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Tengler et al.

(54) ORDER PROCESSING

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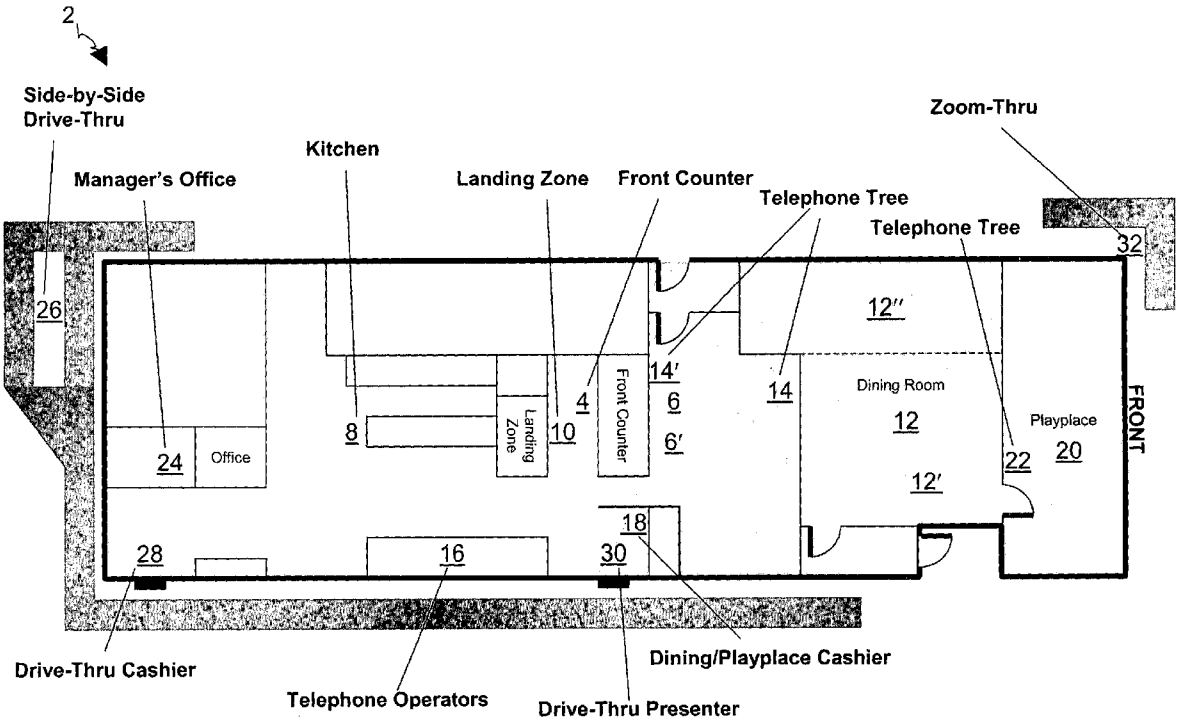
(52) **U.S. Cl.** **705/15**; 705/27

(57) **ABSTRACT**

In one aspect, an electronic association is maintained between each order received at a place at which goods or services are offered, the goods or services to be delivered at a point in the place, and the association of the order with the delivery place is enabled to be altered between the time when the order is placed and the time when the order is delivered.



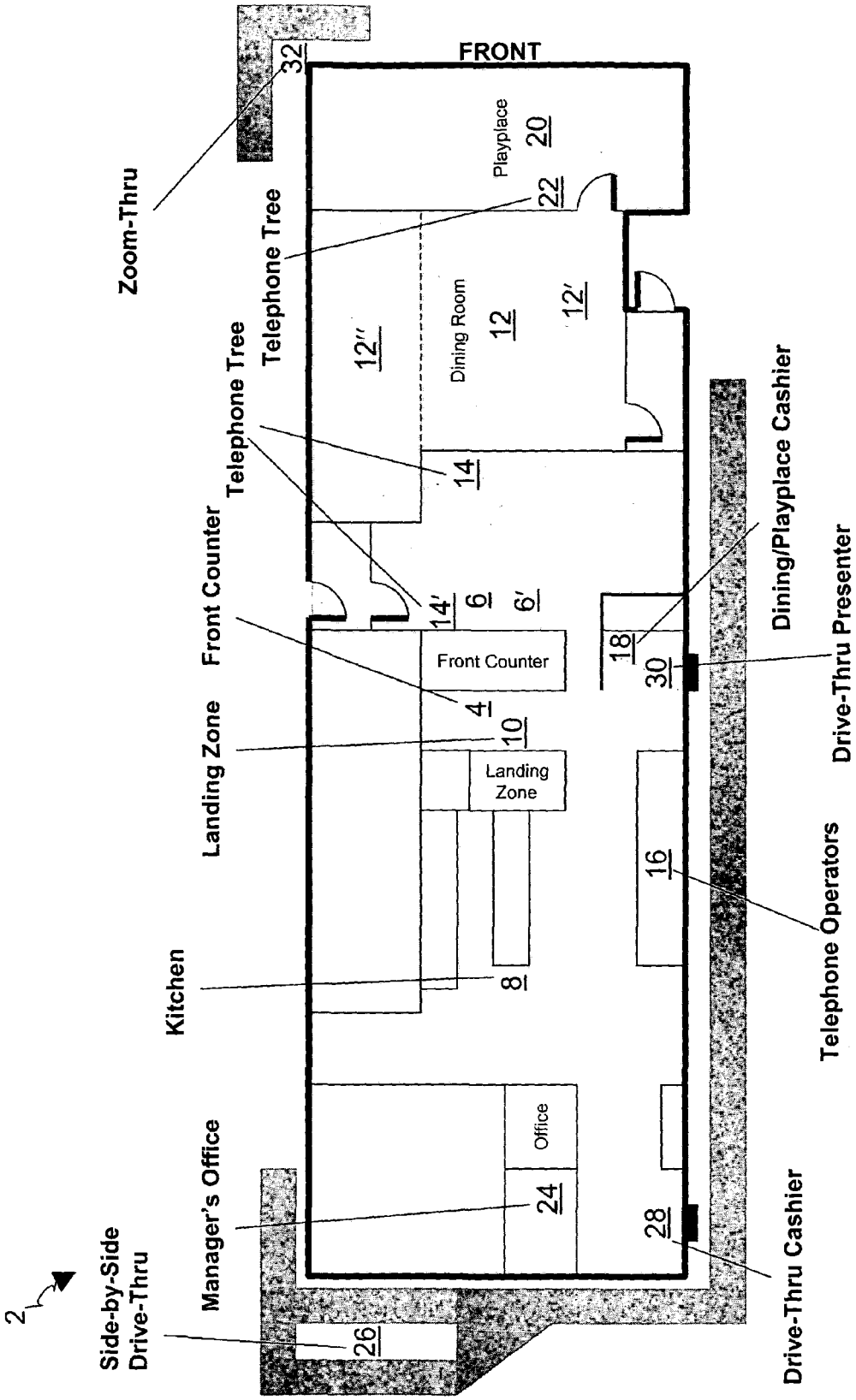

FRONT
Zoom-Thru
32
Telephone Tree
22
Playplace
20
Dining Room
12
12''
12'
Telephone Tree
14
Front Counter
4
14'
6
6'
Front Counter
Landing Zone
10
Landing Zone
Kitchen
8
Manager's Office
Office
24
Side-by-Side Drive-Thru
26
2
Dining/Playplace Cashier
18
Drive-Thru Presenter
30
Telephone Operators
16
Drive-Thru Cashier
28

FIG. 1

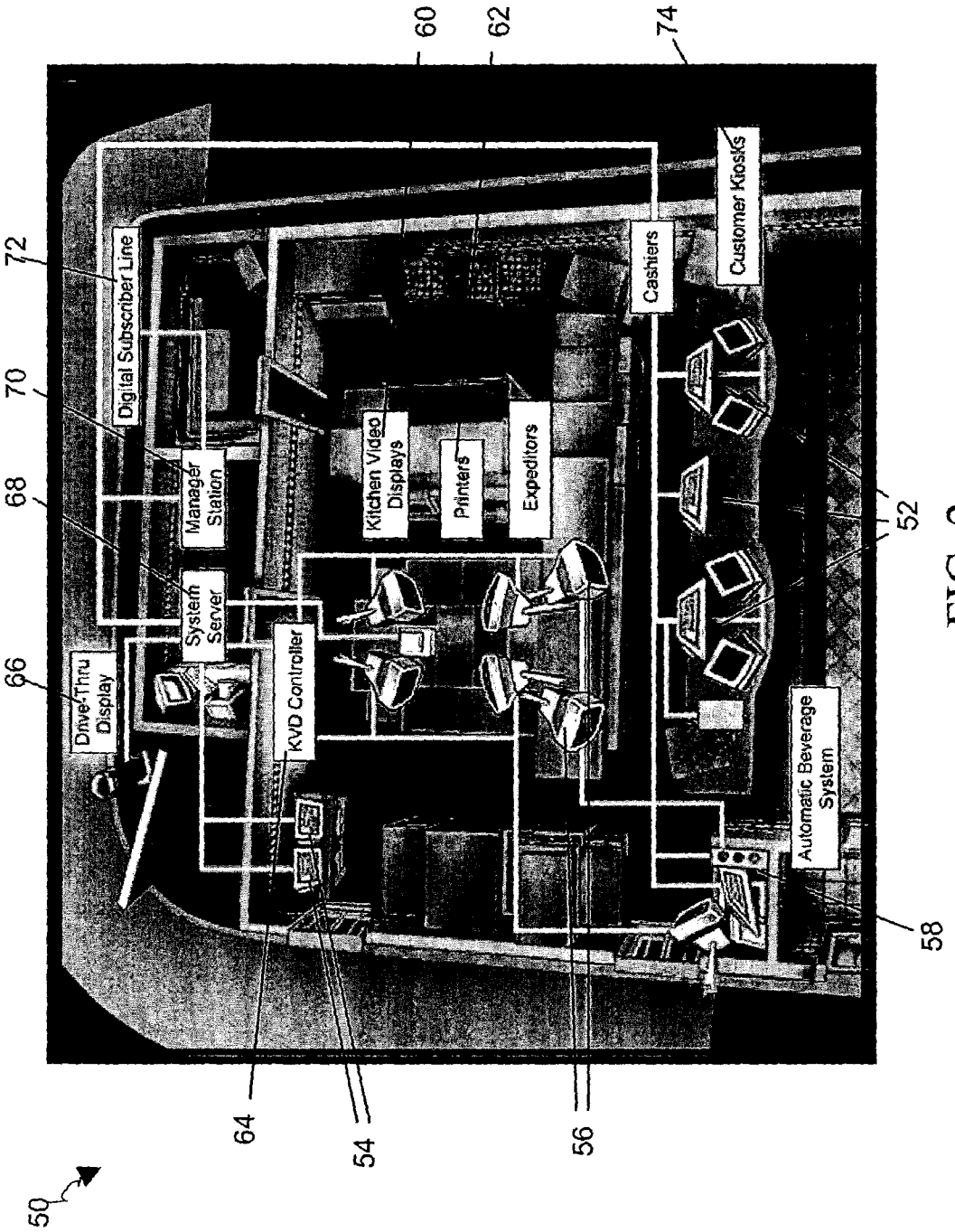

Digital Subscriber Line
Manager Station
System Server
Drive-Thru Display
KVD Controller
Kitchen Video Displays
Printers
Expeditors
Cashiers
Customer Kiosks
Automatic Beverage System
50
52
54
56
58
60
62
64
66
68
70
72
74

FIG. 2

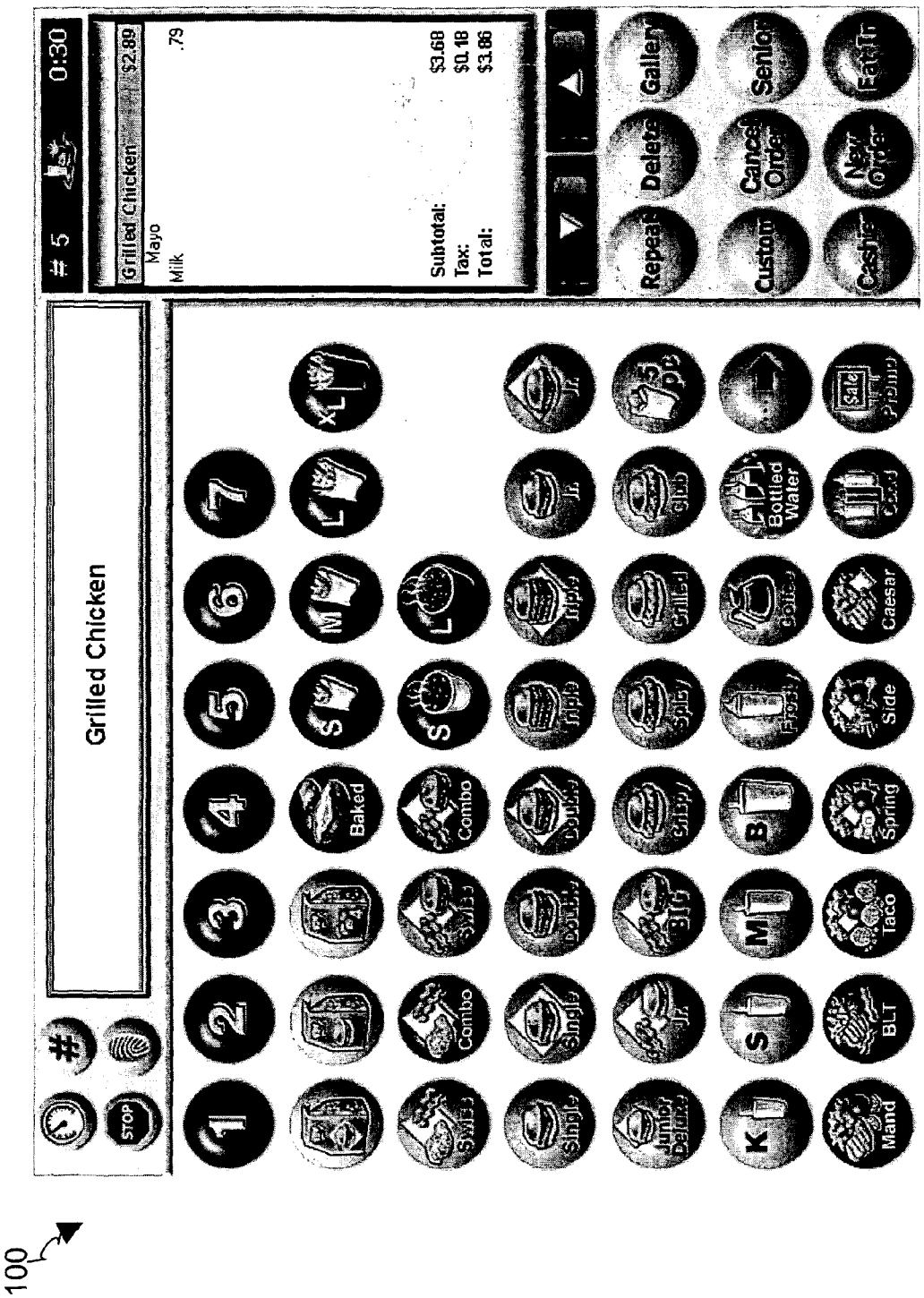
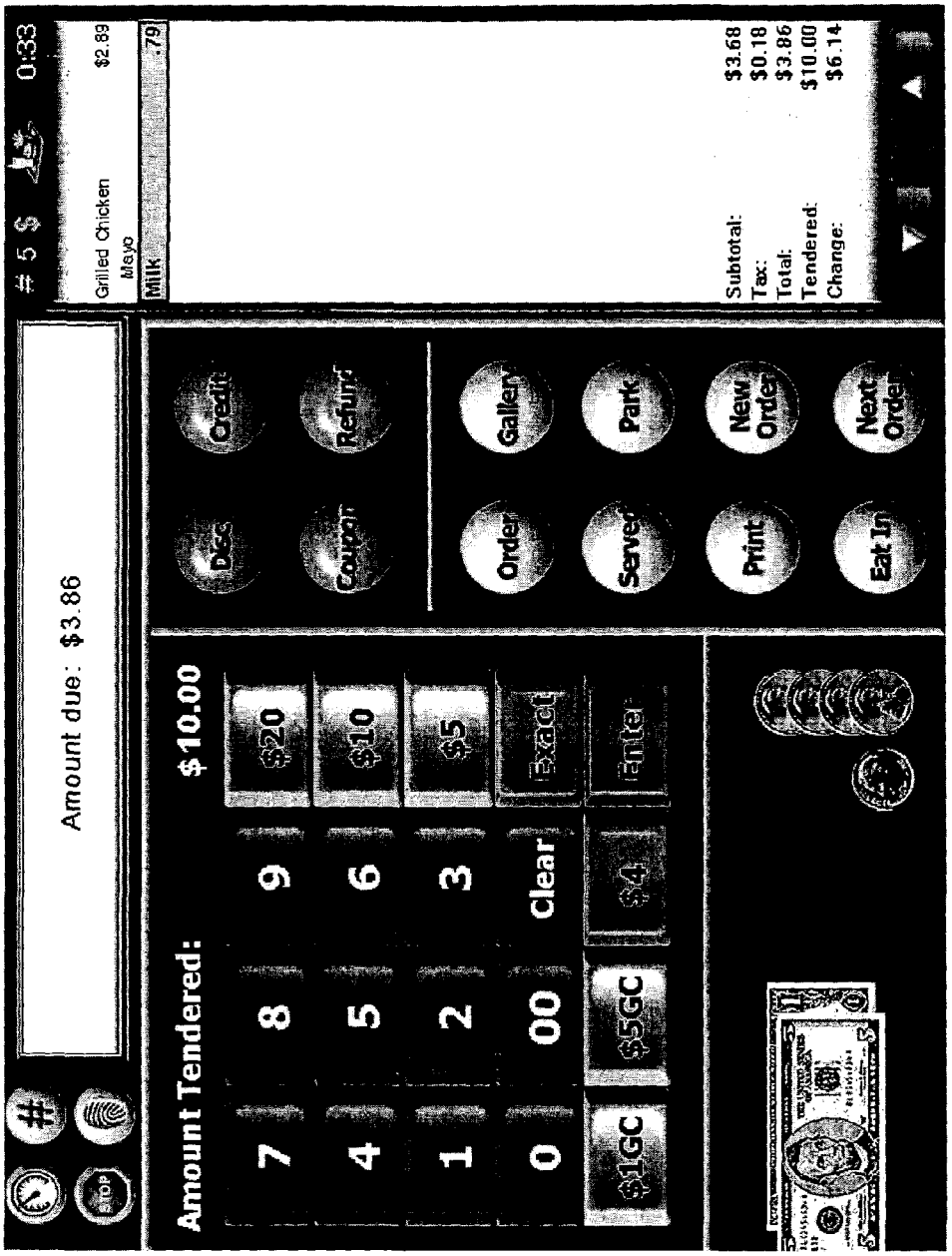

100
Grilled Chicken
5
0:30
Grilled Chicken $2.89
Mayo
Milk .79
Subtotal: $3.68
Tax: $0.18
Total: $3.86
Repeat
Delete
Gallery
Custom
Cancel Order
Senior
Cashier
New Order
Eat In
STOP
Mand
BLT
Taco
Spring
Side
Caesar
Bottled Water
Sale
Combo
Baked
Single
Junior Deluxe
Jr.
Double
Triple
Splay
Crispy
Frosty
Cotton
Cooler
Club
Grilled
Cold
Promo

FIG. 3


Amount due: $3.86
Amount Tendered:
$10.00
7
8
9
4
5
6
1
2
3
0
00
Clear
$1GC
$5GC
$4
$20
$10
$5
Exact
Enter
Disc
Credit
Coupon
Refund
Order
Gallery
Server
Park
Print
New Order
Eat In
Next Order
5 $
0:33
Grilled Chicken $2.89
Mayo
Milk .79
Subtotal: $3.68
Tax: $0.18
Total: $3.86
Tendered: $10.00
Change: $6.14

125

FIG. 4

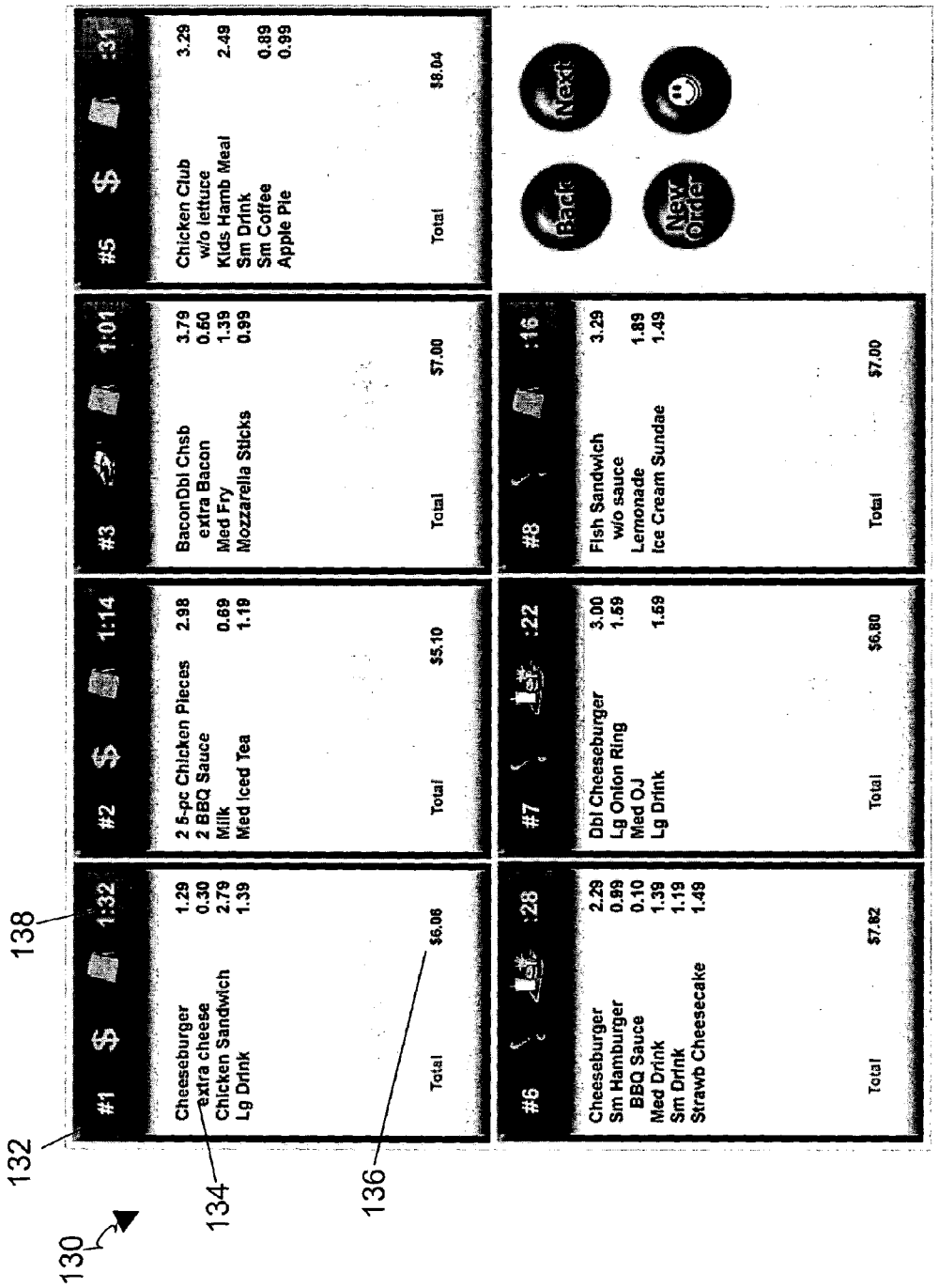

130
132
134
136
138
#1 $ 1:32
Cheeseburger 1.29
extra cheese 0.30
Chicken Sandwich 2.79
Lg Drink 1.39
Total $6.06
#2 $ 1:14
2 5-pc Chicken Pieces 2.98
2 BBQ Sauce
Milk 0.69
Med Iced Tea 1.19
Total $5.10
#3 1:01
BaconDbl Chsb 3.79
extra Bacon 0.60
Med Fry 1.39
Mozzarella Sticks 0.99
Total $7.00
#5 $:31
Chicken Club 3.29
w/o lettuce
Kids Hamb Meal 2.49
Sm Drink 0.89
Sm Coffee 0.99
Apple Pie
Total $8.04
#6 :28
Cheeseburger 2.29
Sm Hamburger 0.99
BBQ Sauce 0.10
Med Drink 1.39
Sm Drink 1.19
Strawb Cheesecake 1.49
Total $7.62
#7 :22
Dbl Cheeseburger 3.00
Lg Onion Ring 1.59
Med OJ
Lg Drink 1.59
Total $6.80
#8 :16
Fish Sandwich 3.29
w/o sauce
Lemonade 1.89
Ice Cream Sundae 1.49
Total $7.00
Next
New Order

FIG. 5

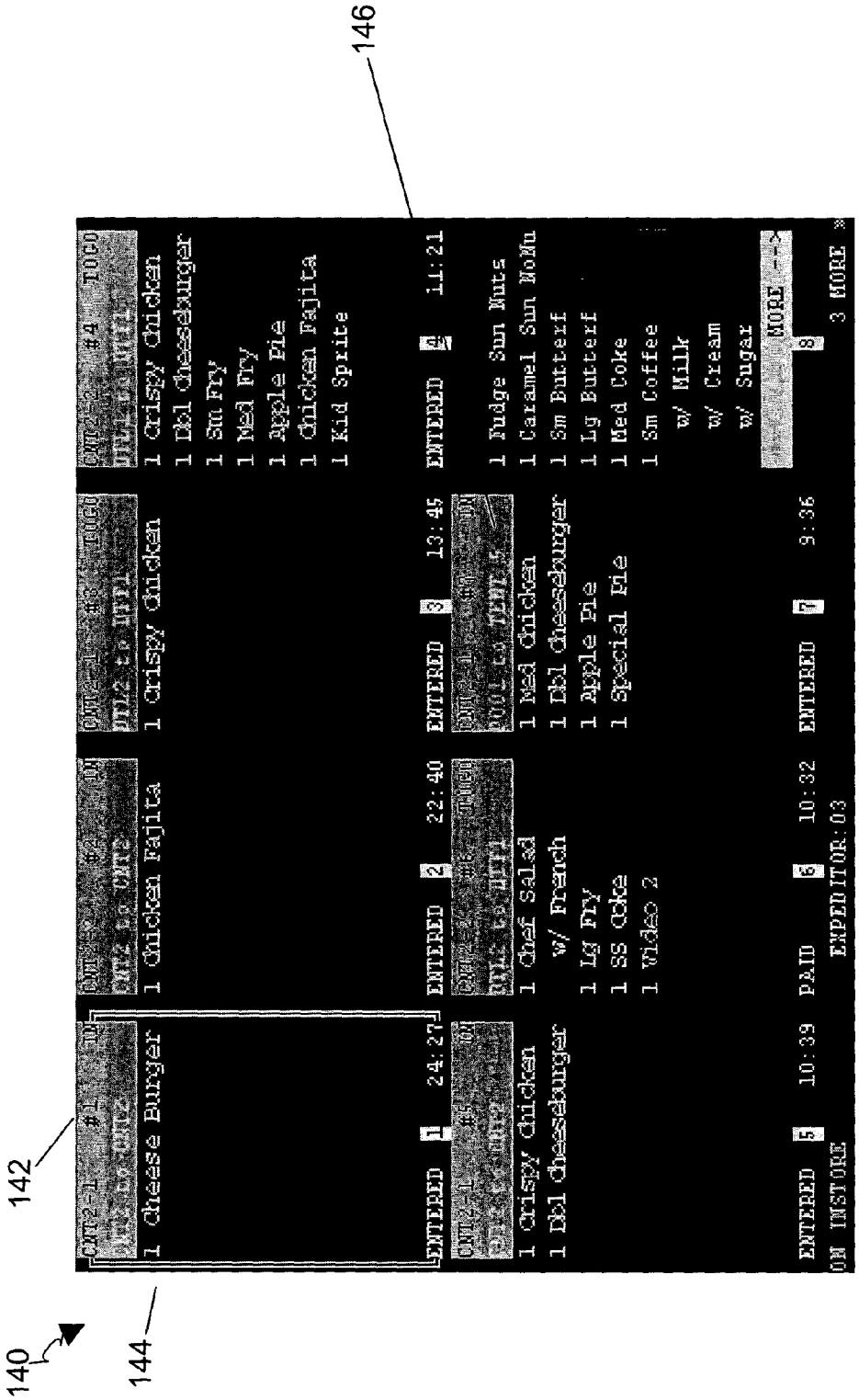

146
142
140
144
1 Cheese Burger
1 Chicken Fajita
1 Crispy Chicken
1 Dbl Cheeseburger
1 Chef Salad
w/ French
1 Lg Fry
1 SS Coke
1 Video 2
1 Crispy Chicken
1 Dbl Cheeseburger
1 Sm Fry
1 Med Fry
1 Apple Pie
1 Chicken Fajita
1 Kid Sprite
1 Fudge Sun Nuts
1 Caramel Sun NoNu
1 Sm Butterf
1 Lg Butterf
1 Med Coke
1 Sm Coffee
w/ Milk
w/ Cream
w/ Sugar
ENTERED 1 24:27
ENTERED 2 22:40
ENTERED 3 13:45
ENTERED 4 11:21
ENTERED 5 10:39
PAID 6 10:32
ENTERED 7 9:36
EXPEDITOR:03
MORE -->
3 MORE

FIG. 5A

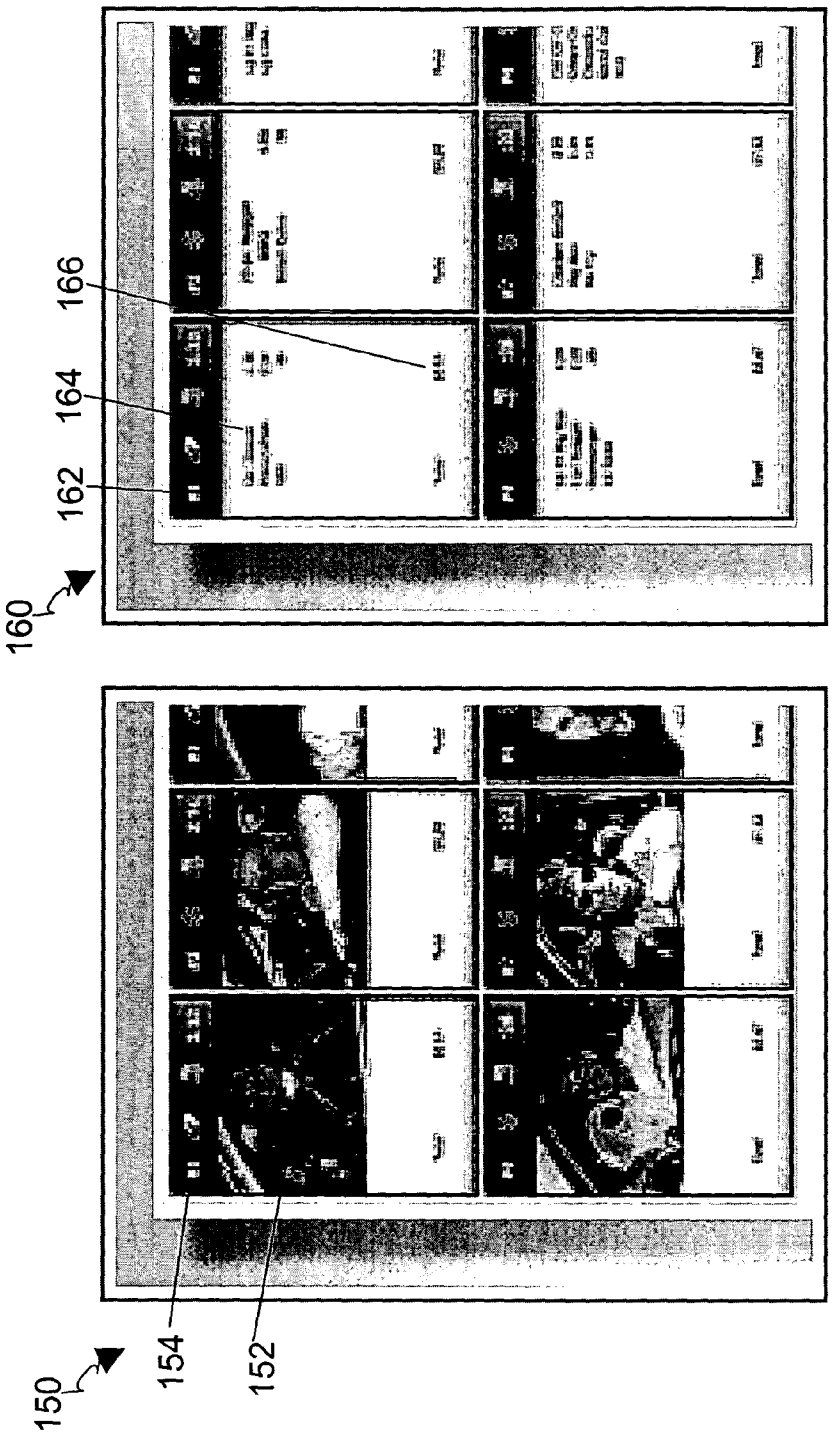


FIG. 5B

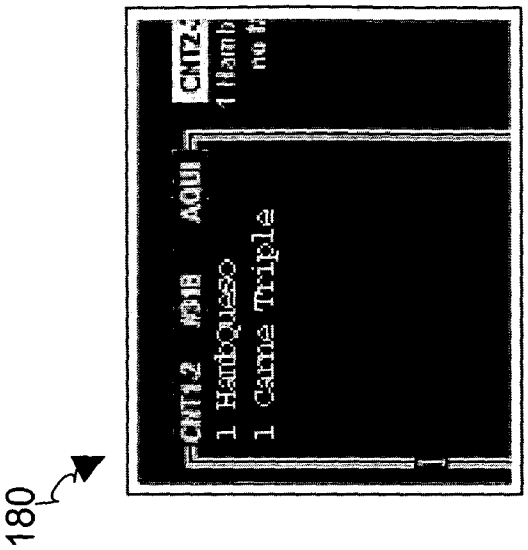

180
CNT1-2 #31B AQUI
1 HambQueso
1 Carne Triple

FIG. 6A

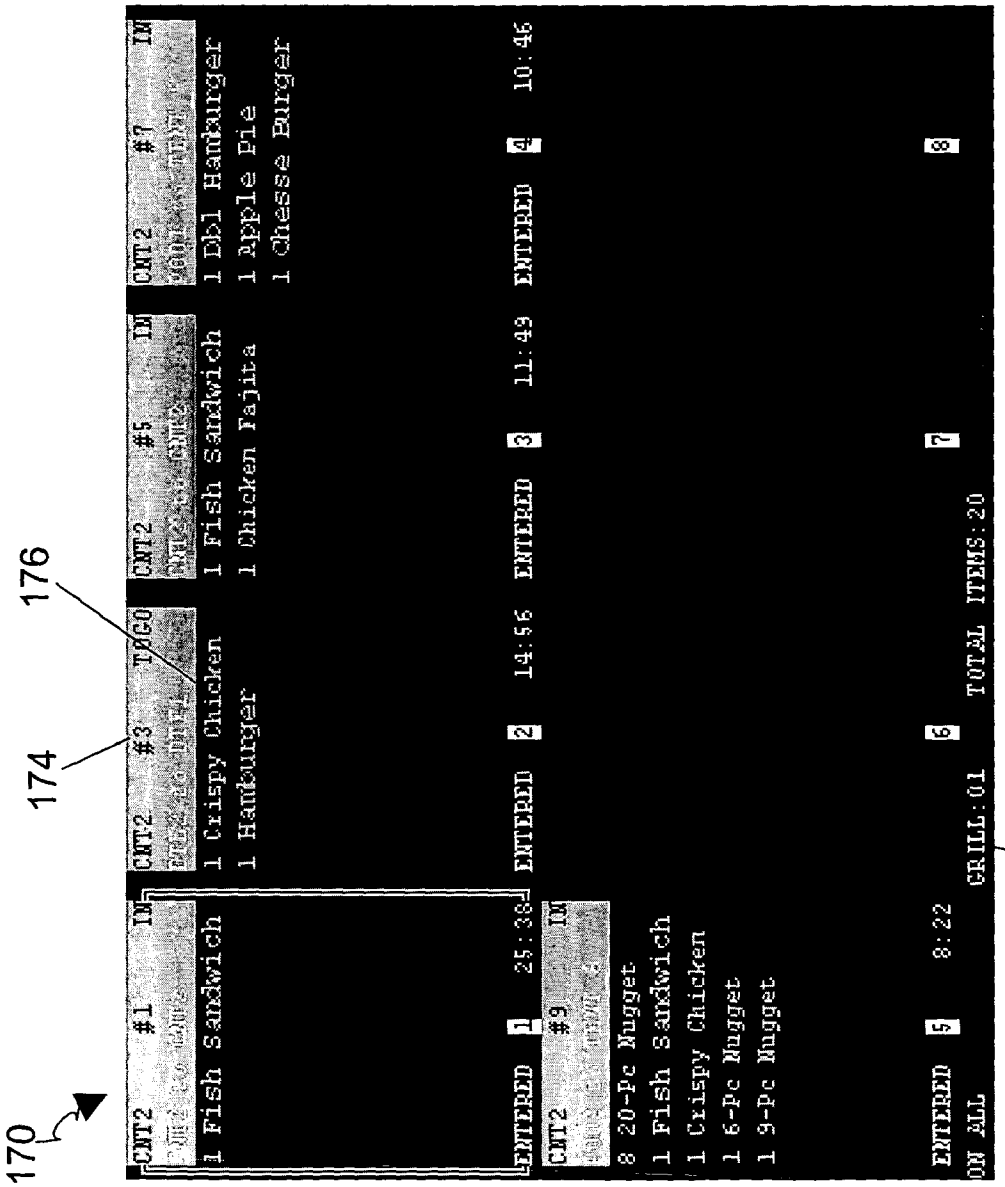

170
CNT2 #1 IN
1 Fish Sandwich
ENTERED 1 25:38
CNT2 #3 TOGO
1 Crispy Chicken
1 Hamburger
ENTERED 2 14:56
CNT2 #5 IN
1 Fish Sandwich
1 Chicken Fajita
ENTERED 3 11:49
CNT2 #7 IN
1 Dbl Hamburger
1 Apple Pie
1 Chesse Burger
ENTERED 4 10:46
CNT2 #9 IN
8 20-Pc Nugget
1 Fish Sandwich
1 Crispy Chicken
1 6-Pc Nugget
1 9-Pc Nugget
ENTERED 5 8:22
ON ALL
GRILL:01
TOTAL ITEMS:20
174
176
172

FIG. 6

190

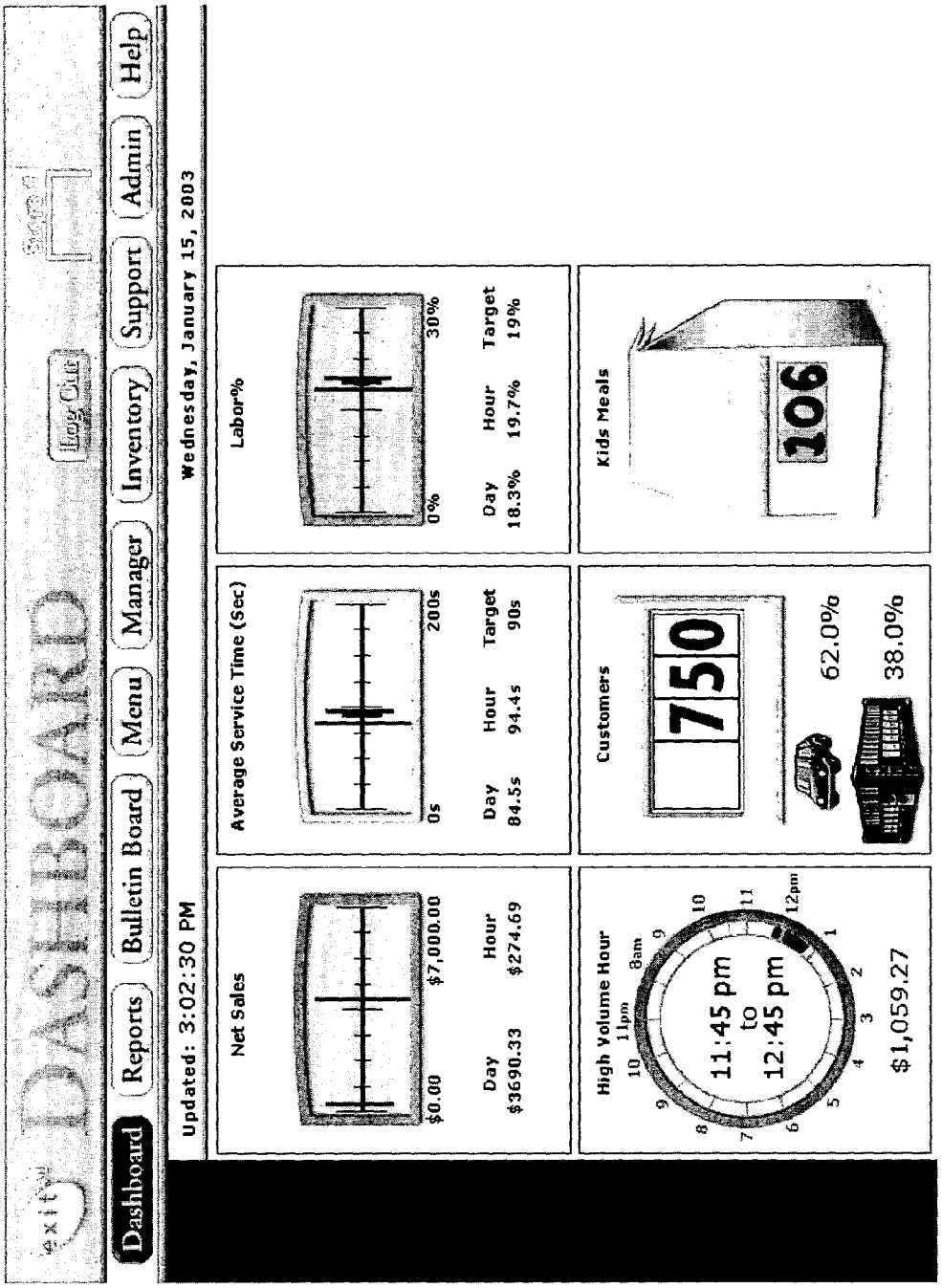

DASHBOARD
Dashboard
Reports
Bulletin Board
Menu
Manager
Inventory
Support
Admin
Help
Updated: 3:02:30 PM
Wednesday, January 15, 2003
Net Sales
$0.00
$7,000.00
Day
$3690.33
Hour
$274.69
Average Service Time (Sec)
0s
200s
Day
84.5s
Hour
94.4s
Target
90s
Labor%
0%
30%
Day
18.3%
Hour
19.7%
Target
19%
High Volume Hour
11:45 pm
to
12:45 pm
$1,059.27
Customers
750
62.0%
38.0%
Kids Meals
106

FIG. 7

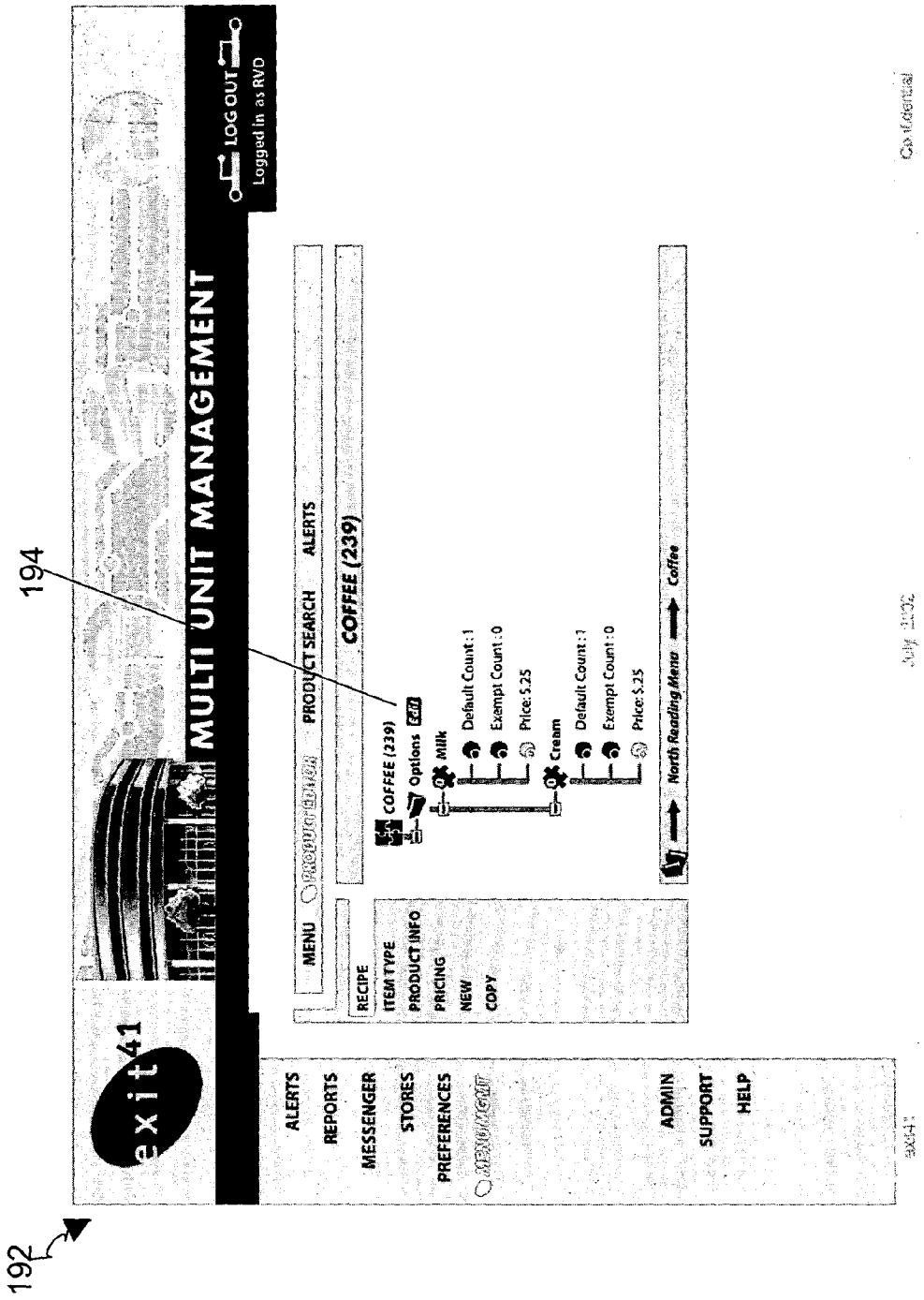
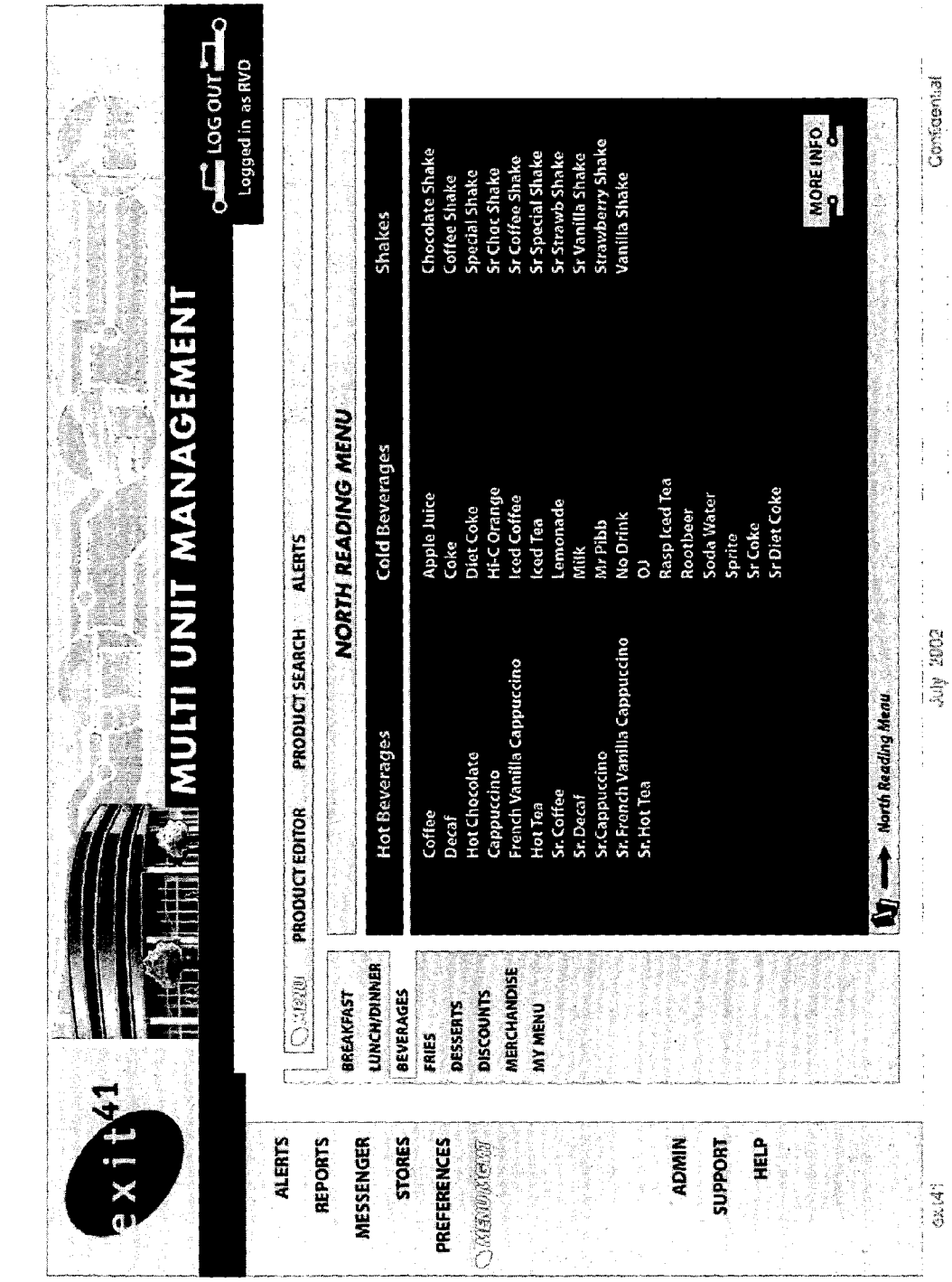

192
194
exit 41
MULTI UNIT MANAGEMENT
LOG OUT
Logged In as RVD
MENU
PRODUCT SEARCH
ALERTS
COFFEE (239)
RECIPE
ITEM TYPE
PRODUCT INFO
PRICING
NEW
COPY
COFFEE (239)
Options
Milk
Default Count : 1
Exempt Count : 0
Price: 5.25
Cream
Default Count : 1
Exempt Count : 0
Price: 5.25
North Reading Menu
Coffee
ALERTS
REPORTS
MESSENGER
STORES
PREFERENCES
ADMIN
SUPPORT
HELP

FIG. 7A


exit41
MULTI UNIT MANAGEMENT
LOG OUT
Logged in as RVD
PRODUCT EDITOR
PRODUCT SEARCH
ALERTS
ALERTS
REPORTS
MESSENGER
STORES
PREFERENCES
ADMIN
SUPPORT
HELP
BREAKFAST
LUNCH/DINNER
BEVERAGES
FRIES
DESSERTS
DISCOUNTS
MERCHANDISE
MY MENU
NORTH READING MENU
Hot Beverages
Cold Beverages
Shakes
Coffee
Decaf
Hot Chocolate
Cappuccino
French Vanilla Cappuccino
Hot Tea
Sr. Coffee
Sr. Decaf
Sr. Cappuccino
Sr. French Vanilla Cappuccino
Sr. Hot Tea
Apple Juice
Coke
Diet Coke
Hi-C Orange
Iced Coffee
Iced Tea
Lemonade
Milk
Mr Pibb
No Drink
OJ
Rasp Iced Tea
Rootbeer
Soda Water
Sprite
Sr Coke
Sr Diet Coke
Chocolate Shake
Coffee Shake
Special Shake
Sr Choc Shake
Sr Coffee Shake
Sr Special Shake
Sr Strawb Shake
Sr Vanilla Shake
Strawberry Shake
Vanilla Shake
MORE INFO
North Reading Menu
July 2002
Confidential

196

FIG. 7B

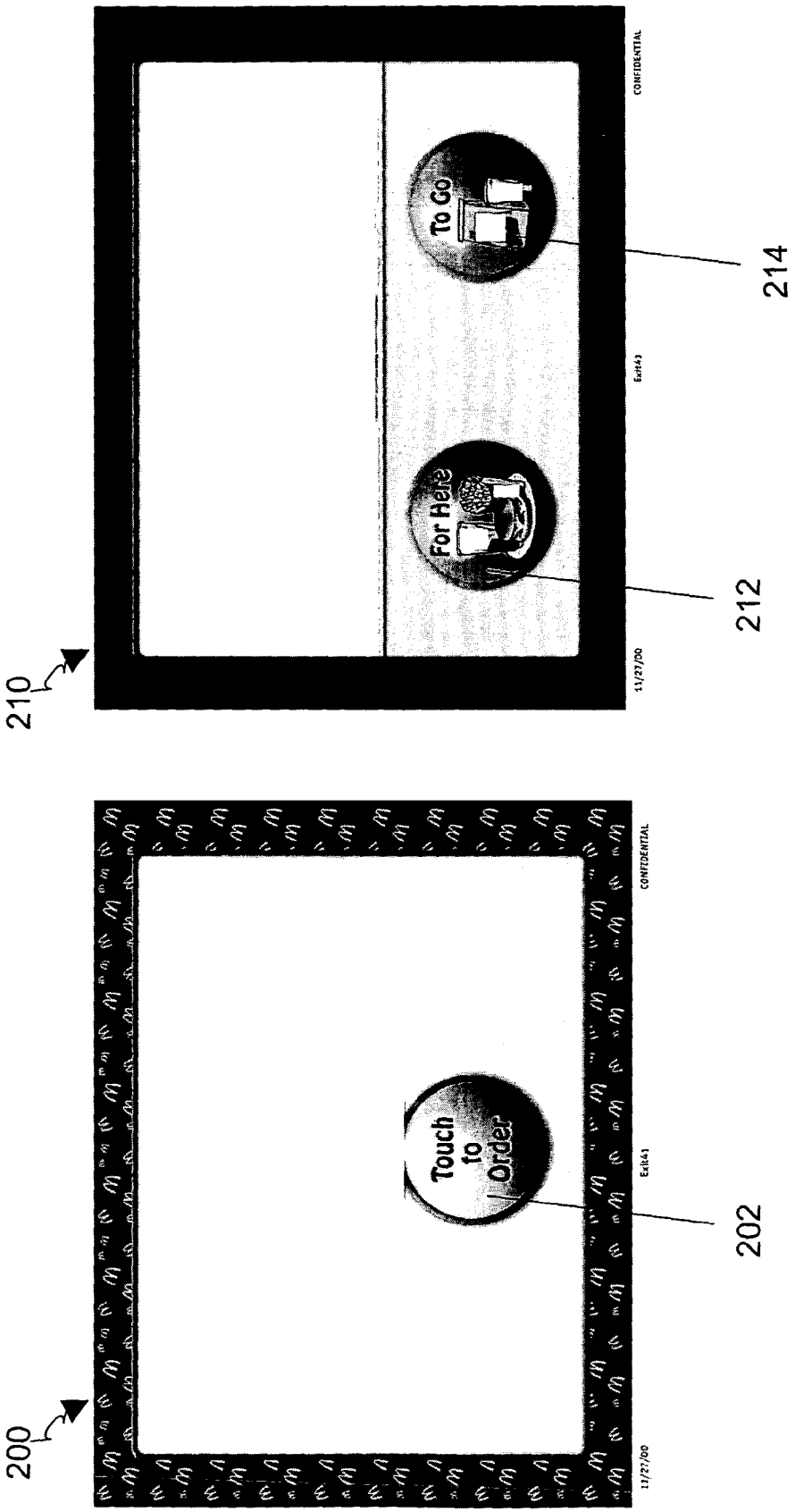
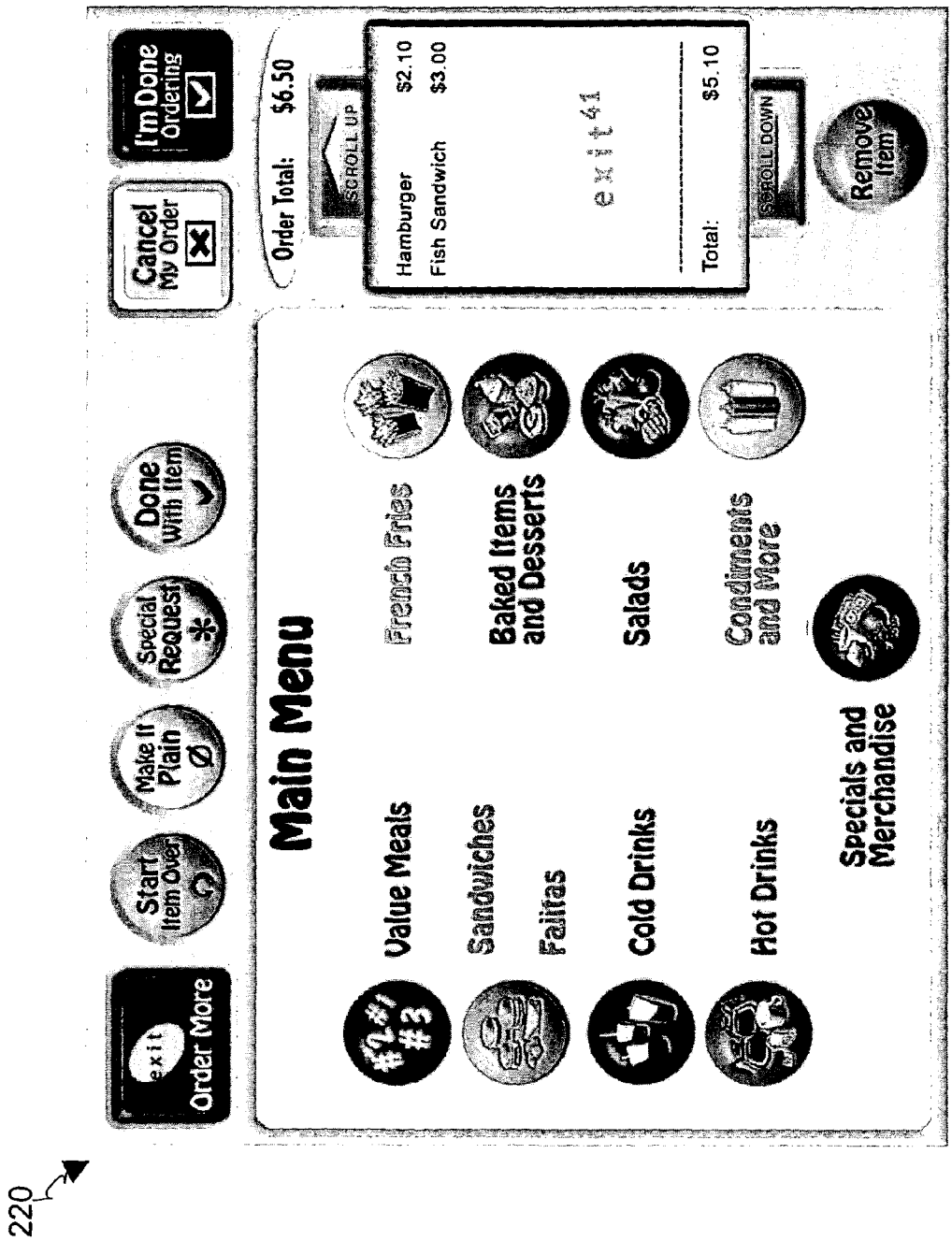

210
For Here
To Go
212
214
CONFIDENTIAL
11/27/00
200
Touch to Order
202
CONFIDENTIAL
11/27/00

FIG. 8


Order More
exit
Start Item Over
Make It Plain
Special Request
Done With Item
Cancel My Order
I'm Done Ordering
Main Menu
Value Meals
Sandwiches
Fajitas
Cold Drinks
Hot Drinks
French Fries
Baked Items and Desserts
Salads
Condiments and More
Specials and Merchandise
Order Total: $6.50
SCROLL UP
Hamburger $2.10
Fish Sandwich $3.00
exit41
Total: $5.10
SCROLL DOWN
Remove Item

220

FIG. 9

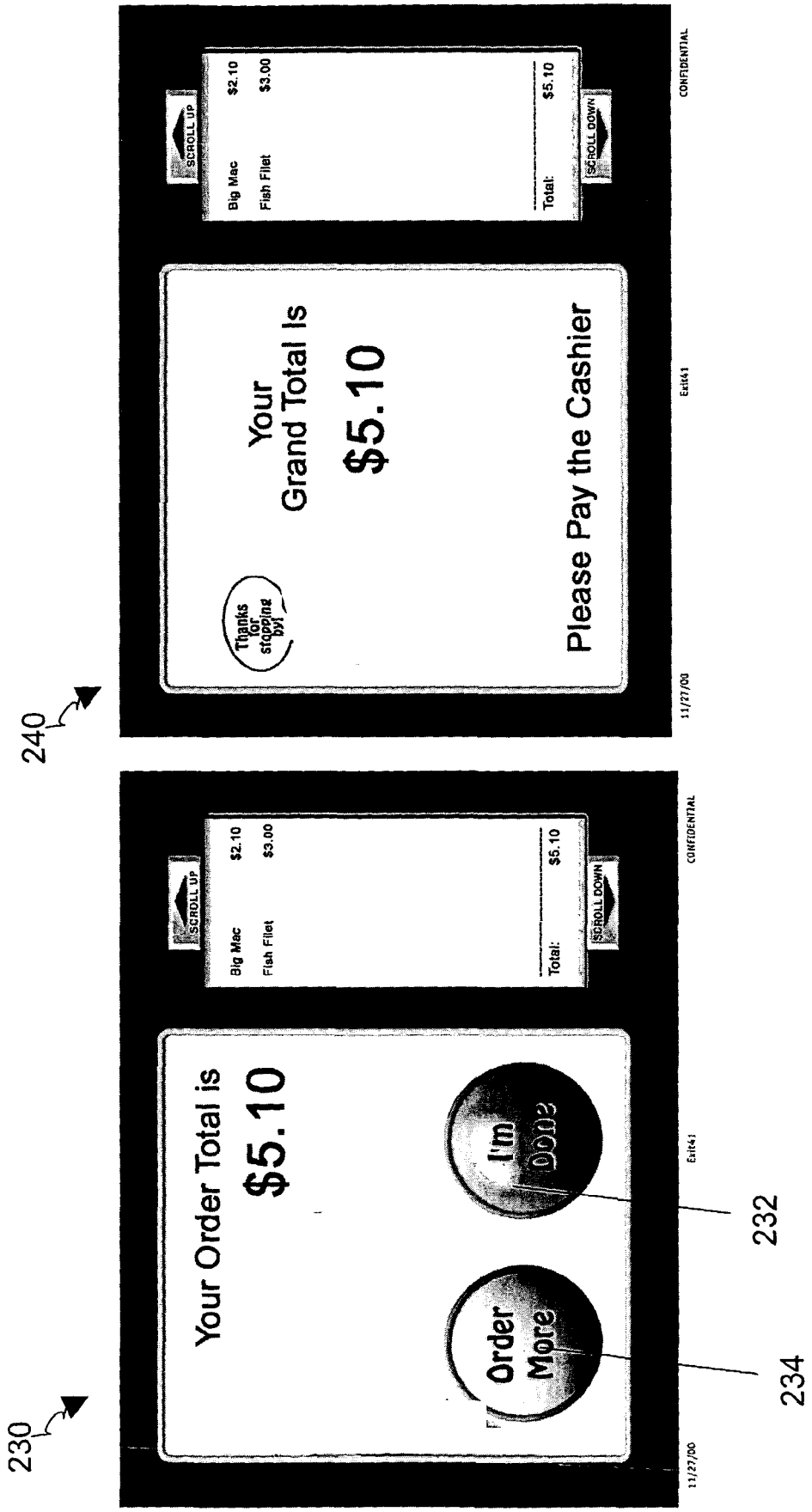

230
Your Order Total is
$5.10
Order More
I'm Done
SCROLL UP
Big Mac $2.10
Fish Filet $3.00
Total: $5.10
SCROLL DOWN
11/27/00
Exit41
CONFIDENTIAL
232
234
240
Thanks for stopping by!
Your Grand Total Is
$5.10
Please Pay the Cashier
SCROLL UP
Big Mac $2.10
Fish Filet $3.00
Total: $5.10
SCROLL DOWN
11/27/00
Exit41
CONFIDENTIAL

FIG. 10

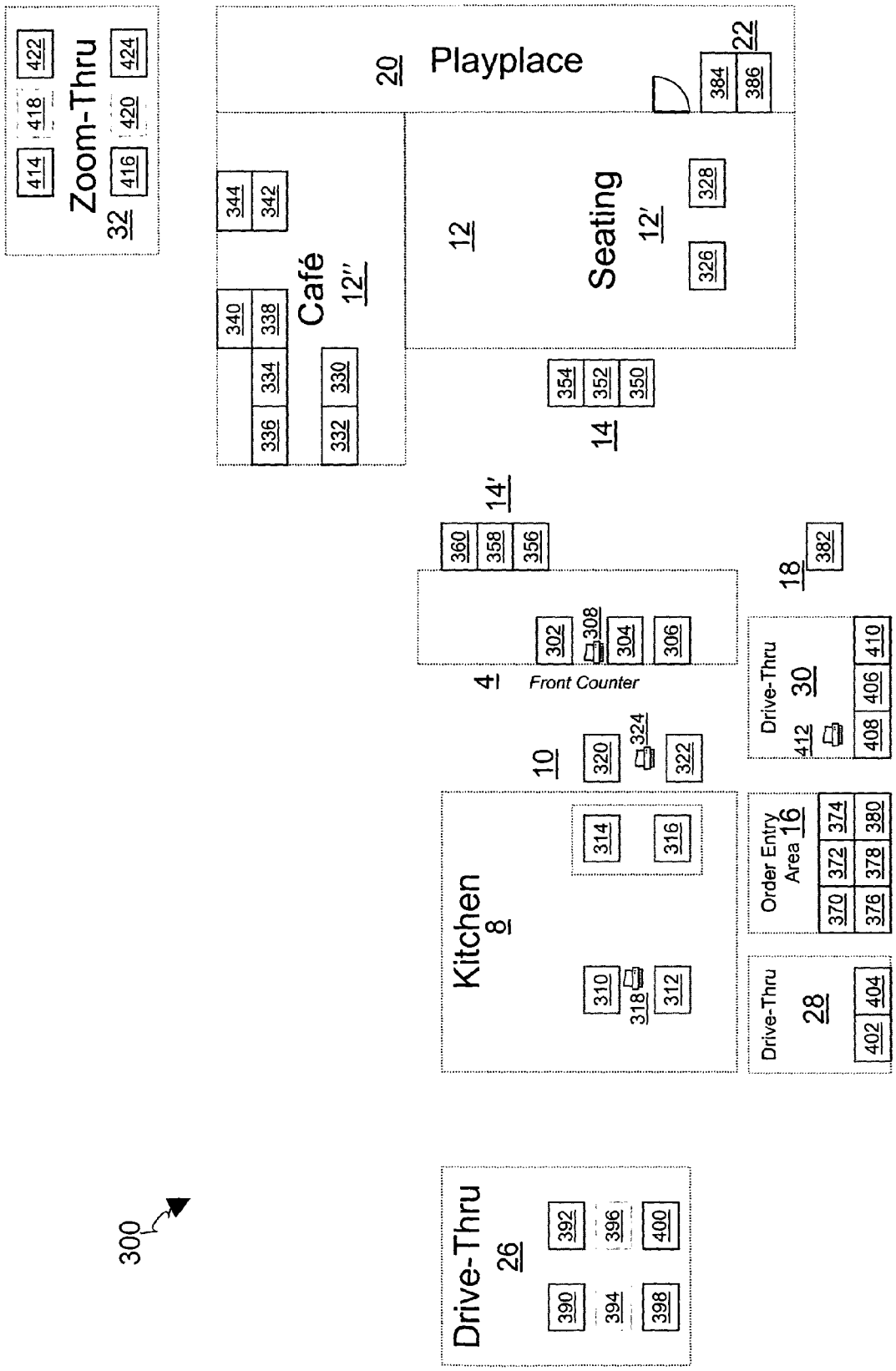

Zoom-Thru
32
414
418
422
416
420
424
Playplace
20
22
384
386
Café
12''
344
342
340
338
336
334
332
330
12
Seating
12'
328
326
14
354
352
350
14'
360
358
356
302
308
304
306
4
Front Counter
18
382
Drive-Thru
30
412
408
406
410
10
320
324
322
Kitchen
8
314
316
310
318
312
Order Entry Area
16
370
372
374
376
378
380
Drive-Thru
28
402
404
Drive-Thru
26
390
392
394
396
398
400
300

FIG. 11

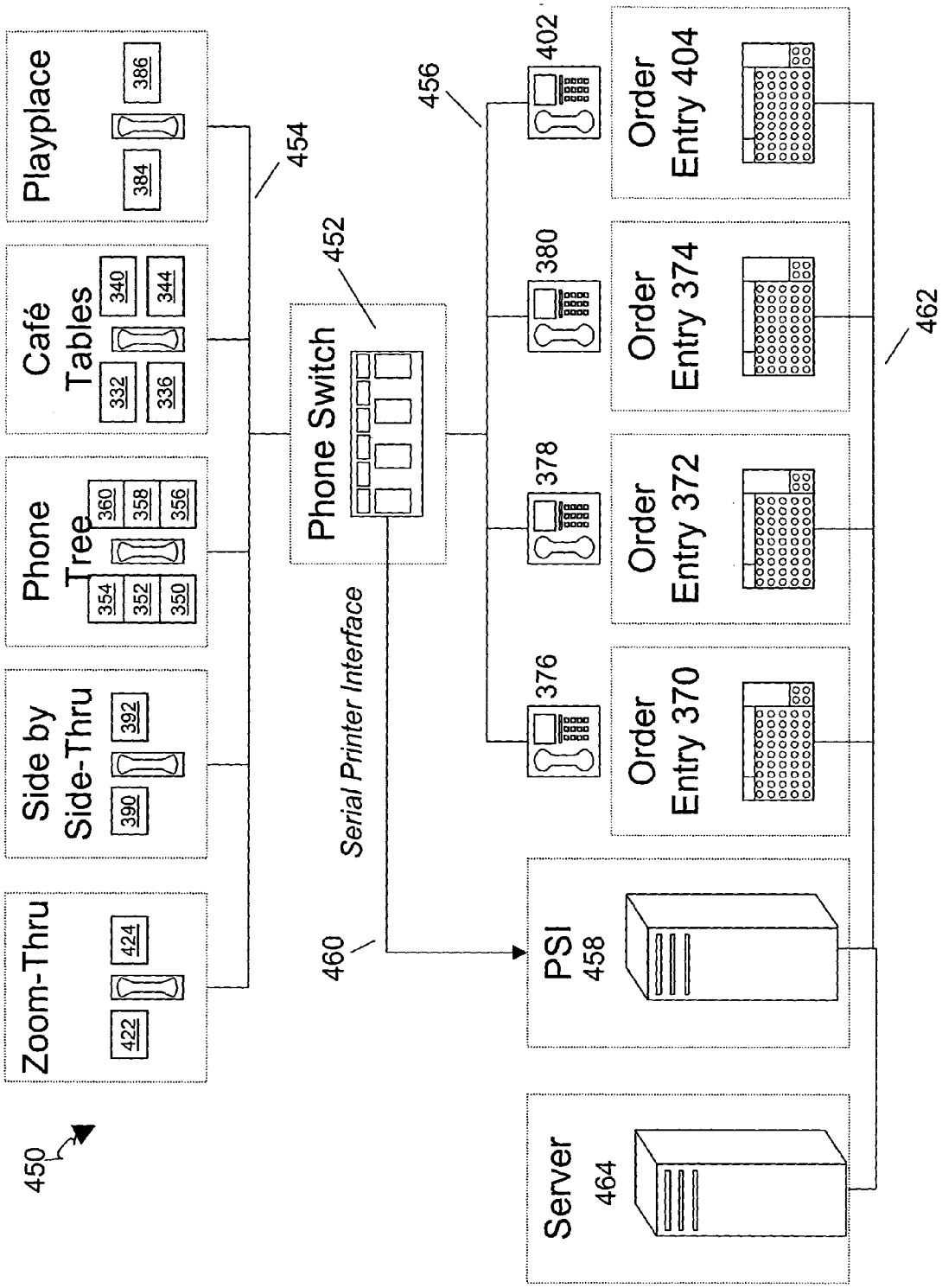

450
Zoom-Thru
422
424
Side by Side-Thru
390
392
Phone Tree
354
352
350
360
358
356
Café Tables
332
336
340
344
Playplace
384
386
454
Phone Switch
452
Serial Printer Interface
460
456
376
378
380
402
Order Entry 370
Order Entry 372
Order Entry 374
Order Entry 404
462
PSI
458
Server
464

FIG. 12

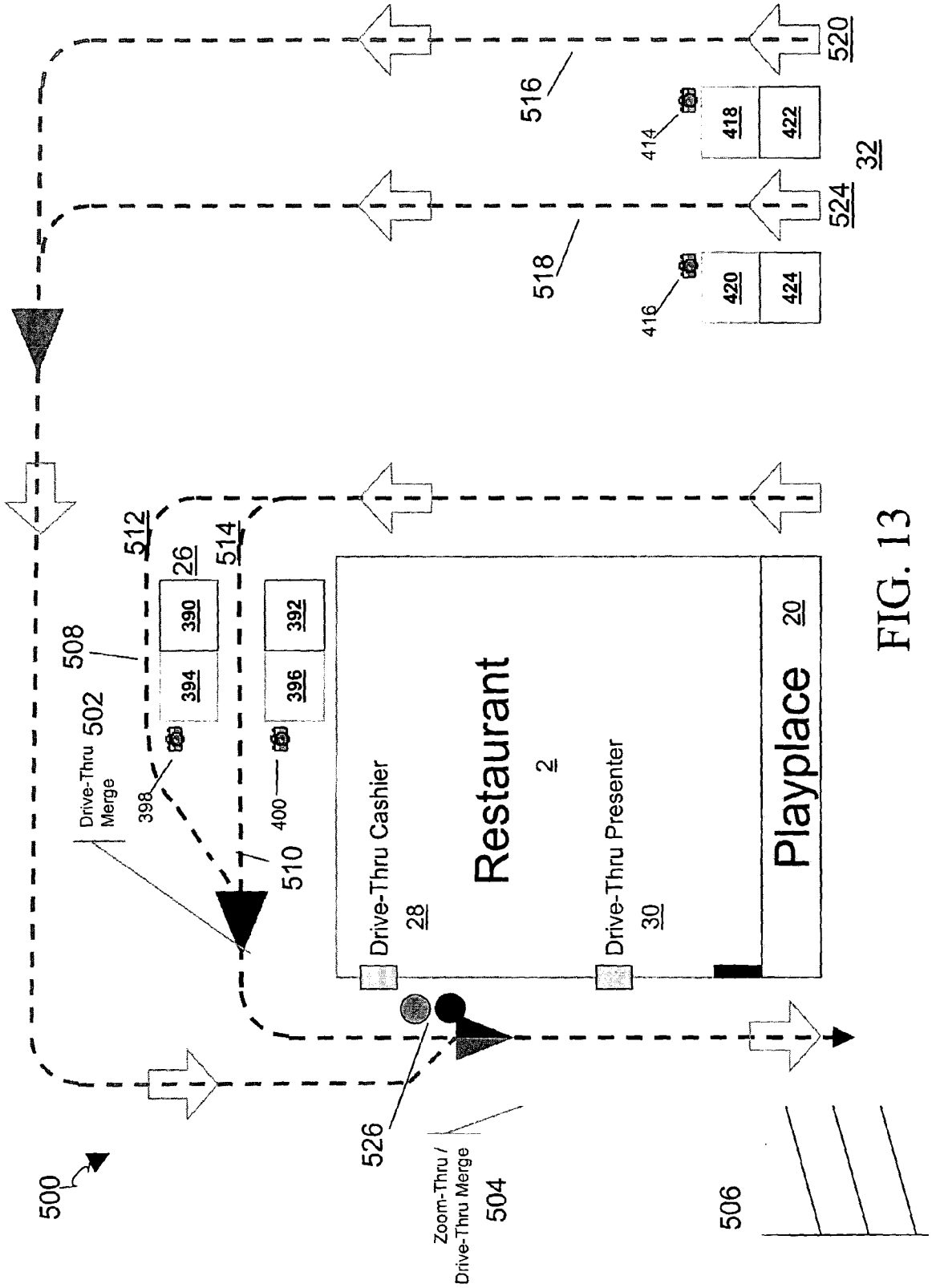

500
502
Drive-Thru Merge
508
510
512
514
26
390
392
394
396
398
400
Restaurant
2
Drive-Thru Cashier
28
Drive-Thru Presenter
30
Playplace
20
516
518
520
524
32
414
416
418
420
422
424
526
Zoom-Thru / Drive-Thru Merge
504
506

FIG. 13

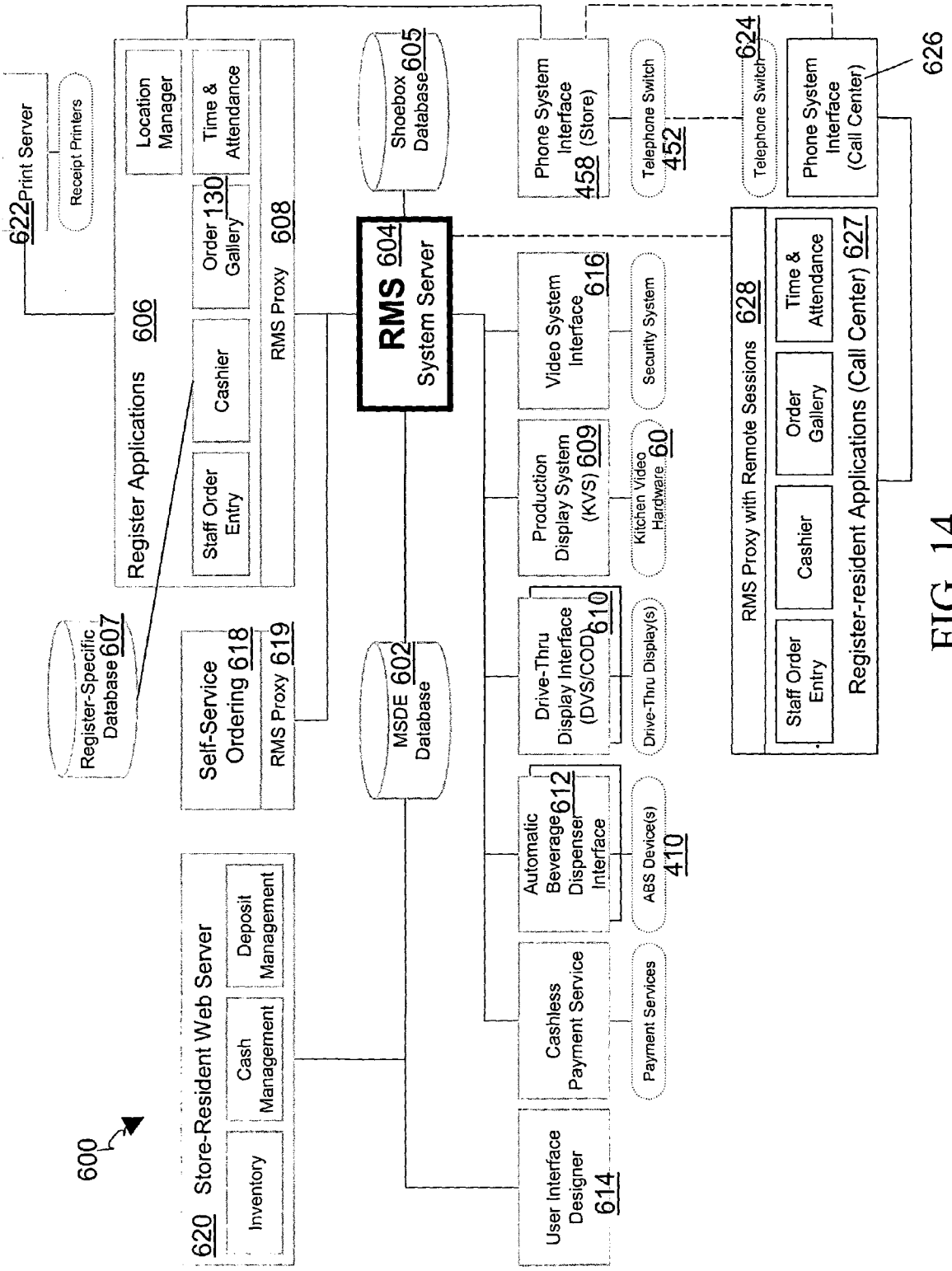

600
620 Store-Resident Web Server
Inventory
Cash Management
Deposit Management
Register-Specific Database 607
Self-Service Ordering 618
RMS Proxy 619
Register Applications 606
Staff Order Entry
Cashier
Order Gallery 130
Location Manager
Time & Attendance
RMS Proxy 608
622 Print Server
Receipt Printers
MSDE 602 Database
RMS 604 System Server
Shoebox Database 605
User Interface Designer 614
Cashless Payment Service
Payment Services
Automatic Beverage Dispenser Interface 612
ABS Device(s) 410
Drive-Thru Display Interface (DVS/COD) 610
Drive-Thru Display(s)
Production Display System (KVS) 609
Kitchen Video Hardware 60
Video System Interface 616
Security System
Phone System Interface 458 (Store)
Telephone Switch 452
Telephone Switch 624
Phone System Interface (Call Center)
626
RMS Proxy with Remote Sessions 628
Staff Order Entry
Cashier
Order Gallery
Time & Attendance
Register-resident Applications (Call Center) 627

FIG. 14

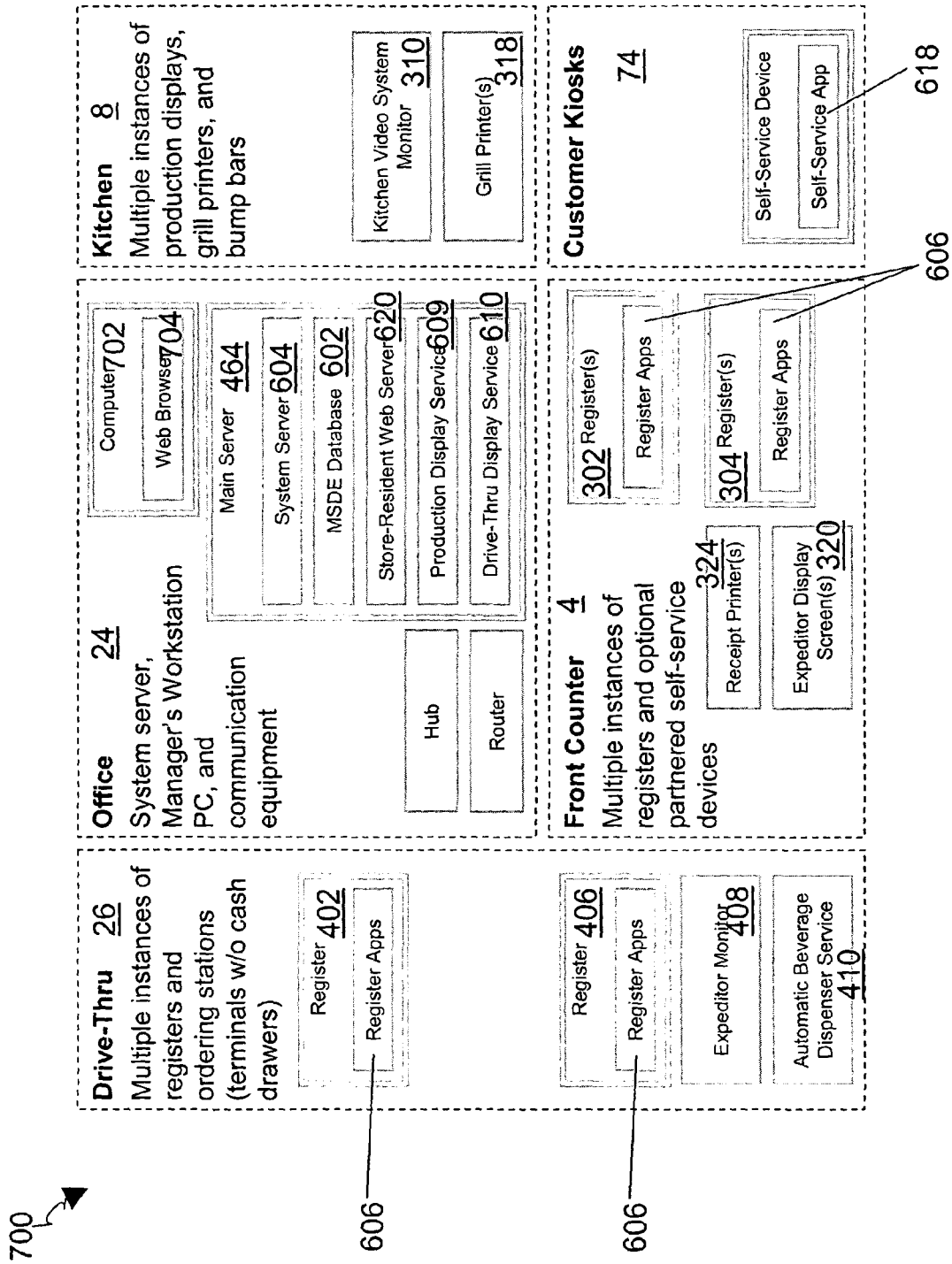

700
Drive-Thru 26
Multiple instances of registers and ordering stations (terminals w/o cash drawers)
Register 402
Register Apps
606
Register 406
Register Apps
606
Expeditor Monitor 408
Automatic Beverage Dispenser Service 410
Office 24
System server, Manager's Workstation PC, and communication equipment
Computer 702
Web Browser 704
Main Server 464
System Server 604
MSDE Database 602
Store-Resident Web Server 620
Production Display Service 609
Drive-Thru Display Service 610
Hub
Router
Front Counter 4
Multiple instances of registers and optional partnered self-service devices
302 Register(s)
Register Apps
304 Register(s)
Register Apps
606
Receipt Printer(s) 324
Expeditor Display Screen(s) 320
Kitchen 8
Multiple instances of production displays, grill printers, and bump bars
Kitchen Video System Monitor 310
Grill Printer(s) 318
Customer Kiosks 74
Self-Service Device
Self-Service App
618

FIG. 15

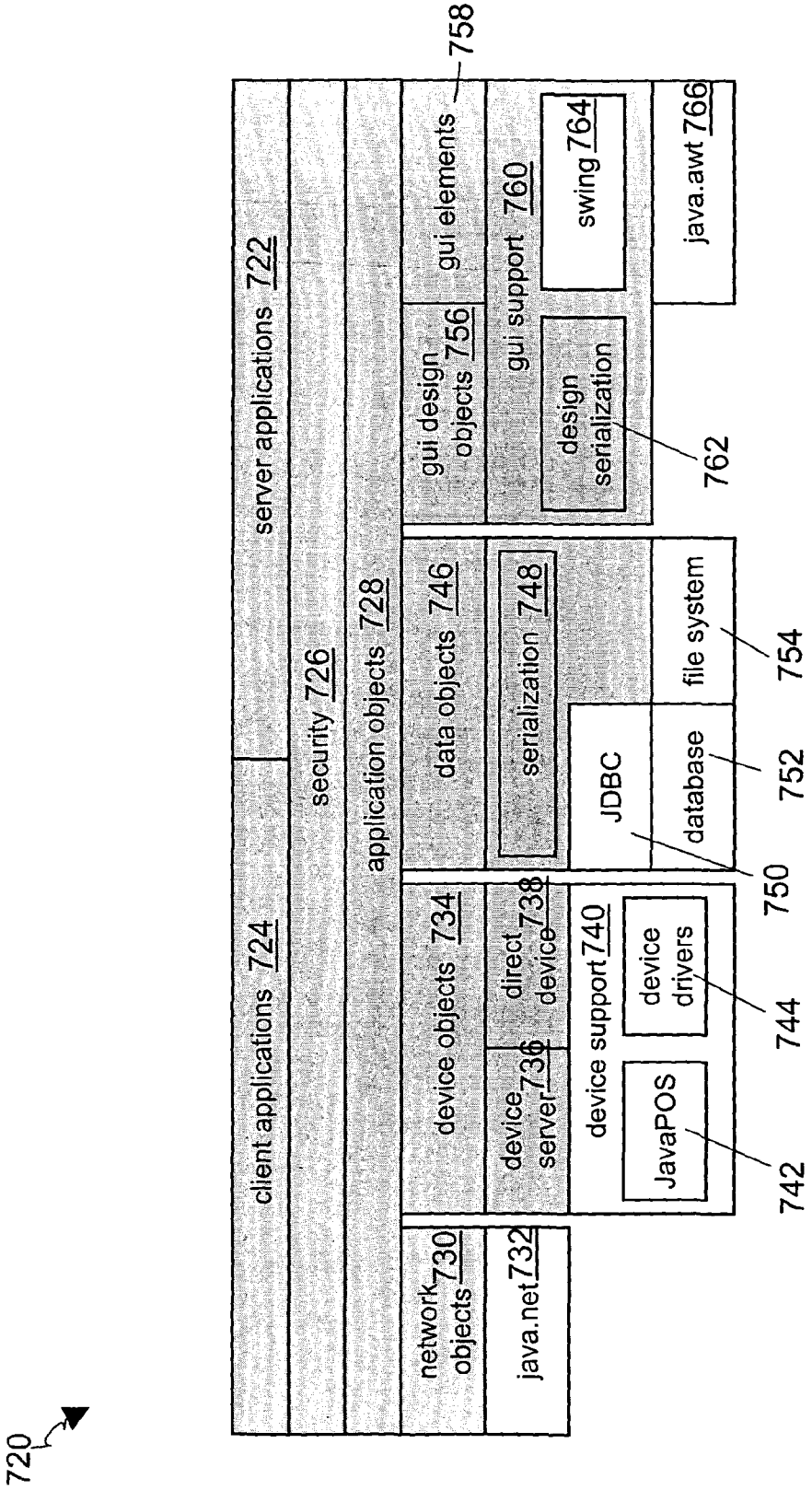

720
client applications 724
server applications 722
security 726
application objects 728
network objects 730
java.net 732
device objects 734
device server 736
direct device 738
device support 740
JavaPOS
device drivers
742
744
data objects 746
serialization 748
JDBC
database
750
752
file system
754
gui elements
758
gui design objects 756
gui support 760
design serialization
762
swing 764
java.awt 766

FIG. 16

800

806

802	Class	804	Guest Check		Level
808	Order	Order #591456			0
	ItemLine	810	1 Hamburger	2.29	1
	OptionLine	812	*no onions*		2
	OptionLine	814	*extra mustard*		2
	ItemLine	816	2 EVM #1 SS	9.78	1
	ComponentLine	818	Dbl QP/Cheese		2
	OptionLine	824	*side pickles*		3
	ComponentLine	820	SS Fries		2
	OptionLine	826	*no salt*		3
	ComponentLine	822	SS Coke		2
	ItemLine		1 Lg Coke	1.29	1
	SubtotalLine		Subtotal	13.36	1
	TaxLine		MA Tax 5%	0.67	1
	TotalLine		Total	14.03	1
	TenderedLine		Cash Tendered	20.00	1
	ChangeLine		Change	5.97	1

FIG. 17

ORDER PROCESSING

TECHNICAL FIELD

[0001] This description relates to order processing.

BACKGROUND

[0002] Order processing occurs in a very wide variety of settings. In some settings, the orders are for goods or services, for example, consumer goods that are to be prepared and delivered quickly after the orders are placed.

[0003] In restaurants serving what is sometimes referred to as "fast food", customers line up at one or more queues at a front counter and place orders for food items. Such restaurants are also sometimes referred to as "quick-serve" restaurants. The customers wait nearby until the orders are processed and delivered at the front counter. Customers then walk to tables with their delivered orders. In this scenario, workers at the restaurant's front counter enter the customer orders into registers, assemble the orders (from food items that are made in response to the orders or are prepared in advance), and deliver the orders. Food items include entrees, appetizers, beverages, and desserts, for example, and any other edible items, whether prepared to order or prepared in advance.

[0004] In general, quick-serve restaurants are distinguished from other types of restaurants by the short time interval between when a customer places an order and when the customer receives the order. In some cases this period could be as long as five or ten minutes or as short as 10 or 15 seconds.

[0005] Quick-serve restaurants also often have drive-through service that enables customers to place orders at an order point and pick up orders at a delivery point while remaining in an automobile. To reduce the delay during busy periods, multiple drive-through service lanes can be provided.

[0006] Order processing for some kinds of goods and services, for example, clothing or electronic products, is done using telephone call centers.

SUMMARY

[0007] In general, in one aspect, the invention features a method that includes maintaining an electronic association between each order received at a place at which goods or services are offered, the goods or services to be delivered at a point in the place, and enabling the association of the order with the delivery place to be altered between the time when the order is placed and the time when the order is delivered.

[0008] In general, in another aspect, the invention features a method that includes maintaining an electronic association between each order point from which an order is received and a point at which the order is to be delivered, and enabling the association of the order point with the delivery point to be altered between the time when the order is placed and the time when the order is delivered.

[0009] In general, in another aspect, the invention features a method that includes receiving orders for goods or services to be delivered quickly, automatically determining a mode or point at which each of the orders was originated, and automatically inferring from the mode or point at which the order was originated, a class of service to be associated with the order.

[0010] Implementations of the invention may include one or more of the following features. The association of the class of service with the mode or point at which the order was originated may be changed at any time.

[0011] In general, in another aspect, the invention features an apparatus that includes stations in a quick-serve commercial establishment, the stations enabling users to enter orders, check the status of orders, and assemble orders for delivery, a network interconnecting the stations, each of the stations comprising storage for data about the orders, and software to cause copies of the data to be cached at multiple ones of the stations. Implementations of the invention may include the feature that each of the stations operates using the cached copies of the data if the station is disconnected from the network.

[0012] In general, in another aspect, the invention features a method that includes receiving data about sources of telephone calls from a data port of a telephone switch, and automatically using the data in connection with entry of orders and fulfillment of orders in a place at which goods or services are delivered.

[0013] In general, in another aspect, the invention features a method that includes accumulating data about characteristics of telephone calls in which orders are received for goods or services that are to be delivered quickly after the orders are received, associating the data with information about the orders, and analyzing the data and the information to correlate features of the telephone calls with features of the orders.

[0014] In general, in another aspect, the invention features a method that includes receiving orders for goods electronically at an order entry point, the orders to be fulfilled by delivery of the goods at a remote delivery point at which the goods are to be quickly prepared in accordance with the orders for delivery to customers at the delivery point.

[0015] Implementations of the invention may include one or more of the following features. Payment for the orders is received electronically at the order entry point. Payment for the orders is received by swiping a credit card through a magnetic stripe reader. Payment for the orders is received by swiping a debit card through a magnetic stripe reader and entering an identifying number in a key pad. A magnetic stripe reader at the order point is set to accept an electronic payment with a payment card and to indicate this ready state to a customer upon receiving the orders at an order point. The ready state of the magnetic stripe reader at the order point indicates to the customer if a previous attempt to make the electronic payment is unsuccessful

[0016] In general, in another aspect, the invention features an apparatus that includes call center equipment to enable a call center operator to process incoming orders for goods to be delivered quickly, and communication equipment to enable the incoming orders to be forwarded to at least two different delivery points, remote from the call center equipment, at which the goods are to be delivered.

[0017] In general, in another aspect, the invention features a method that includes receiving an electronic image of a

customer, and associating the electronic image with an order of a customer for goods or services that are to be prepared and delivered quickly to the customer at a delivery location.

[0018] Implementations of the invention may include one or more of the following features. The contents of the order may be displayed with the electronic image. The order may be displayed according to the displayed contents. The electronic image of the customer is captured at the ordering location. The electronic image of the customer is captured at a location other than the ordering location. The electronic image of the customer is used to identify the customer in connection with the delivery of the goods or services. Information about the customer is associated with the electronic image of the customer. The information includes data useful in automatically determining features of an order for the customer. The information includes historical information about orders previously placed by the customer. The features include the identity of the delivery location. The features include the nature of the goods and services to be ordered. The goods or services include quick-serve items. The quick-serve items include food. The electronic image is captured at a quick-serve drive-through ordering station, and the image is used at a delivery station in the vicinity of the drive-through ordering station. The image is stored in connection with the order, and the image is used in connection with a subsequent order. Images of customers associated with multiple orders are displayed at a point at which the goods or services are to be delivered, the images being displayed in a sequence, and the sequence can be re-ordered to represent a sequence in which the customers are expected to appear at the delivery point. The electronic image is captured as a still frame of a video sequence of a video capture device. The video capture device is associated with a security surveillance system. The electronic image includes a low-resolution image. The image is captured automatically in response to a change of the state of the order for the customer.

[0019] In general, in another aspect, the invention features an apparatus that includes a self-service order kiosk at which a customer places an order for goods or services to be prepared and delivered quickly after the order has been placed, and an image capture device to capture an image of the customer at the kiosk when the order is placed.

[0020] In general, in another aspect, the invention features a method that includes receiving orders from customers for goods or services to be prepared and delivered quickly to the customers, receiving information about the context in which the orders have been received, and prioritizing the orders for delivery based on the contexts.

[0021] Implementations of the invention may include one or more of the following features. The orders are also prioritized based on the times when the orders were received. The context includes the order point from which the order is placed. The order point includes one of a drive-through lane, a kiosk, a table, or a play place of a quick-serve restaurant. Each of the orders is marked electronically with a priority.

[0022] In general, in another aspect, the invention features a method that includes enabling a manager to access a management database of a quick-serve restaurant location remotely through a web interface.

[0023] In general, in another aspect, the invention features a method that includes obtaining a dynamically changing IP address of a quick-serve restaurant automatically from a server.

[0024] In general, in another aspect, the invention features a method that includes receiving electronically from an order point, an order of a customer for goods or services to be prepared and delivered quickly to the customer in a commercial establishment, informing the customer at the order point of an identifier to be displayed at a delivery point in the commercial establishment, the delivery point being different from the order point, and electronically associating the identifier with the order.

[0025] In general, in another aspect, the invention features a method that includes receiving at a call center, a call from a customer of a quick-serve restaurant that is remote from the call center, accepting an order from the customer at the call center, and electronically communicating information about the order to the restaurant to cause the order to be fulfilled at the restaurant.

[0026] In general, in another aspect, the invention features a method that includes a customer in a restaurant placing an order by speaking with an order taker by telephone, and the order taker entering the order into a user interface of an order management system.

[0027] In general, in another aspect, the invention features an apparatus comprising an image capture device to capture an image of a customer in an automobile at an order point of a drive-through lane of a quick-serve restaurant, and software to associate the image with an order placed by the customer at the order point.

[0028] These and other embodiments may have one or more of the following advantages. Order processing is made simpler and less expensive. Placing orders and receiving them is made simpler, easier, and more comfortable. New modes of receiving, entering, preparing, and delivering orders are made possible. In the case of a quick-serve restaurant, customers can sit comfortably at a table to order food and while waiting for delivery. Customers can watch their children play in a play area while ordering food and then waiting for the food. The multi-lane, multi-order point drive-through food order and delivery system enables restaurant workers to match customers with customer food orders regardless of the sequence of customer arrivals at the food delivery points, through the use of customer images captured at the multiple order points, as well as other means. Using a telephone call center for order entry reduces labor cost and enables specialized call center workers to handle surges in business at meal times. Moreover, by handling calls from restaurants in different time zones, the call center staff can remain fully utilized all day long. Worker's compensation insurance is less expensive for call center workers than for in-restaurant staff because of the relatively safer work environment.

[0029] Other advantages will become apparent from the following description and from the claims.

DESCRIPTION OF DRAWINGS

[0030] **FIG. 1** is a schematic view of a restaurant.

[0031] **FIG. 2** is another view of the restaurant of **FIG. 1**.

[0032] **FIG. 3** is a graphical user interface for order entry.

[0033] **FIG. 4** is a graphical user interface for accepting payment for orders and making change.

[0034] **FIG. 5** is a graphical user interface for matching customers with orders.

[0035] **FIG. 5A** is another graphical user interface for matching customers with food orders.

[0036] **FIG. 5B** is a graphical user interface for matching customers in a drive-through window with orders.

[0037] **FIG. 6** is a graphical user interface to specify food production requirements and **FIG. 6A** is a graphical user interface to specify food production requirements in another language.

[0038] **FIG. 7** is a graphical user interface for a manager of a restaurant.

[0039] **FIGS. 7A and 7B** are other interfaces for a manager of a restaurant.

[0040] **FIGS. 8-10** are graphical user interfaces for customers to enter orders by themselves.

[0041] **FIG. 11** is another view of the restaurant of **FIG. 1**.

[0042] **FIG. 12** is a schematic view of the telephone connections for the restaurant of **FIG. 1**.

[0043] **FIG. 13** is a schematic view of the drive through for the restaurant of **FIG. 1**.

[0044] **FIG. 14** is a view of the software architecture of restaurant management software.

[0045] **FIG. 15** is a view of an implementation of the restaurant management software of **FIG. 14**.

[0046] **FIG. 16** is a schematic view of software system objects of the restaurant management software of **FIG. 14**.

[0047] **FIG. 17** is a table with data describing an order.

DETAILED DESCRIPTION

[0048] In what follows, an "order" is a set of items chosen by a customer. These items can include both standard items and customized items. For example, in the context of a quick-serve restaurant, the order could include a standard "large fries" and a customized "hamburger with pickles and onions, no mustard or mayonnaise." An "order point" is a logical location where a customer places his order, for example, the order point could be at the front counter or at the drive-through lane. An "order entry point" is a logical location where information about the order is entered in a machine-based system that manages orders. A "payment point" is a logical location at which payment is made for the order, for example, a cashier position at a front counter. "Marking" an order is an action that labels a customer's order with information that is useful for uniquely identifying the customer at the time of delivery. A "delivery point" is a logical location where the customer receives the order, for example, at a table in a restaurant.

[0049] Referring to **FIG. 1**, in one example of a commercial context in which orders for goods or services are processed, a quick-serve restaurant **2** includes a front counter **4**, an order area **6**, and a delivery area **6'**. The restaurant **2** uses restaurant management software and a database to manage the placing of orders, the entry of orders, the preparation of the food in accordance with the orders, and the assembly and delivery of the orders, among other things. In one mode of operation, workers at the front counter **4** receive food orders and payment from customers in an order area **6** (which then serves as both the order entry point and the payment point) and enter them into the database using order entry terminals. Customers in the delivery area **6'** (which then serves as the delivery point) wait for deliveries of the orders from the front counter **4**. At a kitchen **8**, workers produce food items to fulfill the orders and send the food items to a landing zone **10**.

[0050] The restaurant management software determines production requirements for food items at any given time from the orders stored in the database, determines production instructions from these requirements, and displays the production instructions on kitchen video displays (not shown). The restaurant management software develops these production instructions by matching production resources with production requirements and balancing the loading of the resources. Production resources include grills for cooking food. Thus, in some examples, the restaurant management software can balance the production loading of kitchen grills by displaying different orders to be processed on kitchen video displays in front of different kitchen grills. Workers at the front counter **4** take food items from the landing zone **10** and from other supplies of prepared food items, assemble the orders according to order information presented by the restaurant management software on the kitchen video displays, and deliver the orders to customers in the delivery area **6'**. Customers leave the restaurant **2** with the food orders or consume the food orders in a dining room **12**. The dining room **12** is divided into a seating area **12'** and a café**12"**. The restaurant may be organized in a wide variety of other configurations. And a wide variety of modes of order taking, order entry, food item preparation, order assembly, and order delivery can be used.

[0051] For example, in another mode of operation, customers place orders using telephones (not shown) while sitting at tables (the order points) in the cafe **12"**. Order takers working at an order entry area **16** (the order entry point) receive the calls from the telephones at the tables. Each telephone at a table in the cafe **12"** has a unique extension identifier in a telephone switch (not shown), enabling the restaurant management software to associate an order with a specific table (order point and delivery point) automatically. When the order takers at the order entry area **16** enter the orders, the identities of the tables from which the orders are placed are thus automatically entered into the database from information provided by the telephone switch. Alternatively, the delivery point information may be entered manually by the order taker from information displayed at order entry stations at the order entry area **16**. As before, workers in the kitchen **8** process the food items according to the orders (for example, an order may request a large hamburger, well done, with mustard and mayonnaise, on a sesame seed bun). Expeditors in the landing zone **10** assemble the orders and deliver the orders to tables in the cafe **12"** according to the identities of the tables associated with each order. Customers may pay by either swiping a credit card in a machine (not shown) at the customer's table

or by making a cash payment to expeditors delivering the orders at tables in the cafe **12**". Customers eat the food at tables in cafe **12**".

[**0052**] Many other modes of operation are also possible, not limited to the following examples.

[**0053**] In another mode of operation, customers place orders at "free-standing" telephone trees **14** and **14'** to order takers at order entry area **16**. The telephone trees **14** and **14'** are clusters of telephones that are separate from tables or counters and are available for calls to order entry area **16**. Because the telephones in telephone trees **14** and **14'** are not associated with particular tables, a method is provided to enable the customers and the expeditors to correctly associate an order with a table at which it is to be delivered. One example method is to provide table tents to the customers to post on the table at which they are going to eat. Each table tent bears a unique number large enough to be visible at some distance. While placing an order, the customer communicates the tent number to the order taker. The order taker enters the number into the system so that it becomes associated with the order in the database. After placing the order, the customer pays at the front counter **6'**, displays the table tent on the table, and waits for the delivery of the order.

[**0054**] In another mode of operation, customers place orders at a telephone tree **22** (or simply an individual telephone) located in a playplace **20**, where young children can play while families wait for deliveries of orders. Parents placing orders at telephone tree **22** can supervise their children playing in the playplace **20**. Table tents can be used, as in the earlier example, to identify the table or other delivery point at which the customer wants to receive the order.

[**0055**] In some examples, customers in the restaurant **2** can directly place orders using customer self-service kiosks in a designated area (not shown) away from dining room **12**. Each customer kiosk is linked to the database. While the order is being placed, the kiosk takes a picture of the customer with a digital camera and enters the image into the database, linked to the order. When the order is finished, an expeditor delivers it to the customer matching the picture and seated in dining room **12** and collects a cash payment, unless the customer has already made payment by swiping a credit card at the customer self-service kiosk. More details of the customer self-service kiosks are explained below.

[**0056**] The restaurant **2** also includes a manager's office **24** with access to real-time data describing orders and food production status presented by the restaurant management software.

[**0057**] In another mode of order processing, customers can place and pick up orders using a drive-through lane outside the restaurant. Using the drive-through mode, the customers place orders (with order takers in the order entry area **16**) through telephones at one or more order points located in one or more lanes of a drive-through **26**, view their orders on drive-through displays (not shown), pay a cashier through a window **28** (the payment point), and pick up the orders through a delivery point window **30**. Additional order points and drive-through displays are provided ahead of the lanes of the drive-through **26** in a so-called zoom-through **32**. Customers who do not need extra assistance from live order takers and can pay quickly using a credit card, place orders at order points in the lanes in the zoom-through **32** with workers in the area **16**. Such extra assistance includes questions about menu choices. Customers who do need the extra assistance from operators in the area **16** place orders at order points in the lanes of the drive-through **26** with operators in the order entry area **16**. Customers who enter in the zoom-through **32** and need extra assistance from a live order taker are asked to move forward to the drive-through **26**.

[**0058**] Cameras (not shown) at the order points in drive-through **26** and zoom-through **32** are configured to capture digital images of customers in their automobiles placing orders. For example, the digital cameras used may be part of the restaurant's security surveillance system. In such a case, the restaurant management software directs the security system to extract a still frame from the video stream coming from the appropriate one of its cameras. The same camera may thus be used for both general security purposes as well as customer identification. These digital images are stored in the database, wherein they are associated with the related orders. When a customer arrives at the cashier at the window **28**, the cashier views a gallery of digital customer pictures on a display and identifies the customer by matching the correct displayed image with the live customer. Since there are only a few pictures on the display to compare with the customer at the window **28**, a low-resolution image, for example, of at least 180 horizontal pixels by 135 vertical pixels, is sufficient to match the customer with a picture. Based on this match, the restaurant management software presents a bill for the order to the cashier. The cashier tells the customer the amount due, and the customer pays the cashier. When the customer arrives at a delivery point at the window **30**, a worker views the customer picture gallery again to match the customer's picture (and related order) to the live customer. The restaurant management software presents a list of items in the order along with an indicator that the bill has been paid or not. If the bill has been paid, then the worker assembles the order and delivers it to the customer.

[**0059**] In some of the examples discussed above, the order takers have been removed from their usual place at the order counter of the restaurant to a place in the non-public parts of the restaurant. But the order takers need not even be in the restaurant. They could be, for example, in an adjacent or nearby building directly connected to the telephone switch of the restaurant.

[**0060**] In other examples, the order takers are located at a place that is remote from the restaurant **2** and is not directly wired to the telephone switch of the restaurant. The remote location can be a telephone call center. By locating the order entry point in a telephone call center, the process of receiving and entering the orders can be streamlined and made quicker. Hiring, management, and training of the order takers can be separated from hiring, management, and training of the workers in the restaurant. Labor costs may be reduced. For example, the workers' compensation insurance costs for employees working in the call center, an office environment, may be lower than for employees working the relatively more hazardous environment of the restaurant.

[**0061**] Additional efficiencies can be achieved by locating order takers for multiple restaurants in the telephone call center. By handling a larger volume of order taking, the

order takers can be more highly trained and more focused on the order taking activity than may be possible in a restaurant where the order taker may have to take on additional responsibilities. Less overall staff is required because it is possible to utilize all the capacity of an order taker who services customers at multiple restaurants. Furthermore, the multiple restaurants **2** can be located in multiple time zones. Because the volume of received orders from each of the time zones varies in a predictable way during a twenty-four hour period, an intense order entry period in one time zone may be followed by an intense order entry period in the next time zone, and the load on the central order takers can be balanced in a manner that takes advantage of this predictable variation. The telephone call center is described in more detail below.

[**0062**] Referring to **FIG. 2**, view **50** of the restaurant **2** shows order terminals **52** for order takers at the front counter **4**. In some examples, referring to **FIG. 3**, order takers at the front counter **4** use a graphical user interface **100** displayed on the order terminals **52**, to enter orders. In some examples, referring to **FIG. 4**, cashiers at the front counter **4** use a graphical user interface **125** displayed on the order terminals **52** to enter payment for orders and provide change to customers. Drive-through cashiers in the payment area **28** can also use the graphical user interface **125** displayed on the terminals **54** to enter payment and provide change.

[**0063**] Referring to **FIG. 5**, cashiers at the front counter **4** can also use a graphical user interface **130** displayed on the order terminals **52** to match a customer with a food order. The graphical user interface **130** shows a gallery of unfilled orders each with an order number **132**, the contents of the order **134**, and the price **136** for each unfilled order. The graphical user interface **130** also includes an elapsed time **138** since a customer's order was entered.

[**0064**] Expeditors working at the front counter **4** and serving food to the dining room **12** view the terminals **56** to assemble the orders. Referring to **FIG. 5A**, these expediters at the front counter **4** can use a graphical user interface **140** to match a customer with an order. The graphical user interface **140** shows a gallery of unfilled orders each with an order number **142**, the contents of the order **144**, and an indication of the delivery point, for example, delivery at a table bearing a table tent number **146**. The expeditors match a customer with an order by comparing the table tent number **146** or the order number **142** of a customer with the orders shown in the graphical user interface **140**. Once a food order is identified on the graphical user interface **140**, an expeditor can read the food items for the order, assemble the order accordingly, and deliver it to the location indicated.

[**0065**] Referring to **FIG. 5B**, drive-through cashiers in the payment area **28** (the payment point) and drive-through presenters in the drive-through delivery area **30** also can use interfaces **150** and **160** to match the current customer at the window with an order. The interface **150** displays pictures **152** of customers with unfilled orders in an order gallery. The restaurant management software sorts the unfilled or pending orders in a sequence in which the customers are expected to appear at the delivery point (based on when the customers enter their orders) and puts this sequence into an order gallery. Interface **150** also includes an order number **154**. The drive-through cashiers in the payment area **28** and the drive-through presenters in the delivery area **30** each click on a picture **152** in the interface **150** that matches the view of the current customer at the cashier's or presenter's window. This highlights an order in the interface **160**. Interface **160** includes an order gallery with unfilled orders that includes for each unfilled order an order number **162**, the contents of the order **164**, and the price **166**. The drive-through cashiers know how much to charge a customer by viewing price **166** of a highlighted order in interface **160** and the drive-through presenters know how to assemble an order by viewing contents of highlighted order **164** in interface **160**.

[**0066**] In addition to the terminals, registers, and workstations that display and receive order information, the restaurant includes other hardware devices that interact with the restaurant management software.

[**0067**] For example, an automatic beverage system **58** (**FIG. 2**) automatically dispenses the drink portion of an order. The restaurant management software manages the automatic beverage system **58**. An example of an automatic beverage system is available from IMI Cornelius of Anoka, Minn., USA.

[**0068**] Kitchen video displays (KVD) **60** display food production requirements created by the restaurant management software. In some examples, the kitchen video displays **60** present the food production requirements using the interface **170**, as illustrated in **FIG. 6**. A particular kitchen video display **60** is in front of grill "grill **01**". The interface **170** includes an identifier **172** that indicates the identity of the grill "grill **01**". The interface **170** also includes a customer order number **174** and the contents of the order **176**. The interface **170** shows five of the seven orders displayed in the interface **140** because the restaurant management software has determined that grill "grill **01**" can only handle the five orders. With production resource load balancing, other grills in kitchen **8** are designated to handle the other orders. In some examples, the restaurant management software can be configured to display the interface **170** in other languages such as interface **180**, illustrated in **FIG. 6A**.

[**0069**] The restaurant management software uses printers **62** to print slips for custom orders for food item production. The slips are attached to orders throughout the process of food item production. The restaurant management software also uses the printers **62** to print receipts for payment for orders.

[**0070**] A KVD controller **64** is a software component of the restaurant management software that controls the KVDs **60**.

[**0071**] A drive-through display **66** displays orders to customers in the drive-through **26** and zoom-through **32**. This display enables each customer to get visual confirmation of his or her order.

[**0072**] A system server **68** manages interactions for a central computer database for the restaurant management software.

[**0073**] A manager station **70** allows a manager of the restaurant **2** to view food production and service activity in the restaurant. In some examples, a manager station **70** displays a graphical user interface **190**, as illustrated in **FIG. 7**. The manager station **70** can use a broadband data line **72** to link the manager to the Internet. Referring to **FIGS. 7A**

and 7B, managers can view information about the multiple restaurants **2** using interfaces **192** and **196** over the Internet. These managers can also modify menus and change prices using interfaces **192** and **196**. An interface **192** shows a recipe for coffee with options at a particular restaurant **2**. A button **194** enables a manager to modify the recipe. An interface **196** shows hot beverages, cold beverages, and shakes available at a particular restaurant **2**. The manager's interface is linked directly to the database in the restaurant (without the intervention of any intermediary database or process), so that information presented to the manager is derived directly from the database of the restaurant and changes made by the manager through the interface are committed directly to the database in the restaurant.

[**0074**] Customer self-service kiosks **74** enable customers to enter orders without requiring a human order taker at the other end of a telephone. A customer kiosk **74** includes a camera that takes a digital picture of a customer (similarly to the taking of a picture for a drive-through customer as described earlier) during order entry so that expeditors in the restaurant **2** can identify the customer for delivery of the order. The expeditor uses an interface similar to the gallery of pictures and orders in interface **150** to match the customer to his or her order for payment and delivery.

[**0075**] In some examples, referring to **FIG. 8**, the customer kiosks **74** provide an interface **200** on a touch screen. A customer touches a button **202** to begin entering an order. The customer then touches a button **212** in an interface **210** to specify that the order is to be eaten in the restaurant **2** or the button **214** to specify that the order is to be eaten outside of the restaurant **2**.

[**0076**] Referring to **FIG. 9**, an interface **220** enables the customer to add different food items to the order. Referring to **FIG. 10**, an interface **230** shows the customer the current order and enables the customer to enter the order by clicking on a button **232** or add more food to the order by clicking on a button **234**. An interface **240** shows the customer that the order has been entered. Subsequently, the customer leaves the kiosk **74** (freeing it up for the next customer), goes to a cashier at front counter **4** to pay for his order, and waits for delivery at the front counter **4**. Otherwise, the customer sits in the dining room **12** and waits for an expeditor to deliver the order there.

[**0077**] Referring to **FIG. 11**, in an example of the physical arrangement of devices in a restaurant, the front counter **4** includes cashier stations **302** and **304** having an order entry capability and an order taker telephone **306**. The front counter **4** also includes a printer **308**. The kitchen **8** includes kitchen video system monitors **310**, **312**, **314**, and **316** and a printer **318**. The landing zone **10** includes expeditor monitors **320** and **322** in addition to a printer **324**. The seating area **12'** includes tables **326** and **328**. The café**12"** includes tables **330**, **332**, **334**, and **336** having customer telephones **338**, **340**, **342**, and **344**, respectively. The telephone tree **14** includes customer telephones **350**, **352**, and **354**. The telephone tree **14'** includes customer telephones **356**, **358**, and **360**. The order entry area **16** includes order entry stations **370**, **372**, and **374** in addition to order taker telephones **376**, **378**, and **380**. The playplace telephone tree **22** includes telephones **384** and **386**. The drive-through lanes **26** include speaker/microphones **390** and **392** in addition to drive-through displays **394** and **396**. The drive-through lanes **26** also include cameras **398** and **400**. The drive-through cashier payment area **28** includes a cashier station **402** with an order entry and order taker telephone **404**. The drive-through presenter **30** includes a cashier station **406** with an order entry and expeditor monitor **408**, and an automatic beverage system **410**. The zoom-through area **32** includes cameras **414** and **416**, drive-through displays **418** and **420**, and speaker/microphones **422** and **424**. The cashier stations **302**, **304**, **382**, **402**, order entry stations **370**, **372**, **374**, expeditor monitors **320**, **322**, kitchen video system monitors **310**, **312**, **314**, **316**, and drive-through displays **394**, **396**, **418**, **420** are linked together using a network **462** (shown in **FIG. 12**).

[**0078**] Referring to **FIG. 12**, customer telephones **332**, **336**, **340**, **344**, **350**, **352**, **354**, **356**, **358**, **360**, **384**, **386**, **390**, **392**, **422**, and **424** are connected to order taker telephones **376**, **378**, **380**, and **402** using a telephone switch **452**. The telephone lines **454** connect the customer telephones to the telephone switch **452** while the telephone lines **456** connect the phone switch to the order taker telephones. The telephone switch **452** communicates to telephone switch interface **458** the phone extension of a customer telephone from customer telephones **332**, **336**, **340**, **344**, **350**, **352**, **354**, **356**, **358**, **360**, **384**, **386**, **390**, **392**, **422**, and **424** every time an order taker receives an order from a customer using a customer telephone. The telephone switch interface **458** extracts the extension numbers of the calling and receiving phones by scanning data the phone switch **452** writes to its Station Message Detail Recording (SMDR) port. The switch interface **458** is connected to the phone switch **452**'s SMDR port via a serial RS-232 standard printer interface **460**. The restaurant management software running on server **464** receives the telephone extension information, looks the extension information up in a table linking extension numbers with order locations and order entry locations, and furnishes the resulting order point location information to an order entry terminal (from the appropriate order entry stations **370**, **372**, **374**, and **404**) with an order entry location matching the order taker's extension. The order entry terminal then adds the order location information to the order record. In some examples, the network **462** is a Transmission Control Protocol/Internet Protocol (TCP/IP) network. The restaurant management software matches this location information to a number designating a table **330**, **334**, **338**, or **342** and communicates this table number with an order record to the database on server **464** using network **462**.

[**0079**] In some examples, the restaurant management software can be configured to use the information about the location of the customer placing the order to modify the prices charged for each item in a food order and displayed in interface **100**. For instance, prices could be lower for customers ordering food in the drive-through **26** or the zoom-through **32** than for customers in the dining area **12**. The software could also adjust other aspects of the order based on the identity of the order point.

[**0080**] In some implementations, the telephones in the restaurant **2** may be replaced by Voice over Internet Protocol (VOIP) enabled computers using a TCP/IP network, with each of the computers having a speaker and a microphone. In these examples, the telephone switch **452** is not necessary and the location of a customer using a VoIP enabled computer is determined by the TCP/IP address of the VoIP

enabled computer. Other electronic devices capable of transmitting voice communications between customers and order takers can also be used.

[0081] The telephone switch **452** is able to monitor the availability of order taker telephones **376**, **378**, **380**, and **402** and connects customers on the customer telephones **332**, **336**, **340**, **344**, **350**, **352**, **354**, **356**, **358**, **360**, **384**, **386**, **390**, **392**, **422**, and **424** only with available order takers. During surges in business in restaurant **2**, there might be more customers on customer telephones than order takers able to take orders. During such surges, customers must be placed on hold until an order taker is available. To handle such situations, the telephone switch **452** can be configured to prioritize the customer telephones based on the classes of the customer telephones that define the context of each customer order. These classes are defined by the locations of the customer telephones and can be matched to different levels or classes of service. In some examples, the highest priority is given to the customer microphones/speakers **422** and **424** for the zoom-through **32**, the next priority is given to the customer telephones **390** and **392** for the drive-through **26**, the next priority is given to the customer telephones **350**, **352**, **354**, **356**, **358**, and **360** for the phone trees **14** and **14'**, the next priority is for the customer telephones **332**, **336**, **340**, and **344** for café**12"**, and the last priority is for the customer telephones **384** and **386** for the phone tree **22** in the playplace **20**. This prioritization reflects the different anticipated needs of customers in restaurant **2** and can be modified. Furthermore, the prioritization can be modified based on the time of day. Based on these considerations, for each customer order, the order is marked with a set priority after the order is entered into the restaurant management software. The marking and prioritization of orders into service classes can be done whether or not there is an overload on available order takers.

[0082] For example, assume customers make the following telephone calls in the following time sequence to place orders: order A (from telephone **352** in phone tree **14**), order B (from telephone **384** in phone tree **22** in the playplace **20**) and order C (from microphone/speaker **422** in zoom-through **32**). Assuming only one order taker in area **16**, the order taker handles the calls in the following order: order C, order A, and order B. Even if there were enough order takers to handle all calls immediately, the priority information could be associated with each order and used to process the orders in different ways.

[0083] In the quick-serve restaurant **2**, an order may be placed from the telephone trees **14** or **14'** as follows. A customer picks up one of the customer telephones **350**, **352**, **354**, **356**, **358**, or **360**. The telephone switch **452** directs the new call to an available order taker using one of the telephones **376**, **378**, **380**, or **402**. The available order taker greets the customer and enters the customer's order using the interface **100** on one of the order entry stations **370**, **372**, **374**, or **404**. However, the restaurant management software does not yet add the order items to the production requirements. The order taker asks the customer to take an available numbered table tent. The customer tells the order taker the number on the table tent. The order taker enters the table tent number into the order and tells the customer to proceed to one of the cashier stations **302**, **304**, or **382**. When the customer arrives at the cashier station **302**, **304**, or **382**, the cashier asks for the table tent number and picks the customer's order from the gallery of orders using the user interface **140**. The customer may add items to the order and the cashier can enter the items using an order entry station. The cashier accepts a cash payment from the customer and makes change. The restaurant management software is configured to add the contents of the order to the production requirements. Workers in the kitchen **8** process the order. An expeditor in the landing zone **10** assembles the order and delivers the order at the table tent indicating the customer's chosen delivery point.

[0084] In another example, in the restaurant **2**, to order food from the café**12"** or the playplace **12'** using a credit card, the customer picks up a telephone from one of the customer telephones **332**, **336**, **350**, **344**, **384**, or **386**. The telephone switch **452** directs the new call to an available order taker on one of the telephones **376**, **378**, **380**, or **402**. The order taker greets the customer and requests a payment method. Because the customer wishes to use a credit card for payment, the order taker directs the customer to swipe a credit card in a machine at the customer's table or at the telephone tree **22** and the customer swipes the credit card. The restaurant management software automatically makes a request for approval by the card issuer for a predetermined amount to be charged to the customer's credit card. . The order taker enters the customer's order using the interface **100** on one of the order entry stations **370**, **372**, **374**, or **404**. If the customer is located at the telephone tree **22**, the customer is also directed to choose a table tent as explained earlier. The order taker tells the customer to wait for delivery of the order. In some examples, the restaurant management software can provide a time estimate for the delivery of the food order. In such examples, the order taker can inform the customer of this time estimate. The restaurant management software waits for approval of the credit card. The restaurant management software adds the contents of the order to production requirements. The new production requirements are displayed on the kitchen video system monitors **310**, **312**, **314**, and **316**. Workers in the kitchen **8** produce the contents of the order according to these new production requirements. When the order is complete and payment is authorized, an expeditor assembles and delivers the order to the customer at the location from which the customer called (when seated at table **330**, **334**, **338**, or **342**) or at which the customer has placed the table tent (at table **326** or **328**).

[0085] In the restaurant **2**, to order food from the cafe **12"** or playplace **12'** using cash, the customer indicates to the order taker that the customer intends to pay with cash. After the order taker enters the customer's order, the expeditor (or a cashier) sees an unpaid café or playplace order and prints a guest check using a printer **324** or **308**. The expeditor finds the customer based on a table number (indicating a table from **330**, **334**, **338**, or **342**) or a table tent number (located on table from **326** or **328**) on the receipt and greets the customer. The expeditor accepts a cash payment from the customer and provides any necessary change to the customer. The expeditor returns to a cashier at one of the cashier stations **302**, **304**, or **382** and pays for the order. The restaurant management software adds the contents of the order to the production requirements. When the order is complete, the expeditor assembles the order in the landing zone **10** and finds the customer based on a table number or a table tent number on the receipt and delivers the food order to the customer.

[0086] Referring to **FIG. 13**, the drive-through entrance **26** includes lanes **508** and **510** that merge at a point **502**. The zoom-through entrance **32** includes lanes **516** and **518**. The drive-through lanes **508** and **510** merge with the lanes **516** and **518** of the zoom-through **32** at a point **504**. The restaurant **2** includes a parking lot **506**. The drive-through lanes **508** and **510** have sensors **512** and **514** embedded in the pavement that send a signal to the telephone switch **452** when an automobile enters the lanes **508** and **510**. The zoom-through lanes **516** and **518** have sensors **520** and **524** embedded in the pavement that send a signal to the telephone switch **452** when an automobile enters the lanes **516** and **518**. A stop/go light **526** indicates to customers in the drive-through **26** whether to stop at a cashier window **28** or not. In the restaurant **2**, to order food using the drive-through **26**, the customer drives up to the drive-through **26** at either lane **508** or **510**. The sensor **512** or **514** under the pavement signals the telephone switch **452**. The telephone switch **452** sets up a new call for either microphone/speaker **390** or **392** with an order taker at one of the order taker telephones **376**, **378**, **380**, or **402**. The order taker greets the customer and requests a payment method. If the customer is not ready, the order taker instructs the customer to signal when the customer is ready and hangs up. The process begins again when the customer calls again. If the customer wishes to use a credit card, the order taker directs the customer to swipe a credit card at a machine located beside the lane **508** or **510**. Approval is sought as explained earlier, but the restaurant management software assumes that approval will be granted. The order taker receives the order from the customer and enters the order using the interface **100**.

[0087] A camera **398** or **400** takes a digital picture of the customer when the order taker enters a first food item of the order. The restaurant management software displays the food items of the order to the customer using the drive-through display **394** or **396**. The customer confirms to the order taker that the order is correct. The restaurant management software adds the contents of the order items to the production requirements and the order is produced as explained earlier.

[0088] At the cashier area **28** (the payment point), a cashier uses the digital picture of the customer to match the customer with his order using the interface **150**. If the customer has not already paid with a credit card, the restaurant management software flips the stop/go light **526** to "stop", and the cashier accepts cash payment from the customer and makes change. If the customer has already paid with a credit card, the restaurant management software flips the stop/go light **526** to "go". At the delivery window **30**, an expeditor uses the digital picture of the customer to match the customer with his order using the interface **150**, verifies that the customer has made payment, assembles the order according to the information displayed on the interface **160**, and delivers the assembled food order and a receipt to the customer. To order food using the zoom-through entrance **32**, the customer drives to the zoom-through entrance **32** at either lane **516** or **518**. The sensor **520** or **524** signals the telephone switch **452**. The telephone switch **452** sets up a new call as in the earlier example. If the customer wishes to use a credit card, the order taker directs the customer to swipe a credit card at a machine located beside lane **516** or **518**. As in the earlier example, the restaurant management software assumes approval will be granted. The order taker receives the order from the customer and enters the order using the interface **100**. A camera **414** or **416** takes a digital image of the customer when a first item is added to the order. The restaurant management software displays the contents of the food order using the drive-through display **418** or **420**. The customer confirms to the order taker that the order is correct. When ordering is complete, the order taker directs the customer to proceed to merge point **504**. The restaurant management software adds the contents of the food items to production requirements. At the delivery window **30**, an expeditor views the digital image of the customer to match the customer with a order, verifies that the customer has made payment, assembles the order, and delivers the assembled order and a receipt to the customer.Referring to **FIG. 14**, the restaurant management software **600** includes a portion that runs on a central server in the restaurant and is called a restaurant management system (RMS) server **604**. The server **604** stores restaurant status and order status information for local viewing at registers, stations, terminals, and other devices connected to a local area network. The RMS server **604** tracks the current state of restaurant **2** (for example, open or closed) and also tracks the state of all pending orders at all times and stores this information in a "shoebox" database **605**. Since information about pending orders includes a dynamic association of each order with a delivery point, a customer can change his or her mind about the delivery point and a new delivery point can be recorded in database **605** for the order.

[0089] Status information to be viewed from or used by other devices or to be archived for later analysis and use are archived in a database **602**. In some examples, the computer database **602** is a Structured Query Language (SQL) database, e.g., a Microsoft Data Engine (MSDE) database. In effect, the shoebox database **605** is a redundant storage facility that holds order status information for pending and recent orders and also keeps backup copies of the orders indefinitely. The order information is updated frequently and circulated among the local devices in the restaurant (and also to the call center if one is being used). The database **602**, on the other hand, maintains a complete history of orders for a long period of time for later analysis and display.

[0090] Each of the cashier stations **302**, **304**, **382**, **402**, and **406** has a restaurant management system client application **606** and a database **607**. The database **607** stores information about cash and transactions for each cashier station in addition to information about operators at the cashier station. The databases **607** ensure that each of the cashier stations **302**, **304**, **382**, **402**, and **406** is capable of running in a standalone mode by operating on stored or cached data if any of the cashier stations become disconnected from network **462**. It is essential that records of cash at cashier stations **302**, **304**, **382**, **402**, and **406** be maintained even if any cashier stations become disconnected from network **462**. This ensures that theft of cash from cashier stations can be detected. The databases **607** maintain such cash records. The register-specific database **607** includes a shoe-box database that is a version of the shoe-box data maintained by the RMS server **604**.

[0091] The register applications **606** communicate with the phone system interface **458** to identify the phone extensions (and locations) of customer telephones **332**, **336**, **340**, **344**, **350**, **352**, **354**, **356**, **358**, **360**, **384**, **386**, **390**, **392**, **422**, and **424**. When an order taker begins entering the customer's order, the register application **606** for the order taker's order

entry station queries the phone system interface **458** for the extension of the telephone in restaurant **2** that is currently connected with the order taker's telephone. The phone system interface **458** returns this telephone extension to the register application **606** used by the order taker. The register application **606** then associates the customer's telephone extension with the customer's order. Using this association, the register application **606** can immediately classify a customer order placed over a customer telephone by its order point and in the case of customer orders from café**12**", register applications **606** can assign the locations of the telephones **332**, **336**, **340**, **344** to be the delivery points for the orders as a dynamic association.

[**0092**] Since the order taker's register application **606** also easily associates the identity of the order taker with the customer's order, data can be recorded on the order taker's productivity in handling customer orders. This data can be used to improve the productivity of order taking.

[**0093**] The register applications **606** monitor a communication channel ("listen") to the RMS server **604** via RMS proxy server **608** for new pending orders entered by order takers or entered using self-service ordering **618**. This enables the register applications **606** to display the latest list of pending orders on interfaces **130**.

[**0094**] The interaction between the register applications **606** and other clients with the RMS server **604** is a real-time process. Each client (e.g. register applications **606**) of the RMS server **604** has one or more "listeners" that react to transactions sent by the RMS server **604** and received locally by the RMS proxy servers **608**. The RMS proxy server **608** notifies its host application (e.g. register applications **606**) that a change has occurred via an event when the host application inspects the changed data and updates any internal structures as necessary, which infers updates to the interfaces **130**.

[**0095**] The RMS server **604** keeps restaurant system status, receives order updates from the stations **302**, **304**, **382**, **402**, **370**, **372**, and **374**, broadcasts order status changes to the stations **302**, **304**, **382**, **402**, to the order entry stations **370**, **372**, **374**, to the expeditor monitors **320**, **322**, and to the kitchen video system monitors **310**, **312**, **314**, **316**, updates the database **602** and the shoebox database as required, supports shared cashless payment methods such as credit card payment, and synchronizes the register-specific databases **607** with shoebox database **605**. The register applications **606** allow workers in the restaurant **2** to enter orders, accept payment, and mark orders as served. The register applications **606** display active orders, support cash control and basic reporting, support multi-lingual graphical user interfaces **180** on a station-by-station basis, and "listen" to orders from database **602**.

[**0096**] A proxy is an intermediary between a client workstation and a main server. It supplies the application programming interface (API) that allows the client application to make use of the services provided by the main server. It implements the client side of the client server protocol. It may also maintain server-related state information and cache the results of frequently needed server queries. The RMS proxy **608** is a proxy for register applications **606** and RMS server **604**. Information about customer orders such as the phone extension from phone system interface **458** and the location for an order is passed back and forth through RMS proxy **608** to RMS server **604**.

[**0097**] Restaurant **2** uses a Remote Payment Service (RPS) software module to enable customers to pay for orders using credit cards and other payment cards such as debit cards. RPS is another software client of the RMS server **604** and can execute instructions on computer **464**. With RPS, credit card reading devices are installed at the order points in dining area **12**. The card reading devices can be simple magnetic stripe readers (MSR's) available from Neuron Electronics of Torrance, Calif., or the card reading devices can be payment terminals, such as the Hypercom® 6000, available from Hypercom of Phoenix, Ariz., featuring PIN pads, signature capture, and bit mapped displays that are useful for displaying prompts, order details, and advertising.

[**0098**] The RPS is organized such that the appropriate software driver for each installed terminal is loaded dynamically. For example, restaurant **2** can have one type of terminal inside the restaurant and a different type of terminal (designed for outdoors) at the drive through **26**. In one example, a terminal has a software driver that simply reads cards and adds their information to the order. In another example, a terminal can have a software driver that interactively prompts the customer and displays the status of the charge (and possibly also the order).

[**0099**] In one example, the card payment terminals are passive, port powered magnetic stripe readers having a green Light Emitting Diode (LED) that lights up when the reader is ready to read a payment card. These readers can handle credit cards, but not debit cards. To accept debit cards, another example uses a terminal with a reader equipped with a Payment Identifier Number (PIN) keypad.

[**0100**] The RPS accesses the payment terminals via serial communication lines. Restaurant **2** includes a serial port expander system, for example a 32-port Stallion board available from Stallion Technologies of Santa Ana, Calif., to interface computer **464** with serial ports of multiple credit card payment terminals. After a customer begins placing an order with an order taker over the telephone (and the order point has a terminal managed by the RPS), the order appears in the system and the RPS waits for a payment card swipe. In one example, the RPS turns on the green LED to provide visual confirmation to the customer that the card can be swiped. At this point, the order taker will invite the customer to swipe a credit card. After the customer swipes his or her payment card, the LED will go off, and the RPS will add a cashless payment line to the order. When the order is completed, if there is a cashless line present in the order, the RMS will submit a charge against it for settlement by the store's cashless payment processor. If the charge is accepted, then the order is paid, and all that remains is for it to be prepared and delivered (with a receipt). Otherwise, the green LED light comes back on, and the customer can either try paying with another card or pay cash to an expeditor in the restaurant **2** or at the drive-thru window **404**.

[**0101**] A production display system **609** displays task-specific views of order status on kitchen video system monitors **310**, **312**, **314**, and **316** and updates order status in response to bump bar input. The production display system **609** supports multiple production lines in the kitchen **8**, load balancing, multiple hardware systems, multi-lingual display on a station-by-station basis, and listens for changes to orders by monitoring a communication channel to the RMS

server **604**. The production display system **609** also can communicate with hardware control units that use bump bars to receive production status from workers in the kitchen **8**. Such production status indicates completion of certain food production tasks. Thus, workers in the kitchen **8** communicate to the restaurant management software by pressing bump bar buttons. For example, pressing bump bar buttons can indicate that an order is finished in the kitchen **8** or that the language in interface **180** should be changed or that a full display should be scrolled forward or backward. Bump bar interface devices are available from Logic Controls of New Hyde Park, N.Y., U.S.A.

[**0102**] The production display system **609** contains the logic for business rules that define the production process for a given restaurant brand and a given restaurant. This logic is configurable in the production display system software.

[**0103**] A drive-through display service **610** shows the current customer order on the drive-through displays **394**, **396**, **418**, and **420**. The drive-through display service **610** also presents promotional imagery on the display and listens to orders. An automatic beverage dispenser interface **612** interfaces with the automatic beverage service **410** to pour beverages ordered in the drive-through (or from any other configurable source) and listens to orders. A user interface designer **614** allows management to edit the user interface of the register and self-service applications and also saves the specifications in the database **602**. In this manner, the user interface designer **614** enables the restaurant management software to be configured for different stores and different brands without having to do a complete redesign. A video system interface **616** uploads digital images from cameras **398**, **400**, **414**, and **416** in coordination with order entry and transmits these images to the RMS system server **602**. A self service ordering application **618** handles customer service kiosks **74** that enable customers to enter their own orders. The self service ordering application **618** is a platform for promotions and loyalty programs and can be multi-lingual on a station-by-station basis. A proxy **619** is a proxy between the RMS server **604** and the self-service ordering application **618**. A store resident web server **620** enables external managers to view restaurant status information in the database **602** using the interface **190**. The store resident web server **620** also allows managers to edit the user interface of the register and self-service applications and also saves the specifications in the database **602**. A printer service **622** drives serial printers **308**, **324**, and **412**. The printer service **622** prints receipts or grill slips on demand, may be shared by multiple applications, and respects the language of client application.

[**0104**] Video system interface **616** coordinates with order entry using an order list listener to a server within the video system interface **616**. The RMS server **604** informs the order list listener of changes to any active order. The order list listener instructs a digitizer to digitize a customer's picture from a camera when the video system interface **616**'s server sees an order that should have a customer picture based on the location of the order point (e.g., locations in the drive through **28** or the zoom-through **32**), but does not have a picture, is in the entering state, or the time difference between the creation of the order, or the current time is less than a configurable maximum.

[**0105**] Checking if the current time is less than a configurable maximum is intended to avoid the case where for some reason a picture is not taken in a timely fashion, and despite the fact that the order taker is still entering the order, the customer has moved away from the ordering location and has been replaced by the next customer in line.

[**0106**] The RMS Server **604** (along with the RMS Proxy **608** and **619**) supports two basic kinds of listeners. An "order listener" is informed when a specific order is changed. An "order list listener" is informed when any order in a particular set of orders is changed. The server portion of the video system interface **616** registers itself as an order list listener for all active orders. When any active order is changed, the RMS server **604** sends a message to all the registered order list listeners. That message is received by the RMS Proxy **608** and **619** and converted into an event using standard Java facilities. The host application (e.g., register applications **606**) implements an event handler that encodes each application's reaction to the change.

[**0107**] The register applications **606**, the self-service ordering application **618**, the automatic beverage dispenser interface **612**, the drive-through display interface **610**, the production display system **609**, and the video system interface send information and receive information to and from the RMS system server **604**. Periodically, the RMS system server **604** updates the database **602** with restaurant status information. The store-resident web server **620** and the user interface designer **614** directly connect with database **602**. The store resident web server **620** publishes restaurant status information (including inventory, cash management, and deposit management information) from the database **602** on a secure internet connection.

[**0108**] A Multi-Unit-Management-Interface (MUMI) software application (not shown) provides a centralized point of control for enterprise management of multiple restaurants **2**. A restaurant resident MUMI application manages the nuts and bolts of connectivity, including guaranteed message delivery between different components of the restaurant management software for a single restaurant **2**. At a higher level, a central MUMI server provides features to manage a set of restaurants **2**.

[**0109**] Managers access information about the restaurant **2** using the web server **620** and interfaces **192** and **196**. When a manager attempts to connect to the web server **620** from off-site (such as the manager's home or a central corporation office), the connection requires an Internet protocol (IP) address. The IP address associated with the restaurant **2** can dynamically change for a number of reasons. Some restaurants **2** can use DSL (Digital Subscriber Line) for an internet connection. For restaurants **2** using a DSL connection, Internet Service Providers (ISP) have different rules for when IP addresses are assigned. A restaurant **2** may not have an "always on" Internet connection because of the cost or availability in its locale, and the store must dial in to the ISP in order to have connectivity and to be assigned an IP address. Thus, an IP address is required to connect to the restaurant **2**, but the IP address may not be known and the restaurant **2** may not even be connected to the Internet.

[**0110**] When a restaurant **2** is connected to the Internet, the restaurant-resident MUMI software periodically contacts the central MUMI server and identifies itself. The central MUMI server records the IP address associated with the restaurant **2**. If the IP address changes, the central MUMI server will be informed as a result of the periodic contacts made by the restaurant-resident MUMI software.

[0111] When the off-site person (the owner or regional manager, etc.) attempts to connect to the restaurant **2** through the central MUMI server, the central MUMI server checks the last-known IP address for the given restaurant **2** to determine if the restaurant **2** is still available at that IP address. If the restaurant **2** is available at the last known address, the central MUMI software redirects the request to that address, and the off-site person proceeds to login. Otherwise, the central MUMI software connects to the store directly by calling the modem attached to the restaurant **2**'s server. When and if a connection is established, the central MUMI system directs the restaurant **2**'s restaurant-resident MUMI software to connect to the Internet. Both sides hang up. The restaurant **2** connects to the Internet using the parameters established for that purpose. When the restaurant **2** connects to the Internet, it then contacts the central MUMI server. The central MUMI server knows there is a pending connection request, and it responds. The central MUMI server checks whether its context information for the restaurant **2** is up to date and downloads current information if changes have been made at the restaurant **2**.

[0112] In some examples discussed previously, order takers in the area **16** are located in a call center. In these examples, an additional telephone switch **624** is used at the call center. The call center telephone switch **624** and the restaurant telephone switch **452** are used to connect customers using the customer telephones **332**, **336**, **350**, **344**, **384**, or **386** to order taker telephones **376**, **378**, **380**, or **402** at the call center. When a customer begins a call to place an order using a telephone in the restaurant **2**, the telephone switch **452** waits until a trunk line is available at the call center telephone switch **624** and then routes the call over the available trunk line to the call center telephone switch **624**. Similarly to connecting calls to order takers in restaurant **2**, telephone switch **452** prioritizes calls during busy times based on extension numbers that are linked to locations in restaurant **2**. When the telephone switch **452** successfully connects the call to the trunk line to the call center telephone switch **624**, the telephone switch **452** triggers the phone system interface **458** to lookup the extension of the call and convert it to a location point. The phone system interface **458** also updates its internal memory structure to reflect an active call between the customer telephone and the call center. When an order taker is available at the call center, the call center telephone switch **624** switches the call on the trunk line to the available order taker on telephone **376**, **378**, **380**, or **402**. When the available order taker answers the call, the phone system interface **626** at the call center **626** identifies the restaurant **2** from which the order is being placed by matching the number of the incoming trunk (obtained from data written by the call center switch **624** to its SMDR printer port) line with a table that links trunk lines to restaurants. Next, the call center switch interface **626** asks the restaurant's switch interface **458** for the specific order point location that is connected to the incoming trunk line (information it has gleaned from restaurant **2** switch's **452** SMDR output). Call center switch interface **626** also determines which extension (and thus which order taker) is now connected to that trunk by examining the call center switch's **624** SMDR output. Then, having assembled complete information about the call, the call center switch interface **626** notifies the call center order taker's register **627** to contact the restaurant's RMS server **604** (via a remote session established through its RMS proxy **628**) and to display the appropriate user interface, so that the order taker can enter the customer's order. The call information the call center switch interface **626** supplies to the call center register application **627** includes the same order point information that would be available to an in-restaurant order taker. If the order point does not specify the delivery point (e.g., a phone tree order), the order taker obtains a table tent number verbally from the customer and enters it into the order as the delivery point.

[0113] In addition to entering customer orders, register-resident applications **627** also handle functions at the call center such as staff order entry, cashier, order gallery, and time and attendance and are, in effect, the same as the register applications in the registers that are located in the restaurant.

[0114] A RMS proxy **628** is used at the call center to connect register-resident applications **627** with RMS server **604**. The RMS proxy **628** performs all of the functionality of the RMS proxy **608** except that the RMS proxy **628** is located externally to restaurant **2**. Thus, telephone order takers at the call center use the same interface **100** as order takers in restaurant **2** to enter customer orders. Call centers handling multiple restaurants with different RMS system servers **604** use multiple proxies **628** to communicate with the different RMS system servers **604**. In this manner, telephone order takers at these call centers can switch between interfaces **100** for different restaurants by using software interfacing with different proxy servers **628**. This enables the display of different menus and prices for the different restaurants handled by the telephone order takers. This also enables the different restaurants handled by the call centers to have different brands.

[0115] Referring to **FIG. 15**, in some examples, the restaurant management software **600** is executed in five areas: the office **24**, the drive-through **26** or **32**, the front counter **4**, the kitchen **8**, and the customer self-service kiosks **74**. The restaurant management software **600** includes various components that are executed on different computers. The restaurant management software **600** is not limited to any specific operating system. In some examples, the restaurant management software **600** is implemented in a Java programming language that enables different components of the software **600** to run on different computer platforms and communicate via application programmer interfaces (API). In some examples, these APIs are provided by high level software tools such as Java 2 Platform Enterprise Edition (J2EE) available from Sun Microsystems of Mountain View, Calif. or Microsoft NET available from Microsoft of Redmont, Wash. In other examples, these APIs are created using a proprietary communication protocol from low level Java code for higher rates of communication. This communication protocol can be created as a software layer above TCP/IP sockets for communication between computers on TCP/IP networks.

[0116] In office **24**, a main server computer **464** runs the system server software **604**, the database **602**, the store-resident web server software **620**, the production display service **609**, and the drive-through display service **610**. A computer **702** runs a web browser **704**.

[0117] In the drive-through area **26**, the registers **402** and **406** are computers running the register applications **606** while other computers run software for the expeditor monitors **408** and the automatic beverage dispenser service **410**.

[0118] In the front counter area **4**, the registers **302** and **304** are computers running the register applications **606** while other computers run software for the expeditor monitors **320** and **322**. Another computer runs the print server software **622** to print receipts using the printer **324**.

[0119] In the kitchen area **8**, computers run production display system software for the kitchen video display monitors **319**, **312**, **314**, and **316**. Another computer runs the print server software **622** to print custom food instructions on printer **318**.

[0120] For customer kiosks **74**, the computers run self-service ordering software **618**.

[0121] Referring to **FIG. 16**, a view **720** represents the organization of applications and object classes for the restaurant management software. At the highest level, view **720** includes server applications **722** that include RMS server **604**. View **720** also includes client applications **724** that include register applications **606**, self-service ordering **618**, automatic beverage dispenser interface **612**, drive-through display interface **610**, production display system **608**, video system interface **616**, and register resident applications (call center) **627**. The server applications **722** and the client applications **724** include a security layer **726** and application objects **728**. The application objects include logic specific to restaurant management, for example, the definition of management measures such as "Gross Revenue" vary by organization and so they are defined in objects that can be replaced or customized as needed. Beneath the application objects **728** are network objects **730** that utilize the java.net **732** classes. Java.net **732** is a package that provides the classes for implementing networking applications. Java.net **732** is available from Sun Microsystems of Mountain View, Calif., as part of the standard Java software distribution. Beneath the application objects **728** are hardware independent device objects **734**. The device objects **734** contain logic for interacting with devices such as bump bars and video display devices in a hardware independent manner. Thus, the device objects **734** should not have to be modified to control bump bars from vendor "B" instead of vendor "A". Device objects **734** include device servers **736** and direct device **738**. Device servers **736** provide access to a shared device through a device-independent API in restaurant **2**. Direct device drivers **738** also provide dedicated access to a device through a device-independent API, but these devices can not be shared, and the interface is often embedded in a host application that uses the device as a requirement of its business function. Device servers use device drivers to control the devices to which they provide shared access. The device servers **736** and the direct device **738** employ device support software **740** that includes JavaPOS **742** and device drivers **744**. JavaPOS **742** is a retail industry standard for a point-of-sale I/O device communication that supports pure Java applications and leverages the OPOS standard. JavaPOS is available from the JavaPOS organization (http://www.javapos.org). The device drivers **744** each control a particular type of device such as a magnetic stripe reader or coin dispenser in restaurant **2**. Typically, device drivers **744** are either supplied by the vendor of a device or are written to translate application actions to and from the serial protocol published by the device's vendor. The data objects **746** hold data describing the state of the restaurant **2**, orders, and inventory. The data objects **746** include server proxies **608**, **619**, and **628** that insulate applications from server application failures. The RMS server **604** uses data objects **746** to store data in shoebox database **605** and database **602**. The register applications **606** use data objects **746** to store data in register-specific databases **607**. The serialization objects **748** contain methods for converting data objects **746** into serial streams for storing data objects **746** into databases. JDBC **750** is the Java Database Connectivity API (Application Program Interface). JDBC **750** is a programming interface that allows Java applications to access SQL database servers in a standard way. JDBC **750** allows the integration of Structured Query Language (SQL) calls into a Java programming environment by providing library routines that interface with the database. It provides functionality for Java that is similar to what Open Database Connectivity (ODBC) provides for older programming languages. JDBC **750** is available from Sun Microsystems of Mountain View, Calif. ODBC is available from Microsoft Corporation of Redmond, Wash. Database **752** includes shoebox database **605** and database **602**. A file system **754** is a file system for the operating system of main server **464**. Graphical User Interface (GUI) design objects **756** implement the logic for user interface designer **614**. GUI elements **758** are a library of elements useful for creating GUIs for client applications **724**. GUI support classes **760** include design serialization classes **762** and Java Swing classes **764**. Java Swing classes **764** enable the creation of GUIs for Java applications and applets using a set of components and are available from Sun Microsystems of Mountain View, Calif. Package java.awt **766** contains additional classes for creating user interfaces and for painting graphics and images.

[0122] One class of object among data objects **746** is the order class. An instance of the order class contains information about an order that has been initiated in the restaurant. The instance of the order includes a hierarchical list of lines, each of which reflects a line in the contents **134** of the interface **130** displaying orders. The base class of all order lines is OrderLine. Each line is represented by an instance of an appropriate subclass of OrderLine.

[0123] Different subtypes of OrderLine contain different data. For example, an ItemLine might indicate that a certain quantity of a certain menu item (e.g., a hamburger) is part of the order. An OptionLine may add the fact that a particular modification (e.g., no salt) applies to one of the items being ordered. Other subclasses may record the fact that a coupon, discount, or voucher has been applied to the order or to one of the items in it.

[0124] Some types of line, namely those extended from OrderLineContainer, may contain sublines, which are lines nested within, or owned by, the line.

[0125] Referring to **FIG. 17**, a table **800** is an example of an object-oriented data structure for an order. A class column **802** denotes the class name of each object representing food items or options in the order. A guest check column **804** denotes food items or options in the order. A level column **806** denotes the nesting level of the line objects (the level is not actually stored in the order, but simply depicts the nesting depth). The order as whole is represented by an instance of the Order class **808**, at level #**0**. The order's direct sublines are the lines at level #**1**. The order's direct and indirect sublines are all the lines in the order. At level #**1**, is a Big Mac item **810**, which owns two options, no onions

812 and extra mustard **814**, nested at level #**2**. Following the Big Mac item **810** is the Extra Value Meal item **816**, which has quarter pounder component **818**, fries component **820**, and coke component **822**, at level #**2**. The quarter pounder component **818** owns option side pickles **824** at level #**3** and fries component **820** owns option no salt **826**.

[**0126**] Orders in the database **605** are updated by the RMS server **604** as register applications **606**, self service ordering **618**, and register-resident applications **627** receive orders entered at restaurant **2**. Orders in database **605** are read-only to client applications. When RMS server **604** finishes updating an order, RMS server **604** broadcasts the new version of the order to applications such as register applications **606**, self service ordering **618**, and register-resident applications **627**.

[**0127**] The RMS server **604** updates an order as follows. A register application (e.g., the register application **606**, the self service ordering **618**, or the register-resident application **627**) receives an OrderEvent notification from the order object. The RMS server **604** obtains an OrderUpdate object from the newOrderUpdate method of the Order object. The RMS server **604** application specifies the changes to be made to the order by invoking appropriate methods of the OrderUpdate object. The RMS server **604** invokes the OrderUpdate object's submit method. The RMS server **604** receives the OrderEvent when the update is complete. The OrderEvent contains a new copy of the Order object. The RMS server **604** updates the display model and rebuilds the display.

[**0128**] Whenever an OrderUpdate object applies itself to an order, the OrderUpdate object stamps the Order object with the current time, a station (e.g., order entry station **370**, **372**, and **374**) that issued the update, and the worker using the station. Any actions specified as part of the same OrderUpdate, for which a time stamp is noted, will receive the same timestamp.

[**0129**] An order may be delivered in one of three service modes: EAT_IN, TAKE_OUT, and DRIVE_THRU. The service mode is entered with the order and is part of the data for an order object.

[**0130**] During the lifetime of an order object, the order passes through a number of states. At key state changes, the order update process notes the order's age, the worker (or customer using a self-service kiosk) who entered the change, and the order entry station from which the state change was initiated. The order object uses the recorded times to compute several time intervals which are significant to the management of the restaurant.

[**0131**] An order may exist in the following states: inactive, active, entering, entered, paying, paid, parked, served, held, and canceled. An order starts out in the inactive state. An order belonging to an idle station may be reside in the inactive state indefinitely. An order becomes active when the first update is posted against it. When it becomes active, an order's age is reset to zero, and it automatically enters the entering state. An order is in the entering state while a worker (or the customer) is entering items. When an order first becomes active, it goes into the entering state automatically.

[**0132**] An order leaves the entering state and becomes entered when the user finishes entering its contents. An order is in the paying state while the cashier collects the amount due from the customer. An order becomes paid when the cashier concludes the payment process by shutting the cash drawer. To keep the drive-thru line **26** moving, the RMS server **604** may on occasion direct a customer to park off to the side pending delayed delivery of the order. When this occurs, the order is in the parked state. An order becomes served when the food is handed to the customer. During order entry, a crew member can place an order in the held state to notify the kitchen staff to pause its preparation pending a customer decision. The order object tracks time spent in held status. An order becomes canceled if it is not to be produced after all.

[**0133**] The Order object tracks the following time intervals, which are crucial to measuring restaurant performance. All times are returned as floating point values in seconds. They are maintained internally with a precision that allows measurement to the nearest 0.1 second. Entry time is the total time spent entering the contents of the order into the system. Line time is the interval between the conclusion of the order entry process and the start of the payment process. For drive-thru customers, line time is the interval spent in line after giving the order at the intercom and before reaching the window. For in-store customers, line time is zero. Payment time is the time spent collecting the amount due from the customer for the order. The beginning of payment time is when the payment interface is presented to the cashier. The end of payment is when the cash drawer is closed. Delivery time is the interval extending from the end of the payment process until the order is either served or parked. Parked time is the interval, if any, extending from the time the order was parked until it is served. Held time is the total time during which the order was in held status. Elapsed time is the total time to process the order. Elapsed time extends from the time the order first becomes active until it is served.

[**0134**] Normally, the Order object is used to specify a list of food items to be prepared and served to a customer in return for payment. However, occasionally, a customer is due compensation for unsatisfactory food. In such cases, the restaurant needs to note which items were unacceptable, calculate their value, and possibly prepare replacements. To facilitate and account for this process, an order may take on the following attributes: An order is flagged as a refund if the price of the order is to be paid back to the customer. An order has the replacement attribute if it is to be prepared and served. Certain types of changes to an order are considered voids. An excessive number of voids may call for employee supervision, which the RMS server **604** enforces by requiring a "manager swipe" before making the desired change to the order. Order can record the number of voids and their total value.

[**0135**] Although some examples and implementations have been described, a wide variety of other examples are also within the scope of the following claims.

[**0136**] For example, the customer telephones **332**, **336**, **350**, **344**, **384**, or **386** and order taker telephones **376**, **378**, **380**, or **402** may be replaced with Voice over Internet Protocol (VoIP) enabled computers using the network **462** and speakers and microphones. In these examples, the telephone switches **452** and **622** are not necessary and the location of a customer using a VoIP enabled computer is

determined by the address of the VoIP enabled computer. In examples where network **462** is a TCP/IP network, the address is identified by a TCP/IP address on network **462**.

[**0137**] The discussion has focused on quick-serve restaurants but the techniques described are applicable to other types of restaurants, other types of quick-serve retail businesses, other types of non-quick-serve retail businesses, and other types of non-retail businesses. As one example, the techniques are also applicable to the food service component of convenience stores that also provide gasoline to automobiles. The items to be included in the orders need not be food items and need not be items that are prepared to order or on the premises where they are to be delivered.

[**0138**] Although many of the techniques described involve wired devices, they may also be applied using wireless devices, including wireless telephones, personal assistants, and other wireless devices.

[**0139**] The customers need not be physically present on the premises to order. They may place orders from other locations, for example, from a desktop computer at home or work or from a device such as a mobile phone while traveling in the vicinity of the place where delivery of the order is to occur.

[**0140**] Although in some examples a digital picture is used to identify the customer, it would be possible to use other features, such as the color or model of the automobile being driven by the customer.

What is claimed is:

1. A method comprising

maintaining an electronic association between each order received at a place at which goods or services are offered, the goods or services to be delivered at a point in the place, and

enabling the association of the order with the delivery place to be altered between the time when the order is placed and the time when the order is delivered.

2. A method comprising

maintaining an electronic association between each order point from which an order is received and a point at which the order is to be delivered, and

enabling the association of the order point with the delivery point to be altered between the time when the order is placed and the time when the order is delivered.

3. A method comprising

receiving orders for goods or services to be delivered quickly,

automatically determining a mode or point at which each of the orders was originated, and

automatically inferring from the mode or point at which the order was originated, a class of service to be associated with the order.

4. The method of claim 40 in which the association of the class of service with the mode or point at which the order was originated may be changed at any time.

5. Apparatus comprising

stations in a quick-serve commercial establishment, the stations enabling users to enter orders, check the status of orders, and assemble orders for delivery,

a network interconnecting the stations,

each of the stations comprising storage for data about the orders, and

software to cause copies of the data to be cached at multiple ones of the stations.

6. The apparatus of claim 5 in which each of the stations operates using the cached copies of the data if the station is disconnected from the network.

7. A method comprising

receiving data about sources of telephone calls from a data port of a telephone switch, and

automatically using the data in connection with entry of orders and fulfillment of orders in a place at which goods or services are delivered.

8. A method comprising

accumulating data about characteristics of telephone calls in which orders are received or goods or services that are to be delivered quickly after the orders are received,

associating the data with information about the orders, and

analyzing the data and the information to correlate features of the telephone calls with features of the orders.

9. A method comprising

receiving orders for goods electronically at an order entry point, the orders to be fulfilled by delivery of the goods at a remote delivery point at which the goods are to be quickly prepared in accordance with the orders for delivery to customers at the delivery point.

10. The method of claim 9 in which payment for the orders is received electronically at the order entry point.

11. The method of claim 10 wherein payment for the orders is received by swiping a credit card through a magnetic stripe reader.

12. The method of claim 10 wherein payment for the orders is received by swiping a debit card through a magnetic stripe reader and entering an identifying number in a key pad.

13. The method of claim 10 further comprising setting a magnetic stripe reader at the order point to accept an electronic payment with a payment card and to indicate this ready state to a customer upon receiving the orders at an order point.

14. The method of claim 13 further comprising indicating the ready state of the magnetic stripe reader at the order point to the customer if a previous attempt to make the electronic payment is unsuccessful.

15. Apparatus comprising

call center equipment to enable a call center operator to process incoming orders for goods to be delivered quickly, and

communication equipment to enable the incoming orders to be forwarded to at least two different delivery points, remote from the call center equipment, at which the goods are to be delivered.

16. A method comprising

receiving an electronic image of a customer, and

associating the electronic image with an order of a customer for goods or services that are to be prepared and delivered quickly to the customer at a delivery location.

17. The method of claim 16 also including displaying the contents of the order with the electronic image.

18. The method of claim 17 also including assembling the order according to the displayed contents.

19. The method of claim 16 in which the electronic image of the customer is captured at the ordering location.

20. The method of claim 16 in which the electronic image of the customer is captured at a location other than the ordering location.

21. The method of claim 16 in which the electronic image of the customer is used to identify the customer in connection with the delivery of the goods or services.

22. The method of claim 16 also including

associating information about the customer with the electronic image of the customer.

23. The method of claim 18 in which the information comprises data useful in automatically determining features of an order for the customer.

24. The method of claim 18 in which the information comprises historical information about orders previously placed by the customer.

25. The method of claim 19 in which the features include the identity of the delivery location.

26. The method of claim 19 in which the features include the nature of the goods and services to be ordered.

27. The method of claim 18 in which the goods or services comprise quick-serve items.

28. The method of claim 22 in which the quick-serve items comprise food.

29. The method of claim 18 in which the electronic image is captured at a quick-serve drive-through ordering station, and the image is used at a delivery station in the vicinity of the drive-through ordering station.

30. The method of claim 18 also including storing the image in connection with the order, and using the image in connection with a subsequent order.

31. The method of claim 18 also including displaying images of customers associated with multiple orders at a point at which the goods or services are to be delivered, the images being displayed in a sequence, and enabling the sequence to be re-ordered to represent a sequence in which the customers are expected to appear at the delivery point.

32. The method of claim 18 also including capturing the electronic image as a still frame of a video sequence of a video capture device.

33. The method of claim 27 in which the video capture device is associated with a security surveillance system.

34. The method of claim 19 in which the electronic image comprises a low-resolution image.

35. The method of claim 15 also including capturing the image automatically in response to a change of the state of the order for the customer.

36. Apparatus comprising

a self-service order kiosk at which a customer places an order for goods or services to be prepared and delivered quickly after the order has been placed, and

an image capture device to capture an image of the customer at the kiosk when the order is placed.

37. A method comprising

receiving orders from customers for goods or services to be prepared and delivered quickly to the customers,

receiving information about the context in which the orders have been received, and

prioritizing the orders for delivery based on the contexts.

38. The method of claim 37 also including prioritizing the orders also based on the times when the orders were received.

39. The method of claim 37 in which the context comprises the order point from which the order is placed.

40. The method of claim 39 in which the order point comprises one of a drive-through lane, a kiosk, a table, or a play place of a quick-serve restaurant.

41. The method of claim 37 in which each of the orders is marked electronically with a priority.

42. A method comprising

enabling a manager to access a management database of a quick-serve restaurant location remotely through a web interface.

43. A method comprising

obtaining a dynamically changing IP address of a quick-serve restaurant automatically from a server.

44. A method comprising

receiving electronically from an order point, an order of a customer for goods or services to be prepared and delivered quickly to the customer in a commercial establishment,

informing the customer at the order point of an identifier to be displayed at a delivery point in the commercial establishment, the delivery point being different from the order point, and

electronically associating the identifier with the order.

45. A method comprising

receiving at a call center, a call from a customer of a quick-serve restaurant that is remote from the call center,

accepting an order from the customer at the call center, and

electronically communicating information about the order to the restaurant to cause the order to be fulfilled at the restaurant.

46. A method comprising

a customer in a restaurant placing an order by speaking with an order taker by telephone, and

the order taker entering the order into a user interface of an order management system.

47. Apparatus comprising

an image capture device to capture an image of a customer in an automobile at an order point of a drive-through lane of a quick-serve restaurant, and

software to associate the image with an order placed by the customer at the order point.

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