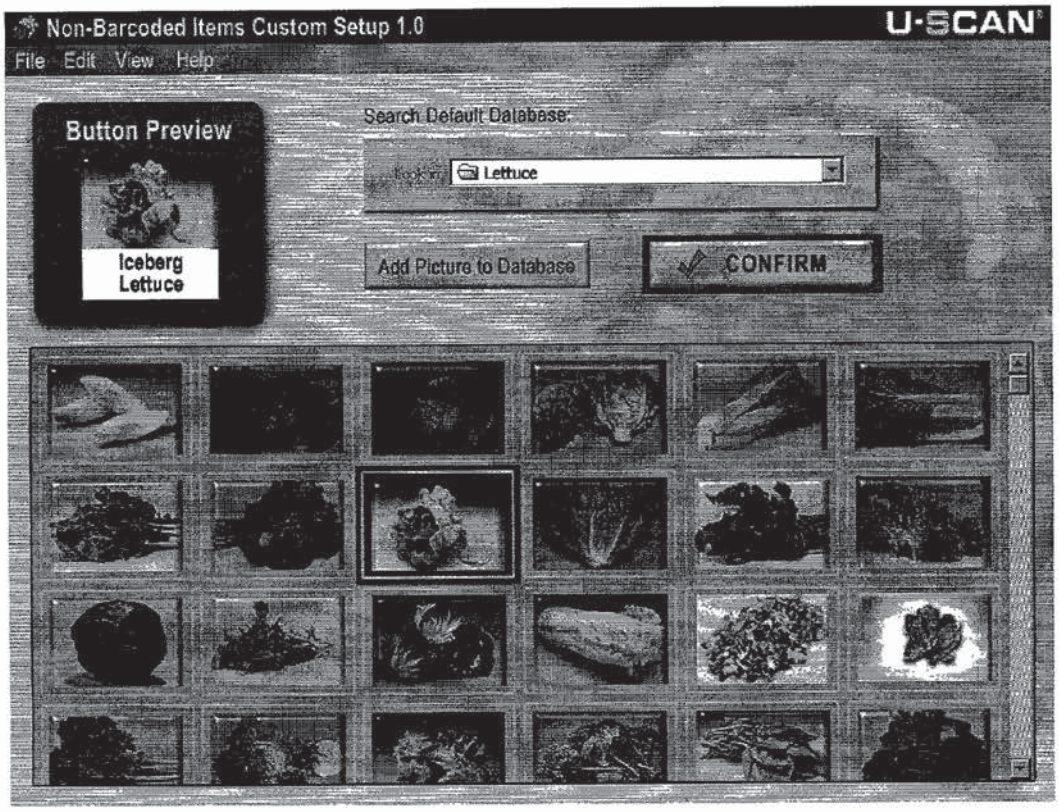

Non-Barcoded Items Custom Setup 1.0
U-SCAN
File Edit View Help
Button Preview
Iceberg Lettuce
Search Default Database:
Lettuce
Add Picture to Database
CONFIRM

FIG. 37

# SELF-CHECKOUT METHOD AND APPARATUS

[0001] This application is a continuation-in-part of application Ser. No. 09/710,137 filed Nov. 10, 2000, entitled "Self-Checkout Method And Apparatus Including Graphic Interface For Non-Bar Coded Items" and claims benefit to provisional application serial No. 60/244,234 filed Oct. 30, 2000.

## FIELD OF THE INVENTION

[0002] The present invention relates to a method and apparatus for self-checkout. In particular, the invention relates to a method of and apparatus for self-checkout of non-bar coded items which includes using a graphic user interface (GUI) on a touch screen display.

## BACKGROUND OF THE INVENTION

[0003] In a traditional retail environment, a customer selects various items for purchase and brings these items to a store clerk for checkout. Over the past few decades, retail point of sale systems have been greatly automated to expedite the checkout process. Computer-based point-of-sale systems are now the norm in the retail environment.

[0004] Such point-of-sale systems include one or more terminals, and a database of prices, inventory and other information related to the items for purchase. Each terminal typically has an optical scanner which scans the items to be purchased for a machine readable bar code that identifies the item on its packaging. When an item is scanned, the optical scanner sends a signal corresponding to the product number of the item to a data processing component of the point-of-sale system, which then obtains from the database the price and the description of the scanned item.

[0005] More recently, self-checkout point-of-sale systems have been popularized. These systems typically comprise self-checkout terminals each of which typically is provided with a bar code scanner with an integrated scale that allows the customer to scan the bar codes on the items to be purchased. The terminal typically also has other input and output devices such as a printer, electronic fund transfer terminal (EFT), a video camera unit and a display.

[0006] Automated self-checkout systems, such as the U-Scan Express® available from Optimal Robotics Corp., have become popular among retailers throughout North America. Some self-checkout systems are described in U.S. Pat. Nos. 5,083,638, 5,115,888, 5,123,494, 5,125,465 and 5,168,961.

[0007] In the typical retail market, most produce items, as well as other items such as items priced according to weight but usually not having a standardized weight, do not have a Universal Product Code (UPC), in the form of a bar code, associated with them. A Product Look Up (PLU) code is assigned instead to such items. The PLU code corresponds to a numeric identification of the item and, in most cases, is attached to the item with a sticker.

[0008] The non-bar coded item typically is checked out by the item being placed on the scale at the checkout station, if the item is priced according to weight, and then the PLU code of the item being entered by the customer at the self-checkout station, or by the cashier at a manned checkout station, using the numeric keypad. The processing unit then assigns a price to the item based on the PLU code and, if applicable, the weight of the item detected by the scale. Many customers at such self-checkout stations do not know, however, that they need to enter manually the PLU code for such items, and therefore such customers experience delay in the checkout process.

[0009] At a self-checkout terminal, the customer is provided means to call for assistance from a supervisory employee when a non-bar coded item is to be processed. In some implementations, a video camera unit at the self-checkout terminal captures a video image of the uncoded item placed on the terminal's scale by the customer. The video image of the uncoded item is displayed at a supervisor station display which allows the supervisory employee to view the non-bar coded item and thereafter enter the appropriate PLU code for the item. This employee typically supervises, however, several self-checkout terminals, and therefore the customer might encounter delay waiting for a non-bar coded item to be processed.

## SUMMARY OF THE INVENTION

[0010] The present invention provides an apparatus and method for self-checkout of non-bar coded items. The apparatus includes a PLU entry device, a PLU database and a processing unit. The PLU entry device includes a display and a GUI. The GUI provides on the display a predetermined image corresponding to a non-bar coded item, and means for the user to select the predetermined image of the non-bar coded item. The PLU entry device supplies a PLU corresponding to the non-bar coded item selected by the user. The processing unit uses the PLU supplied by the PLU entry device to retrieve the price per pound or per unit of the selected non-bar coded item from the PLU database. This data can be used to calculate price in relation to the weight or quantity of the item.

[0011] The apparatus may include a GUI editor. The GUI editor may be used to configure the GUI for non-bar coded items.

[0012] The processing unit may maintain for each item a count of the number of units of the item sold within a predetermined period of time. The processing unit also may maintain a list of most frequently sold items, and the image of at least one item on the list may be provided on a selected display screen. The processing unit may update the display screen when the list of most frequently sold items changes.

[0013] An image of a generic category of items may be provided on the display. The displayed image of the generic category may be selected by the user to view images of respective items in the generic category.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The present invention can be more readily understood from the following detailed description by referring to the accompanying drawings wherein:

[0015] **FIG. 1** shows an exemplary image of a non-bar coded item selection GUI that can appear on a touch screen monitor for selecting a generic category of items;

[0016] **FIG. 2** shows an exemplary GUI screen for selecting one of specific types of apples;

[0017] **FIG. 3** shows an exemplary GUI screen presenting maintenance mode options;

[0018] **FIG. 4** shows an exemplary GUI screen for entering a password;

[0019] **FIG. 5** shows an exemplary GUI screen for entering an alternate password;

[0020] **FIG. 6** shows an exemplary GUI screen presenting custom setup options;

[0021] **FIG. 7** shows an exemplary GUI editor screen presenting edit options;

[0022] **FIG. 8** shows an exemplary GUI editor screen for selecting a reset frequency for the database of most frequently sold items;

[0023] **FIG. 9** shows an exemplary GUI editor screen for selecting a day of the week upon which the database is to be reset;

[0024] **FIG. 10** shows an exemplary GUI editor screen for selecting visual layout of the GUI for non-bar coded items;

[0025] **FIG. 11** shows an exemplary GUI editor screen for selecting a button to which an item or generic category may be assigned;

[0026] **FIG. 12** shows an exemplary GUI editor screen for selecting a type of an item to be assigned to the selected button;

[0027] **FIG. 13** shows an exemplary GUI editor screen for selecting a third button to be defined;

[0028] **FIG. 14** shows an exemplary GUI editor screen for selecting a specific item to assign to a button;

[0029] **FIG. 15** shows an exemplary GUI editor screen indicating selection of an organic fruit/vegetable;

[0030] **FIG. 16** shows an exemplary GUI editor screen informing that an incorrect PLU code was entered;

[0031] **FIG. 17** shows an exemplary GUI editor screen for selecting a fourth button to be defined;

[0032] **FIG. 18** shows an exemplary GUI editor screen for selecting a generic category to be assigned to a selected button;

[0033] **FIG. 19** shows an exemplary GUI editor screen for selecting a generic category;

[0034] **FIG. 20** shows an exemplary GUI editor screen for selecting a fifth button to be defined;

[0035] **FIG. 21** shows an exemplary GUI editor screen for selecting a button to be assigned in the submenu;

[0036] **FIG. 22** shows an exemplary GUI editor screen for selecting an item to assign to the selected button in the submenu;

[0037] **FIG. 23** shows an exemplary GUI editor screen for selecting an item to assign to a second button in the submenu;

[0038] **FIG. 24** shows an exemplary GUI editor screen for selecting a third button to be assigned in the submenu;

[0039] **FIG. 25** shows an exemplary GUI editor screen for presenting a warning if a selected button has been assigned to a generic category with a pre-defined submenu;

[0040] **FIG. 26** shows an exemplary GUI editor screen for confirming removal of a selected button;

[0041] **FIG. 27** shows an exemplary screen in the GUI for non-bar coded items;

[0042] **FIG. 28** shows an exemplary screen in the GUI for non-bar coded items when a generic category button is selected;

[0043] **FIGS. 29A and 29B** show a flow chart for a process, in accordance with an embodiment of the present invention, of setting up a non-bar coded items GUI.

[0044] **FIG. 30** shows a block diagram of a self-checkout system.

[0045] FIGS. **31-35** show exemplary screens of the GUI for non-bar coded items with alphanumeric lookup.

[0046] **FIG. 36** shows data stored in exemplary database records.

## DETAILED DESCRIPTION OF THE INVENTION

[0047] Improvements in the operation and usability of point-of-sale self-checkout systems can be provided by a self-checkout system that includes a scanning device for automated scanning of bar-coded items as well as a customer-operated interface for checkout of items that are not coded for scanning. The customer-operated interface can be a graphical user interface (GUI) (a "non-scannable item GUI") that may include features such as a touch-screen display and input device, iconic representations of items for purchase, and search facilities to help identify items being purchased and to enter appropriate checkout data. An editor for provisioning data and setting up various features of the non-scannable item interface can also be provided. The checkout system, and in particular, the non-scannable item GUI, can be used for checkout of items such as produce and bakery items in a grocery sales environment and for non-scannable items in other retail environments. To do so, a flexible method of provisioning data and icon images associated with the non-scannable items is provided.

[0048] **FIG. 30** shows a block diagram of an implementation of a point-of-sale self-checkout station that includes a non-scannable item GUI. The self-checkout station **300** includes a processing unit **301** which may be configured similar to known microprocessor-based computers and has a central processing unit (CPU), a plurality of storage devices, an input/output (I/O) interface and a network interface. The storage devices may include program memory, random access memory (RAM), non-volatile memory, read-only memory (ROM), electrically erasable programmable ROM (EEPROM), etc., and any or a combination of the mass storage devices known conventionally in the art, such as floppy disk, optical disk, hard disk and/or tape cartridge drives, plus appropriate device drivers. The CPU communicates via the I/O interface with a PLU database **303**, one or more scales **304**, a touch-screen display **302** (or other entry device, such as a touchpad), and a bar code scanner. Items may include other types of machine-detectible identification encodings instead of, or in addition to, scannable

bar codes (e.g., magnetic encodings, magnetic transducers, and other machine-readable printed codes). Consequently, implementations may be equipped with other types of reader devices to detect encoded product identifications (IDs), e.g., magnetic sensors to read magnetic encodings, and other types of scanning sensors for other printed code types.

**[0049]** The self-checkout station (i.e., processing unit **301**) also can include a network interface used for communication over a network (e.g., a local area network, wide area network (WAN), wireless and other networks) with other devices. These other devices may include a host computer, such as a store's central controller, and may also include other checkout stations and supervisory stations. The network interface includes the appropriate units for interfacing with the network, including, for example, Ethernet card, modem, radio frequency (RF) transceiver, etc. For example, processing unit **301** may download product and other information from a central point-of-sale database on the network, on power-up as well as periodically during operation, via the network interface. Thus, the PLU database **303** stored in the storage devices may be updated.

**[0050]** Self-checkout orders commonly include a combination of scannable (i.e., bar-coded) and non-scannable items. To purchase a scannable item, the customer moves the item past an automated scanning device which reads the scannable product identifier and thereby determines the item's identification. If the customer wants to purchase a non-scannable item, the customer may do so by entering of a product identifier using the non-scannable item interface. This product identifier can be received through the entry of an alpha-numeric identifier, an icon selection, or by a combination of these methods (the chosen mechanisms may differ in different implementations). In some implementations, speech and visual inputs may be processed by the self-checkout system to assist in identifying a produce.

**[0051]** FIGS. **1-2** and **31-35** show customer interface screens displayed in two example implementations (implementation #1 and #2) of non-scannable item GUIs. Each of the example implementations uses an interactive touch-screen display **302** combining a touch-sensor screen **302***b* and a cathode ray tube (CRT), liquid crystal display (LCD), or other graphical display element **302***a* for customer interaction. Implementation #1 (FIGS. **1-2**) includes a on-screen numeric keypad **192** for the entry of product lookup (PLU) codes, and displays interactive icons **191** that can be used to select an item from system-determined initial grouping of products. The system-determined grouping is a grouping that is determined separate from an explicit search request by a customer for a desired item. Examples of system-determined groupings include predetermined grouping and predictively determined grouping (e.g., a grouping of frequently-purchased non-scannable items). Implementation #2 (FIGS. **31-35**) also includes a on-screen numeric keypad **3102**, as well as a system-determined initial group of interactive icons **3201**. Implementation #2 also includes a alphabetic keyboard interface **3204** used to enter search terms so that the customer can locate and select products in addition to those shown in the initial group **3201**. The self-checkout system's non-scannable item GUI is accessed when the customer wishes to purchase a non-bar-coded item. Access to the interface may be triggered when the customer places an unscanned item on a scanner scale, or by explicit selection of a on-screen control from the display **302** (e.g., a button labeled "Purchase Item Without A Bar Code).

**[0052]** When the non-scannable item GUI is activated, a PLU entry screen **100**, **3100** may be displayed. As shown in screen 100 of implementation #1, the customer can identify an item by PLU code entry using a graphical touch-screen keypad **192**. If the item is displayed in the grouping **191**, the customer can also select the appropriate item to enter the purchase. In some implementations, icons **191** display images representing a generic category and selection of the generic category's icon will provide a more detailed sub-menu. If the item is not labeled with a PLU code, and an appropriate icon **191** is not displayed, the user may select the "No Label" button **103** to obtain assistance from store personnel. Interface screen **3100** of implementation #2 also permits entry of a PLU code using a graphical touch-screen interface. If the item is not labeled with a PLU code, the user can select the "No Label" button **3103** to access a second interface screen **3200** (**FIG. 32**). Interface screen **3200** initially displays the system-determined icon grouping **3201** as well as an on-screen keyboard **3202**. Icons initially displayed in **3201** can be best seller or most frequently sold items, and this information can be displayed as soon as the screen is displayed. If the purchase item is shown by an icon **3201**, the user may select that icon to purchase the item, otherwise keyboard **3204** may be used to enter terms used to search a product database **303** and locate the desired item.

**[0053]** To locate a desired item, keyboard **3204** is used to provide alphabetic character input (or, in some implementations, expanded input sets such as alpha-numeric) to the checkout system. The checkout system receives the input characters, parses the input into search terms, queries a product database, and display results as user-selectable icons. Referring to **FIG. 33**, as letters are entered on the keyboard **3204**, they are displayed in a display area **3305** and matching products are determined based on the entered characters and displayed as icons **3301** displayed on the interface **3300**. As additional letters are entered, the display area **3301** is again updated to reflect the additional input (compare the icons of **FIG. 33** which are displayed after the entry of the letter "P" with the icons of **FIG. 34** which are displayed after the further entry of the letter "E").

**[0054]** To identify the matching products, the checkout system parses input characters to form search terms and uses those terms to query the database **303** and thereby locate matching items. The search terms included in the query can include words (i.e., a group of contiguous letters delimited by a space character) as well as a word fragment (i.e., a group of contiguous letters not yet delimited by a space character). Querying database **303** includes comparing each of the search terms to keywords associated with each product. The item-keyword database may be stored in a local database **303** or a central database (e.g., a store controller database). **FIG. 36** shows example item-keyword records for a number of products. As shown in **FIG. 36**, for each product, the database stores an icon **3601**, a PLU number **3602**, a descriptors **3603** that may be used by other store systems (e.g., by a store's master controller), and keywords in one or more languages (e.g., English **3604**, Spanish **3605**, and French **3606**).

**[0055]** Preferably, the product query algorithm will match search terms to an item's keywords regardless of the relative

ordering of the search terms and keywords. Further, a search term will match a keyword if the term is present as an initial substring of the keyword. Thus, the term "Pear Bos" will match "Bosc Pears." Additionally, implementations may provide for automatic conversion between plural and singular terms such that a term entered by the user in the plural (e.g., "pears") will match a keyword expressed in the singular (e.g., "pear"). Conversion between singular and plural tenses may be done, e.g., by using a lookup table. In some implementations, a lookup table may also be used to convert a term entered by a user into an alternative term or to expand an entered term into multiple terms. This conversion and expansion feature may be used, for example, to convert a regional product name to a standard term, or where a product may be known by multiple terms (e.g., in a hardware store implementation, the search term "fastener" may be expanded to the Boolean search expression "bolt or screw or rivet"). Where term substitution and/or expansion is employed, the display of results may be in accordance with an ordering that favors results matching the specific terms entered, rather than the expanded or substitute terms.

**[0056]** In some implementations, the icon display **3301** is automatically updated as each letter is entered. In other implementations, the icon display may be updated when there is a pause in data entry (e.g., after a 500 millisecond pause), or upon explicit request by the user (e.g., selecting an "Enter" button). Implementations can also include scroll buttons (e.g., buttons **3302**) used to scroll the displayed icons when the number of items exceeds the available screen space. After the desired item icon is displayed and selected, another screen (**FIG. 35**) may be displayed for the entry of quantity information using keypad **3501**.

**[0057]** In the example implementations (#1 and #2), the system-determined icons (**191** and **3201**, respectively) are displayed when the non-scannable item GUI is accessed. These initial icons sets **191, 3201** may be selected based on an expectation or probability that a particular items is to be purchased. This expectation can be determined based on the frequency of purchase of particular items during a preceding period (e.g., during the past month) in all customer orders. In other implementations, the initial icons **191, 3201** may be customer specific and can be determined based on a customer's specific sales history. The initial icon set can also be determined based on other statistical/probabilistic factors. For example, the icons **191, 3201** may be determined based on a statistical correlation that a particular item will be purchased when another item has already been entered as part of an order. For example, in a hardware store implementation, if copper piping has already been entered in an order, the icons **191, 3201** may correspond to non-bar-coded joints and fasteners used to connect copper piping.

**[0058]** In some implementations, the system-determined icons **191, 3201** can be determined on a user-specific basis. To enable this feature, the database **303** includes customer purchase history information. Following receipt of a customer identification by the self-checkout system (e.g., by the swiping of a bar-coded frequent-shopper card in front of a scanner, swiping of a credit or debit card entry, or using data entered directly by the customer), the database **303** is queried to determine the user's purchase history. The icons **191, 3201** are then determined based on the user's purchase history or other user-specific information. Correspondingly, at the end of order processing, customer purchase data may be stored in the database **303** reflecting the newly purchased items. In other implementations, the sales history database may be implemented by data stored on the frequent-shopper card (e.g., using a magnetic strip or in "smart card" memory).

**[0059]** Implementations can include further refinements, such as the ability to determine the frequently sold items on a seasonal basis. In such implementations, the database **303** can store customer purchase information along with purchase dates so that seasonal buying patterns can be determined. Thus, for example, during the week before Halloween, icons for purchase of pumpkins may be displayed based on a customers' purchases of pumpkins during that week of the previous year. This information may be stored without differentiating based on the particular customers, or may be stored on a customer-specific basis.

**[0060]** The icon grouping **191, 3201** may change continuously as a result of ongoing sales at the self-checkout terminals. For example, in a frequently-sold item implementation, the system automatically updates the images on the touch screen monitor for those buttons pre-defined as buttons for most frequently sold items. The updating of the buttons may be dynamic and may occur in between the processing of two orders at the self-checkout terminal, or may be at greater intervals (e.g., monthly or quarterly). The processing unit of each self-checkout terminal, or a central database, may maintain an item count of every produce (or non-bar coded item) sold. Checkout terminals may communicate to find the highest count of produce (or non-bar coded) items in their database.

**[0061]** As an example, the following may be a snapshot (in time) of information stored in the databases corresponding to counts of produce (or non-bar coded) items sold at four respective self-checkout terminals in a grocery store:

| Terminal 1 Database | Terminal 2 Database | Terminal 193 Database | Terminal 4 Database |
|---|---|---|---|
| carrots = 156 | lemons = 200 | bananas = 750 | cucumbers = 6 |
| peaches = 48 | tomatoes = 156 | carrots = 155 | bananas = 46 |

**[0062]** After the terminals have communicated amongst themselves, (or the purchase information has been aggregated in a central data system) the following results may be displayed on the touch screen monitor of each of the self-checkout terminals:

| | |
|---|---|
| Top 1 = bananas | Top 4 = tomatoes |
| Top 2 = carrots | Top 5 = peaches |
| Top 3 = lemons | Top 6 = cucumbers |

**[0063]** Each database record may also contain other information such as an expected weight range, density range, and size information. This additional data may be employed in enhanced versions of a self-checkout system. Two such enhancements include the use of image processing and voice recognition.

**[0064]** In an implementation that includes image processing, the system-selected items **191, 3201** may be selected

based on analysis of an image of an item as captured by a video camera **306**. This image data may include the color, shape, size, texture, and number of items. For example, the camera **306** may capture an image of one or more pieces of fruit placed on the scale **304**, process the image to determine candidate items, and display those items on the non-scannable item interface. Technology for the recognition of visual images is known (see, for example, U.S. Pat. Nos. 5,546,475; 5,631,976; 5,649,070; 6,005,959; and 6,310,964 specifically addressing the recognition of images of produce). By applying such recognition system technology to the selection of a group of candidate items, rather than merely for the final determination of the product, the system **300** may provide for additional accuracy by including confirmation by the customer of the image processing results.

**[0065]** In some implementations of the system **300**, criteria such as weight (as determined by the scale **304**) and size or shape (as determined by image processing) can be used together. For example, size, shape, and weight can be used to calculate item density. This size, shape, weight, texture, color, and/or density information can be compared to data stored in the database **303** to further refine the selection of icons **191**, **3201**. For example, image processing may be used to determine that an item placed on the scale **304** is a spherical item. Therefore, the system will only select items from database **303** where the database **303** indicates that the items are spherical. In some cases, weight may be used to further distinguish item. For example, a melon and a head of iceberg lettuce may each have similar spherical shapes and sizes. However, at a given size, the weight of these two items, and therefore their density, will occupy different ranges and this data can be used as distinguishing criteria. Once the CPU has made the item analysis, it will display a suggestion of photo quality images of the non-bar coded items on the self-checkout terminal's touch screen monitor **191**, **3201**. Of course, if the image analysis does not yield a appropriate result, the customer may identify the item using the keyboard **3204** search method or PLU entry methods described of the system **300**.

**[0066]** In some implementations, the image processing features may be used for security purposes instead of, or in addition to, the use of image processing for item selection. For example, the system may capture an image of a produce item, process that image to make an initial assessment of the item, and compare it to an item selection entered by the consumer using the non-scannable item interface. If the item selected by the consumer matches the recognition system's identification of the item, the purchase is made. If there is a mismatch, an alert may be sent to a monitoring station displaying the image captured by the system as well as the identification entered by the consumer. The attendant at the monitoring station may then approve the transaction (e.g., where the consumer entered the proper identification but the recognition system assessment was inaccurate), or override the consumer's item identification by accepting the recognition system's assessment or by entering a correct item identification.

**[0067]** In some implementations, the system may be equipped with a voice recognition system that can operate to identify non-scannable items. When a non-scannable item needs to be identified, the user may have an option of speaking into a microphone **307** to identify the item. The system can be programmed to recognize both specific and generic descriptions of each item (e.g., "Apple" or "Granny Smith"). If a generic identifier is specified, then the system may display icons corresponding to the specific choices within the generic category. Preferably, speaker-independent voice recognition software will be used to implement voice recognition capabilities. Further, the system may be programmed to identify multiple languages.

**[0068]** An editor for setting up the non-bar coded items GUI, in accordance with one embodiment of the present invention, will be described below in connection with FIGS. **3-26** and **29**.

**[0069]** A GUI editor may be provided as a tool for an administrator of the self-checkout system to set up the GUI for non-bar coded items. The term "administrator" is used herein to mean a person who has access privileges for configuring the GUI for non-bar coded items. Such person need not be a computer specialist or expert, particularly when the person has the benefit of a GUI editor such as the one described below.

**[0070]** Using the GUI editor, the administrator may select, and configure the terminals to show, the appropriate GUI screens, such as those illustrated in **FIGS. 1 and 2**, for non-bar coded items.

**[0071]** Configuration of the GUI for non-bar coded items may be performed at, for example, one of the self-checkout terminals in a maintenance mode. The maintenance mode screens at the self-checkout terminal allow the administrator to use a GUI editor for setting up the screens for processing non-bar coded items. After configuration of the GUI for non-bar coded items has been completed at the selected terminal, the GUI data may be broadcast to the remaining self-checkout terminals in the store on a LAN or wireless network, in order for the GUI for non-bar coded items to be installed on those terminals.

**[0072]** The selected checkout terminal on which the GUI for non-bar coded items will be configured enters a maintenance mode from one of a number of possible paths. For example, the terminal may enter the maintenance mode by default upon boot-up or by command from a shell or user interface.

**[0073]** An example of a GUI screen which may be displayed when the terminal enters the maintenance mode is illustrated in **FIG. 3**. The maintenance mode screen provides assorted user interface features for performing maintenance at the terminal, including testing the various components of the terminal, such as the bill dispenser and the speaker. Moreover, the administrator is provided with means, e.g., a graphic button/key, to enter custom setup of the terminal (step **102** shown in **FIG. 29**) Custom setup is password protected, i.e., the user is required to enter a password to enter custom setup. An example of a GUI screen for entering custom setup is illustrated in **FIG. 4**. The user may enter the password and select a "DONE" button on the touch screen monitor (step **104**). If the password is incorrect (step **106**), a message asking the user to try again may appear on the screen, as shown for example in **FIG. 5**.

**[0074]** When the password is correct, the administrator is provided with a number of custom setup functions by the GUI. The user interface provides means on the touch screen monitor, e.g., button identified as "Produce Editor" in **FIG. 6**, for the user to select access to the GUI editor for non-bar

coded items (step **108**). An additional password also may be required for access to the GUI editor. The GUI again may prompt the user for a password as shown for example in **FIG. 4** (step **110**).

**[0075]** After a correct password is supplied (step **112**), the GUI editor provides the administrator with two edit options (step **114**), as shown for example in **FIG. 7**. The administrator may select the first option (shown in **FIG. 7** as "Best-Seller Database Management") to configure a database of specific features, such as the best seller items, described further below. The administrator may select the second option (shown in **FIG. 7** as "Layout Modification") to configure a layout of the GUI for non-bar coded items.

**[0076]** When the administrator selects the first option, the GUI editor prompts the administrator to select a frequency for resetting the database of the most frequently sold items (step **116**), as shown for example in **FIG. 8**. The frequencies that may be selected include, for example, daily, weekly, bi-weekly, monthly, etc. After the administrator selects the update frequency, the GUI editor prompts the administrator to select a day of the week on which the database is to be reset (step **118**), as shown for example in **FIG. 9**.

**[0077]** After the administrator completes configuration of the best-seller database, the GUI editor provides the administrator with the edit options again (**FIG. 7**). The administrator then may select the "Layout Modification" option. A number of possible visual layouts of the GUI for non-bar coded items are displayed by the GUI editor for selection (step **120**), as shown for example in **FIG. 10**.

**[0078]** After one of the layouts is selected, the GUI editor prompts the administrator to select one of the buttons to be defined in the GUI for non-bar coded items (step **122**), as shown for example in **FIG. 11**. Next, the GUI editor prompts the administrator to assign the selected button to an item or generic category (step **124**). As shown for example in **FIG. 12**, the button may be assigned to one of the following item/category types: (i) a best seller; (ii) a specific produce item, e.g. kiwi; or (iii) a generic produce category, e.g., a family of fruits or vegetables.

**[0079]** For example, if "A Top 12 Best-seller Item" is selected (step **126**), the selected button is assigned dynamically to the item that is currently highest in the list of most frequently sold produce items at the self-checkout terminals (step **128**). After the button is assigned to the best seller item, the GUI editor prompts the administrator to select one of the remaining buttons, and the process is repeated for that second selected button.

**[0080]** **FIG. 13** shows a GUI editor screen prompting the administrator to select another one of the buttons after the second button is assigned to, for example, the next best seller. After the third button is selected, the GUI editor prompts the administrator to assign the selected button to a produce item or generic category, as shown for example in **FIG. 12**.

**[0081]** For example, if "A Specific Produce Item" is selected (step **130**), the administrator is prompted to enter a PLU code of the item to be assigned to the selected button (step **132**). The image corresponding to the entered PLU code appears in a portion of the GUI editor screen, as shown for example by the image of the banana in **FIG. 14**.

**[0082]** As shown for example in **FIG. 15**, an organic fruit or vegetables can be selected by specifying its corresponding PLU code.

**[0083]** The administrator may confirm that the image that appears in the GUI editor screen should be assigned to the button by pressing the displayed image (steps **134**, **136** and **137**). On the other hand, if the wrong code was entered (step **134**), the administrator may select "CLEAR" to enter the PLU code again (step **138**). If the PLU code entered by the administrator is not valid (step **135**), the GUI editor displays a message that the image is not on file, as shown for example in **FIG. 16**, and disables the "OK" button. Under this circumstance, the GUI editor waits for the "CLEAR" key to be selected and a valid PLU code to be entered.

**[0084]** Next, a fourth button to be defined may be selected from the main screen, as shown for example in **FIG. 17**. After a fourth button is selected, the screen for selecting an item or generic category, as shown for example in **FIG. 12**, again is presented by the GUI editor.

**[0085]** For example, "A Generic Produce Category" button may be selected (step **140**). The generic category options include, as shown for example in **FIG. 18**, assigning a generic category to the selected button, or creating a submenu of other buttons to be linked to the category button. If the administrator chooses to assign the button to a generic category (step **141**), the GUI editor prompts the administrator to select one of a number of generic categories (e.g., Apples) displayed on the screen (step **142**), as shown for example in **FIG. 19**. When the administrator selects one of the generic categories, the selected button is set to the selected category (step **144**).

**[0086]** Next, the GUI editor prompts the administrator to select a fifth button to be defined, as shown for example in **FIG. 20**. After a fifth button is selected, the GUI editor prompts the administrator to select an item or generic category to the selected button, as shown for example in **FIG. 12**. For example, this button, like the previous, may be assigned to a generic category. Then, the GUI editor prompts the administrator to either (1) assign a generic category to the button or (ii) create a submenu of other buttons to be linked to the button, as shown for example in **FIG. 18**.

**[0087]** The option to create a submenu for this button may be selected, and then specific items may be assigned to buttons in the submenu. If the option to create a submenu is selected (step **141**), the GUI editor prompts the administrator to select a button in the submenu (step **146**), as shown for example in **FIG. 21**. Next, the GUI editor prompts the administrator to enter a PLU code of the item to be assigned to the selected button (step **148**). When the PLU code is entered, the image corresponding to the entered PLU code appears in a portion of the GUI editor screen, as shown for example in **FIG. 22**. The administrator may confirm that the image that appears in the GUI editor screen should be assigned to the button in the submenu, by pressing the displayed image (step **150**). The selected button in the submenu then is set to the selected item corresponding to the entered PLU code (step **151**). If a mistake is made (step **149**), the "CLEAR" button may be selected (step **152**) and a correct PLU code entered (step **148**).

**[0088]** This process may be repeated, as shown for example in **FIGS. 23 and 24**, until all buttons in the

submenu have been assigned to items. The "EXIT" button may be selected when the process is complete. Let's now return to the GUI editor screen shown in **FIG. 20**. One of the already assigned buttons may be selected. After one of the assigned buttons (e.g., button assigned to the "Apples" category) is selected, the GUI editor screen shown in **FIG. 12** is presented. If the administrator attempts to assign the button to another item or category, a warning screen, as shown for example in **FIG. 25**, appears. If the already assigned button corresponds to a generic category with a pre-defined submenu, all the information stored concerning the submenu could be lost if the "YES" button is selected.

**[0089]** Let's return again to the GUI editor screen shown in **FIG. 20**. After one of the assigned buttons is selected, the GUI editor screen shown in **FIG. 12** again is presented. The administrator may choose to "Remove this Button" to delete the selected button. If the administrator chooses to "Remove this Button" a confirmation screen appears, as shown for example in **FIG. 26**. The "YES" button may be selected to confirm the deletion. The "Go Back" button may be selected to return to the edit options screen (i.e., **FIG. 7**), and then the "Go Back" button may be selected again to exit the GUI editor and return to the custom setup screen (i.e., **FIG. 6**), and a third time to return to the maintenance mode screen (i.e., **FIG. 3**).

**[0090]** **FIG. 27** illustrates how the GUI for non-bar coded items created by the editor process described above might look on the touch screen of a self-checkout terminal. After a customer selects the apples generic category button, the GUI screen shown in **FIG. 28** is displayed.

**[0091]** In some implementations, the system database may be customized on a per-store basis so that only items sold by the particular store are displayed to the consumer. **FIG. 37** shows an interface allowing a store manager to customize the items that may be selected by the user. In the example of **FIG. 37**, the store manager has selected the default "lettuce" type database and may select particular varieties of lettuce in the system's database. If the standard database does not contain a particular product sold by a store, a new icon can be created by the system administrator (e.g., by importing a bitmap file or by capturing an image using the camera **306**).

**[0092]** Various changes and modifications of the described embodiments could be effected by one skilled in the art without departing from the spirit or scope of the invention recited in the appended claims. For example, database **303** may be a local database dedicated to a particular checkout terminal or a remote database shared by terminals and other store systems, and may be a hard-disk or in-memory database or data structure, and although use for the checkout of supermarket produce items is described, the self-checkout system may be adapted for other retail environments such as the checkout of non-bar-coded hardware items in a hardware store. Improvements and modifications which become apparent to persons of ordinary skill in the art after reading this disclosure, the drawings and the appended claims are deemed within the spirit and scope of the present invention. It is therefore contemplated that the appended claims would cover any such modifications or improvements.

What is claimed is:

**1**. A product purchasing method comprising:

at a point-of-sale self-checkout terminal comprising a code reader device for automated entry of a product identification code present on items for purchase and a customer input device for receipt of data from a customer,

receiving from a self-checkout customer a first input at the customer input device initiating a purchase of an item that does not have a product identification code compatible with the reader device present on the item;

querying a database to identify a first plurality of items based on a prediction of purchase of the items;

in response to the first input, displaying to the customer a graphical user interface comprising a first plurality of user-selectable icons each of said icons representing one of the first plurality of items;

receiving from the user a second input selecting one of the first plurality of icons; and

processing a purchase transaction for an item corresponding to the selected icon.

**2**. The method of claim 1 wherein the self-checkout terminal further comprises a scale and processing the purchase transaction comprises computing a purchase price based on weight measured by the scale.

**3**. The method of claim 1 wherein identifying the plurality of items based on a prediction of purchase comprises:

receiving customer identification data;

based on the customer identification data, querying a database to retrieve purchase history information associated with the identified customer; and

processing the purchase history information to determine the plurality of items.

**4**. The method of claim 3 wherein receiving the data identifying the customer comprises receiving data at an input device from a shopper identification card.

**5**. The method of claim 3 wherein the purchase history information comprises seasonal purchase information and querying the database comprises querying to retrieve purchase history information associated with the identified customer during a seasonal period.

**6**. The method of claim 1 wherein identifying the plurality of items based on a prediction of purchase comprises:

capturing an image of a checkout item;

processing the image using an image identification algorithm to compute a visual characteristics of the checkout item;

executing a matching algorithm to compare the visual characteristics of the checkout item to visual characteristic information stored in a database;

selecting the plurality of items based on the comparison of visual characteristics.

**7**. The method of claim 1 wherein identifying based on a prediction of purchase comprises querying a database to identify a plurality of frequently-purchased items.

**8**. The method of claim 1 wherein the interface is further configured to receive entry of an input identifying an item that is not represented by one of the first plurality of icons.

**9**. The method of claim 1 further comprising the prediction of purchase is based on correlation of items purchased by the customer during a purchasing session.

**10**. A product purchasing method comprising:

at a point-of-sale self-checkout terminal comprising an image capture device and a customer input device for receipt of data from a customer,

capturing an image of a checkout item;

processing the image using image identification functionality to establish a preliminary identification of the checkout item;

receiving from the user an input at the customer input device identifying an item for purchase; and

generating an alert signal when the identification entered by the user and the preliminary identification do not match.

**11**. The method of claim 10 wherein generating the alert signal comprises transmitting an image of the checkout item to a supervisor station.

**12**. A computer-implemented method of configuring a point-of-sale self-checkout terminal system, the method comprising:

initiating a configuration mode upon entry of an administration password;

receiving administer input to configure a best-seller product database by defining a generic group comprising a plurality of products and to configure the database to determine a sales frequency associated with the generic group based on an aggregate of sales of the plurality of products in the group.

**13**. The method of claim 12 wherein configuring the product database further comprises configuring a update frequency parameter, said update frequency parameter determine a period between changes to a display of selection icons on a user interface viewed by a self-checkout customer.

**14**. The method of claim 12 further comprising propagating changes in the configuration data to a plurality of other self-checkout systems.

**15**. A product purchasing method comprising:

at a point-of-sale self-checkout terminal comprising a code reader device for automated entry of a product identification code present on items for purchase and a customer input device for receipt of data from a customer,

receiving from a self-checkout customer a first input at the customer input device initiating a purchase of an item that does not have a product identification code compatible with the reader device present on the item;

receiving from a purchaser successive ones of a plurality of alpha-numeric characters;

querying a database based on the received plurality of alpha-numeric characters to determine a query result comprising one or more products identified based on a match between the entered alpha-numeric characters and keywords associated with the identified products;

displaying to the purchaser a graphical user interface comprising a plurality of icons, each icon depicting one of the product based identified in the query result;

receiving from the purchaser a selection of one of the displayed icons; and

recording a purchased transaction for an item associated with the selected icon.

**16**. The method of claim 15 wherein

for a first one of a plurality of items, the database comprises a plurality of keywords; and

determining based on the match comprises comparing the identified alpha-numeric characters to each of the keywords associated with the first one of the items and determining that the first item is a matching item when the alpha-numeric characters received from the purchaser match an initial segment of any of the plurality of keywords.

**17**. The method of claim 15 further comprising:

updating the display of icons as successive ones of the plurality of alpha-numeric characters are entered so as to maintain a match between the entered alpha-numeric characters and the displayed icons.

**18**. The method of claim 17 wherein refining the display comprises re-querying the database as successive ones of the plurality of alpha-numeric character are received.

**19**. A method of self-checkout implemented by a point-of-sale self-checkout terminal, the method comprising:

at the self-checkout terminal,

receiving from a user an input initiating a purchase of a non-bar-coded item,

receiving from the user an audio input,

processing the audio input to identify an item, and

processing a purchase transaction for the identified item.

**20**. The method of claim 19 wherein processing the audio input comprises processing using a speaker-independent voice recognition algorithm.

**21**. A point-of-sale self-checkout terminal comprising:

a code reader device for automated entry of a product identification code present on items for purchase;

a customer input device for receipt of data from a customer;

a database comprising stored data indicating expectation of purchase of items;

a video display;

a processor coupled to the code reader, the input device, the database, and the video display and a memory comprising stored instructions to configure the processor to:

receive from the self-checkout customer a first input at the customer input device to initiate a purchase of an

item that does not have a product identification code compatible with the reader device present on the item;

query the database to identify a first plurality of items based on expectation of purchase;

in response to the first input, display to the customer on the video display a graphical user interface comprising a first plurality of user-selectable icons each of said icons representing one of the first plurality of items;

receive from the user a second input selecting one of the first plurality of icons; and

process a purchase transaction for an item corresponding to the selected icon.

**22**. A point-of-sale self-checkout apparatus comprising:

an audio input device; and

an audio processing module configured to process an audio signal received from the audio input device and to determine a product identification based on the processed audio signal.

**23**. The apparatus of claim 22 further comprising:

a processor and a video display, wherein the processor is configured to receive the product identification from the audio module and to display an icon on the video display representing the identified product; and

an input device for selection of the icon displayed on the video display.

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