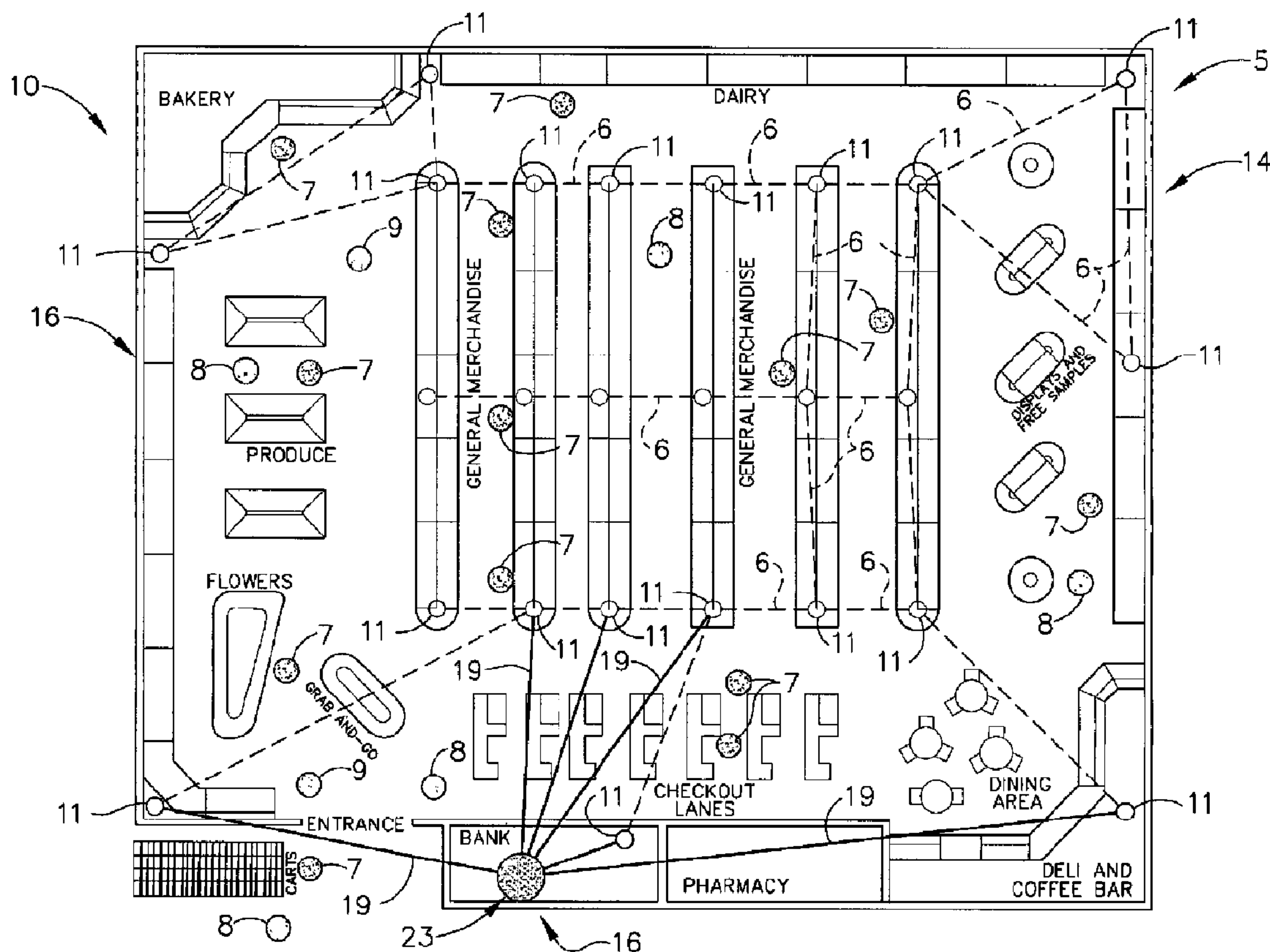




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 (54) Title: ACQUIRING ACTUAL REAL-TIME SHOPPER BEHAVIOR DATA DURING A SHOPPER'S PRODUCT
 SELECTION



(57) Abrégé/Abstract:

The invention provides systems of acquiring actual real-time shopper behavior data during product selection by a shopper in a store. More specifically, disclosed herein are systems of using a communications network, a First Moment of Truth device and a

(57) **Abrégé(suite)/Abstract(continued):**

data collections device to track actual real-time shopper behavior data relating to the presumed locations of shoppers in a store, the time spent and location of time spent by a shopper while considering a product for selection and products chosen for purchase.

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[Continued on next page]

(54) Title: ACQUIRING ACTUAL REAL-TIME SHOPPER BEHAVIOR DATA DURING A SHOPPER'S PRODUCT SELECTION



FIG. 1A

(57) Abstract: The invention provides systems of acquiring actual real-time shopper behavior data during product selection by a shopper in a store. More specifically, disclosed herein are systems of using a communications network, a First Moment of Truth device and a data collections device to track actual real-time shopper behavior data relating to the presumed locations of shoppers in a store, the time spent and location of time spent by a shopper while considering a product for selection and products chosen for purchase.

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ACQUIRING ACTUAL REAL-TIME SHOPPER BEHAVIOR DATA DURING A SHOPPER'S PRODUCT SELECTION

CLAIMS PRIORITY TO RELATED APPLICATIONS

5 **[0001]** This patent application claims priority to U.S. Nonprovisional Patent
Application 12/408,581 filed on March 20, 2009, U.S. Nonprovisional Patent
Application 12/353,817 filed on January 14, 2009, U.S. Nonprovisional Patent
Application 12/353,760 filed on January 14, 2009, U.S. Patent Nonprovisional Patent
Application 12/172,326 filed on July 14, 2008, U.S. Patent Nonprovisional Patent
10 Application 11/859,703 filed on September 21, 2007, and US. Provisional Patent
Application 61/070,344 filed on March 21, 2008.

FIELD OF INVENTION

[0002] The invention herein provides systems and methods for gathering
actual real-time shopper behavior data while a shopper shops in a store. In particular,
15 systems and methods for acquiring shopper behavior data during the course of a
shopper's product selection in a store are provided for improved systems and methods
of influencing a shopper's future product selections before, during and after the First
Moment of Truth.

BACKGROUND OF THE INVENTION

20 **[0003]** Understanding shopper behavior in a store has become paramount to
retailers, merchandisers, data gatherers and those in the business of running
warehouses. To date, understanding and then later predicting shopper behavior at the
point of decision, i.e., the first moment of truth, has been elusive. Also elusive has
been knowledge of the paths taken by shoppers in a store. Typically, the only
25 consistent actual data known has been that data gained after a shopper has purchased
multiple items and then left the store; i.e., data gathering at the point of sale (POS)
OR AFTERWARDS. Persons of ordinary skill in the art have rightly followed up
such purchases with interviews in order to gain further insight, but such interviews
still miss the mark for in the moment shopper behavior, real-time shopper behavioral
30 perspectives, and for knowing the actual and decisional paths taken by shoppers in a
store.

5 **[0004]** The first moment of truth (FMOT) has been defined as product selection which includes 1) the product considered for selection, 2) the product actually selected, 3) the amount of time that a shopper expends to consider a particular product or products for selection and 4) a shopper's presumed location in a store in relation to a product location at the moment of decision.

10 **[0005]** The amount of time that a shopper expends to consider a particular product or products for selection is generally thought to range from about three to about seven seconds, but varies from shopper to shopper and a person with skill in the art will understand these variances more fully. Regardless of the actual time required, the FMOT includes a shopper's decisional process in a store, at the store shelf, end
15 cap, kiosk, stand alone display, in-store store or other means of display known to those with ordinary skill in the art.

[0006] Merchandisers who sell their wares in retail stores spend billions of dollars per year seeking to influence shoppers' behavior during the FMOT and while shoppers travel along their paths in a store. Currently, real-time, empirical
20 understanding about how shoppers behave and what, if anything, influences shoppers during the First Moment of Truth remains a mystery.

[0007] While seeking to understand shopper behavior at the FMOT is important, it is also important to provide a system for such discovery that can be consistently applied, provides a whole picture of a shopper's shopping experience,
25 works well, is reproducible and that is truly a measure of the entirety of a shopper's shopping experience.

[0008] The prior art provides that the use of RFID to track the movement of products in a store can be useful. Persons of ordinary skill in the art using RFID on products in retail environments will readily acknowledge that less than 10% and often
30 less than 2% of all products in a retail environment (e.g., grocery store) contain RFID tags. Even if RFID tags are attached to shopping carts, such attachment does not provide useful information about what a shopper selects from store shelves, end-caps, etc. but rather where the shopping cart has traveled within the store. Such an approach therefore provides no shopper product selection insights.

35 **[0009]** In U.S. Patent No. 6,659,344 a system is provided that gathers data on the behavior of shoppers in a retail market. Herein, a scanner is attached to a shopping basket and is configured to detect, through RFID, the removal of an item from a shelf whereby such items are also equipped with one or more RFID tags. An

obvious limitation to this approach, again, is the limited use of available RFID tags on products within a store. By dependence upon RFID, it is unlikely that much useful shopper behavior data can be gathered from which shopper insights may be gained.

5 [0010] What remains therefore is the need for a system by which actual and/or real-time shopper behavior data may be culled through the ability to track a shopper's location throughout a store in real-time, knowledge of which items a shopper has selected for purchase, knowledge of where in the store a shopper has selected an item for purchase, knowledge of how long the decisional process has been for each product selected by a shopper for purchase. Also important is the use of all such real-time shopper behavior data to
10 enhance computer-aided simulation models. Such inclusion would serve to enhance accuracy of computer simulations that predict shopper behavior.

SUMMARY OF THE INVENTION

15 [0011] According to one aspect, there is provided a system of acquiring actual real-time shopper behavior data approximate to a moment of decision by a shopper in a store filled with one or more purchasable items. The system includes a first moment of truth device that collects the actual real-time shopper behavior data approximate to the moment of decision by the shopper of the one or more purchasable items. The first moment of truth device includes a
20 location tracking device that operates to create location tracking data. The system has at least one data collections device that receives and stores the actual real-time shopper behavior data and historical progression data comprising substantially all of the location tracking data. The system includes a communications multi-network positioned about the store. The first moment of truth device is communicatively coupled to the communications multi-network.
25 The data collections device is in operative communication with the communications multi-network. The communications multi-network has at least one mesh communication network through which the first moment of truth device is tracked throughout the store based on the location tracking data produced by the the moment of truth device. The communications multi-network has at least one star communication network through which the first moment
30 of truth device transfers the shopper behavior data to the data collections device.

[0012] Accordingly, the invention provides a system for acquiring actual real-time shopper behavior data approximate to a moment of decision by a shopper in a store filled with one or more purchasable items. The system comprises a communications network positioned about said store, at least one data collections device which is in operative
5 communication with the communications network, and a First Moment of Truth device that is adapted to be communicatively coupled to the communications network in the store. The First Moment of Truth device is used to collect the actual real-time shopper behavior data approximate to the moment of decision by the shopper of one or more purchasable items. The preferred communications network is a multi-network. Preferably, the system transmits
10 one or more influencing messages to the First Moment of Truth device in order to influence a shopper's decision making before, during or after the shopper's moment of decision of one or more purchasable items.

[0013] When a shopper uses a FMOT device, it is then enabled to track the shopper's response or non-response to one or more influencing messages. Such response or non
15 response is then recorded and stored as part of the shopper's real-time shopper behavior data. In an alternative embodiment herein, the influencing message delivered to the shopper by the system herein is delivered to the shopper through a

5 communications device not including the First Moment of Truth device; e.g., a cell phone, PDA or wireless enabled mp3 device.

10 [0014] Actual real-time shopper behavior data herein comprises the identity of one or more purchasable items considered for purchase, the amount of time taken by a shopper to choose or not choose one or more purchasable items, and the shopper's presumed location in the store. Also, the actual real-time shopper behavior data comprises the identity of the one or more purchasable items chosen for purchase by the shopper when a product that has been considered for purchase is then chosen by the shopper for actual purchase. In the event that a shopper, who has chosen an item for purchase changes her mind prior to purchase, such decision is also preferably recorded as part of the actual real-time shopper behavior data and that item is marked as "unchosen".

15 [0015] As has been noted hereinabove the system comprises one or more data collections devices. The actual real-time shopper behavior data is transmitted to one or more data collections devices each of which is communicatively coupled to the communications network. In practice, the data collections device acquires and organizes the actual real-time shopper data.

20 [0016] While shopping, the shopper's presumed location is known. Such location is known is provided that the shopper has a First Moment of Truth device held in proximate position to the shopper and the FMOT device is assigned to the shopper. The preferred manner in which a shopper's presumed location is known is through continuous or substantially continuous location tracking. Namely, the First Moment of Truth device comprises a location tracking device that creates location tracking data during the course of a shopper's time in a store. Preferably the data collections device stores historical progression data which consists of location tracking data. Alternately, all or at least a portion of the location tracking data can be stored in the First Moment of Truth device.

25 [0017] In practice, the location tracking data is collected by the First Moment of Truth device starting at from about the time the location tracking device is associated with the communication network to about the time the location tracking device de-associates from the communication network.

30 [0018] In the store, the one or more purchasable items comprise readable media thereon for scanning by the First Moment of Truth device. The readable media

5 contains product identity information for each of the one or more purchasable items and/or a group of items bound together; e.g., a six-pack of soda.

BRIEF DESCRIPTION OF THE DRAWINGS

10 [0019] While the specification concludes with claims particularly pointing out and distinctly claiming the invention, it is believed that the embodiments will be better understood from the following description in conjunction with the accompanying Figures, in which like reference numerals identify like elements and in which:

15 [0020] FIG. 1A – FIG. 1D provide a depiction a shopper selecting product from an end cap in a store during the shopper's moment of decision;

[0021] FIG. 2A – FIG. 2D provide a depiction of a shopper selecting product from a store shelf along a store aisle in a store during the shopper's moment of decision;

20 [0022] FIG. 3 is a flow diagram that shows a process for a shopper to select products within a store and for communication between a location tracking device, held in proximate position to said shopper as she selects products from the store, and a data collections device; wherein said communication occurs through a communications network in said store;

25 [0023] FIG. 4 shows the front surface of a "First Moment of Truth" device (i.e., wireless end device) used by a Shopper in the store to communicate with a data collections device;

[0024] FIG. 5 is a schematic plan view of a store having an exemplary store-based multi-network for communication;

30 [0025] FIG. 6A and FIG. 6B provide a schematic view of an exemplary mesh communication network useful in a store to collect actual, real time shopper behavior data;

[0026] FIG. 7A and FIG. 7B provide a schematic view of an exemplary star communication network useful in a store to collect actual, real time shopper behavior data;

35 [0027] FIG. 8 provides a schematic view of a store providing an exemplary communication multi-network with one star communication network and one mesh

5 communication network useful in a store to collect actual, real time shopper behavior data;

[0028] FIG. 9 provides a schematic view of a store providing the exemplary communication multi-network;

10 [0029] FIG. 10 provides a diagram of an exemplary process by which the location tracking subsystem operates;

[0030] FIG. 11A provides an exemplary embodiment of the location tracking subsystem;

[0031] FIG. 11B provides an exemplary embodiment of the location tracking subsystem;

15 [0032] FIG. 11C provides an exemplary embodiment of the location tracking subsystem;

[0033] FIG. 11D provides an exemplary embodiment of the location tracking subsystem; and

20 [0034] FIG.12 shows a simplified schematic for the location tracking subsystem.

DETAILED DESCRIPTION OF THE INVENTION

[0035] The invention herein provides a system for acquiring actual real-time shopper behavior data approximate to a moment of decision by a shopper in a store
25 filled with one or more purchasable items. The system comprises a communications network positioned about the store, at least one data collections device which is in operative communication with the communications network, and a First Moment of Truth device that is adapted to be communicatively coupled to the communications network in the store. The First Moment of Truth device is used to collect the actual
30 real-time shopper behavior data approximate to the moment of decision by the shopper of one or more purchasable items. The preferred communications network is a multi-network.

[0036] Preferably, the system transmits one or more influencing messages to the First Moment of Truth device in order to influence a shopper's decision making
35 before, during or after the shopper's moment of decision of one or more purchasable items.

[0037] When a shopper uses a FMOT device, it is then enabled to track the shopper's response or non-response to one or more influencing messages. Such

5 response or non-response is then recorded and stored as part of the shopper's real-time shopper behavior data. In an alternative embodiment herein, the influencing message delivered to the shopper by the system herein is delivered to the shopper through a communications device not including the First Moment of Truth device; e.g., a cell phone, PDA or wireless enabled mp3 device.

10 [0038] Actual real-time shopper behavior data herein comprises the identity of one or more purchasable items considered for purchase, the amount of time taken by a shopper to choose or not choose one or more purchasable items, and the shopper's presumed location in the store. Also, the actual real-time shopper behavior data comprises the identity of the one or more purchasable items chosen for purchase by
15 the shopper when a product that has been considered for purchase is then chosen by the shopper for actual purchase. In the event that a shopper, who has chosen an item for purchase changes her mind prior to purchase, such decision is also preferably recorded as part of the actual real-time shopper behavior data and that item is marked as "unchosen". What ever choice a shopper makes it is noted and recorded in real-
20 time.

[0039] As has been noted hereinabove the system comprises one or more data collections devices. The actual real-time shopper behavior data is transmitted to one or more data collections devices each of which is communicatively coupled to the communications network. In practice, the data collections device acquires and
25 organizes the actual real-time shopper data.

[0040] While shopping, a shopper's presumed location is known. Such location is known so long as the shopper has a First Moment of Truth device held in proximate position to her and the FMOT device is assigned to the shopper. The preferred manner in which a shopper's presumed location is known is through
30 continuous or substantially continuous location tracking. Namely, the First Moment of Truth device comprises a location tracking device or mechanism that creates location tracking data during the course of a shopper's time in a store. Preferably the data collections device stores historical progression data that consists of location tracking data. Alternately, all or at least a portion of the location tracking data can be
35 stored in the First Moment of Truth device.

[0041] In practice, the location tracking data is collected by the First Moment of Truth device starting at from about the time the location tracking device is

5 associated with the communication network to about the time the location tracking device de-associates from the communication network.

[0042] In the store, the one or more purchasable items comprise readable media thereon for scanning by the First Moment of Truth device. The readable media contains product identity information for each of the one or more purchasable items
10 and/or a group of items bound together; e.g., a six-pack of soda.

[0043] The term “actual real-time shopper behavior data” as used herein means the total sum of a shopper’s identification data, location tracking data, product scanning data and product selection timing data. Ideally, actual real-time shopper behavior data also includes a shopper’s personal and demographic profile.

15 [0044] The terms “First Moment of Truth device”, “FMOT device”, “wireless end device” or “WED” as used herein mean a handheld or small portable electronic device that operates wirelessly through a communication network herein; such device being capable of scanning readable media on items for purchase and or communicating the presumed location of a shopper using the fmot device.

20 [0045] The term “product scanning device” as used herein means a device capable of scanning readable media like barcodes, UPC codes and other machine readable symbols and codes and includes but is not limited to imagers capable of taking photographs. Product scanning devices produce product scanning data among other types of data disclosed herein. Whenever the phrase “scanned a product” or
25 “product is selected and then scanned” or a similar phraseology referring to the scanning of a product is used, it is meant herein that the bar code or readable medium of the product is being scanned. The preferred product scanning device herein is a FMOT device.

[0046] The terms “barcode”, “UPC code” and “readable medium” as used
30 herein mean any machine readable code by a product scanning device (e.g., FMOT device) disclosed herein.

[0047] By the term “data collections device” it is meant herein one or more electronic devices comprising a switch and a server grade computer with ample memory for the storage of large quantities of data. The data collections device is
35 capable of performing the functions of a switch, gateway server, store computers, including an associate task managing server, a computer assisted ordering system computer, a point of sale terminal, an in store processor (ISP server), a location tracking server, a commerce server or other logic engine useful for the processing

5 and/or storage of data including, but not limited to, all of the data-related functions described herein.

[0048] The term “presumed location” as used herein means the estimated location of the shopper or associate as tracked through one or more electronic devices; e.g., a First Moment of Truth device (FMOT device/wireless end device) in relation to
10 known product locations. Shoppers’ locations are presumed because the store tracks the location of a location tracking device preferably held within a FMOT device herein and which is held in close proximity to shoppers.

[0049] Figure 1A through Figure 1D depict a shopper’s 7 product selection process of items for purchase from an end cap 22 during the shopper’s First Moment
15 of Truth in the store. While these figures depict the end cap, the process may be used for a kiosk, a display, or any other grouping of products that are not placed on one or more standard store shelves. Figs. 1A – 1D are meant to capture, pictorially, the experience had by the shopper at the First Moment of Truth in the store. Figure 1A shows the shopper just as he approaches end cap 22 in store 5.

20 [0050] Shopper 7 in Figures 1A, 1B, 1C and 1D is shown to possess a First Moment of Truth device 50, herein wireless end device 50 (Figure 4), which is discussed in greater detail below. Present, but not fully shown in Figures 1A – 1D is a location tracking subsystem operating between a data collections device and FMOT device 50 through an in-store communication network described more fully
25 hereinbelow. In practice, FMOT device 50 transmits and receives data through one or more information routers 12. In real time herein, data collections device 23 (Figures 5, 7A & 9) and store communication network 10 (Figures 5 & 9) knows or can know a shopper’s location in store 5 as he moves to, stops in front of and then later leaves end cap 22. While shopping, shopper 7’s presumed locations are tracked as he
30 maneuvers throughout the store with First Moment of Truth device 50.

[0051] In Figure 1A shopper 7 is shown stopped at end cap 22 while he considers his purchasing options. In one example herein, shopper 7 stands before a great array of, for example, laundry detergent options. In Figure 1B, shopper 7 has selected product 35 from end cap 22. In Figure 1C, shopper 7 scans the readable
35 media (not shown) on selected product 35. At such scanning of product 35, several important functions occur, each of which will be described in turn.

[0052] First, the identity of the scanned product 35 is transmitted by FMOT device 50 through store communication network 10 such transmissions being received

5 through one or more information routers 12 and ultimately transferred to data
collections device 23.

[0053] Second, the moment in time of the shopper's product selection is also
recorded and stored by data collections device 23. The amount of time that shopper 7
spends deliberating his product selection choice is also known since his travel through
10 the store can be assessed on a moment by moment basis in actual real time. This time
can be tracked by either a timing device in the FMOT device 50 or the data
collections device 23. This tracked time is referred to herein as product selection
timing data.

[0054] Third, since the position of shopper 7 in store 5 is known in actual real-
15 time, such position is attached to the identity of selected product 35.

[0055] Finally, the transaction is completed and the selected product is
chosen, shopper 7 is shown placing selected product 35 into the shopping cart as an
indication that product 35 has been actually selected for purchase and not just
considered for purchase.

20 [0056] The term "location tracking data" as used herein means the proximate
positions of the shopper as she travels throughout the store at select points in time.
One specific area of interest may include the proximate positions of the shopper as he
experiences a First Moment of Truth, as the location tracking device tracks the First
Moment of Truth device, which is in close position to the shopper as she maneuvers
25 throughout the store.

[0057] From all of the steps noted hereinabove, shopper 7's behavior in store
5, can begin to be assessed. By tracking the entirety of shopper 7's shopping
experience including all scanned products therein, his actual real-time shopping
behavior in a store can now be tracked, analyzed and potentially influenced once that
30 behavior becomes better understood. Data collections device 23 creates actual real-
time shopper behavior data after compiling the product selection timing data, the
location tracking data and product scanning data.

[0058] Moreover, the system herein tracks the amount of time that shopper 7
spends during a moments of decision for product selection (i.e., the First Moment of
35 Truth) to create product selection timing data. Shopper 7's time of product
consideration is tracked, preferably, electronically through either FMOT device 50,
data collections device 23 or both. This timing is initiated when the system detects
shopper 7 is engaged in a First Moment of Truth.

5 **[0059]** In practice, the system herein detects shopper 7's engagement during product consideration for selection when it detects that his rate of speed is substantially slower than the shopper's average rate of speed and when the shopper's presumed location in the store is in front of a product display in the store. Part of this detection includes the comparison of the two relative speeds between the time of
10 product consideration for possible purchase and a shopper's typical travel through a store.

[0060] Data collections device 23 then acquires and organizes the product scanning data, location tracking data and product selection timing data to create the actual real-time shopper behavior data. In exemplary embodiments, the data
15 collections device 23 collects actual real-time shopper behavior data associated with shopper 7 from two or more shopping trips to store 5 and creates shopper 7 behavior pattern data pertaining to a particular individual shopper. Since data collections device 23 collects data from which shopper behavior data is determined it also create shopper demographic data that categorizes entire groups (e.g., women, men,
20 region of the country, behavior during a holiday, etc.).

[0061] Going further, data collections device 23 collects and keeps historical progression data, which is the sum total of substantially all of said location tracking data collected from about the time the location tracking device associated with communications network 10 to about the time the shopper 7 checks out and leaves
25 store 5.

[0062] Data collections device 23 collects the shopping trip timing data for each shopper for each shopping trip. In alternative embodiments, a timing device collects the shopping trip timing data. The shopping trip timing data means the amount of time the shopper spends in the store from the first moment the shopper's
30 First Moment of Truth device 50 associates with communication network 10 in store 5 until the time that the FMOT device disassociates from communication network 10.

[0063] Importantly, suppliers of products for purchase for store placement can use the actual real-time shopper behavior data, shopper behavior pattern data and/or the categorical behavior pattern data to determine how to place their products in a
35 store, which products to place in a store, where to geographically place their products, how to best price their products, as well as many other product demographic determinations. Similarly, a store can use the actual real-time shopper behavior data, the shopper behavior pattern data and/or the categorical behavior pattern data to

5 determine what products to place in what stores in what geographic regions, prices for one or more products on display in said store, content for one or more influential messages used to influence shoppers and/or display locations within a store for one or more products supplied by said supplier to the store.

10 [0064] In an exemplary embodiment, data collections device 23 serves as the store's main database—i.e., its main repository of data. Functionally, data collections device 23 organizes, manages and stores data received from other members of the store's communication network 10. Furthermore, data collections device 23 routes data out to other elements of communication network 10—i.e., FMOT device 50 and information routers 12.

15 [0065] In an exemplary embodiment, data collections device 23 has the operability to perform ray tracing calculations and blind node (i.e., FMOT device 50) location calculations to determine its own location in relation to information routers 12 and ultimately its location in store 5. Data collections device 23 produces product selection timing data, shopping trip timing data, and actual real-time shopper behavior data. Data collections device 23 is preferably inside store 5, but because it can
20 encompass more than one physical electronic device, data collections device 23 may be entirely contained within the store premises or it may be located both within and outside of the brick and mortar retail location.

[0066] As noted hereinabove, FMOT device 50 is adapted to operate as a
25 location tracking device through communications network 10 for (1) tracking each of the shopper's presumed locations in a store, and (2) creating location tracking data. Alternatively, a location tracking device in close physical proximity to and in communication with the FMOT device 50 operates through communications network 10 for (1) tracking each of the shopper's presumed locations in a store, and (2)
30 creating location tracking data.

[0067] Figures 2A through 2D depict a similar process to that of Figures 1A through 1D of product selection by a shopper 7 except that such product selection is occurring along a product aisle 24 at a product shelf.

35 [0068] Figure 2A shows shopper 7 approaching a store aisle 24 on which product 35 is placed. In Figure 2B, shopper 7 selects a selected product 35 from the shelf in the aisle 24. Figure 2C shows shopper 7 using a First Moment of Truth device, herein a FMOT device 50, to scan the identity of the selected product. At such scanning product scanning data is created and transmitted through the store's

5 communications network to the data collections device where it is collected and organized. Finally, Figure 2D shows shopper 7 placing the selected product 35 into the attendant shopping cart.

[0069] Figure 3 provides a flow chart that details the collection of data from a shopper's conduct in a retail environment like grocery store 5. In the first instance the
10 shopper, armed with FMOT device 50 that comprises a location tracking device and a product scanning device, begins shopping in the store.

[0070] FMOT device 50, when activated, wirelessly associates with in-store communications network 10. Once associated, the communications network continuously tracks and updates each of the presumed locations of shopper 7 in the
15 store through FMOT device 50, which either is preferably adapted to operate as or be associated with a location tracking device.

[0071] Alternatively, if not continuously tracked and updated, each of the presumed locations of the shopper is tracked and updated by data collections device 23 for some predetermined interval; e.g., every 5 seconds, every 15 seconds, every 30
20 seconds, etc. One of ordinary skill in the art will readily understand that a chosen time period of tracking and updating is arbitrary with respect to the exact interval chosen and that such an interval may be chosen by a store manager (or other personnel) in keeping with a corporate directive. So long as a suitable interval of time has been selected according to the needs of retail environment 5, the criteria for the
25 invention herein has been met.

[0072] Moving forward in a shopper's shopping process, shopper 7 selects a selected product 35 for purchase at a location in front of either a store shelf (as shown in Figure 2A through Figure 2D) or from a product display that is not a store shelf, such as an end-cap 22 (as shown in Figures 1A – 1D). Once selected, the shopper
30 scans the barcode of the selected product 35 selected for purchase. By scanning the barcode at or soon after the moment of selection, a shopper 7 registers the identity of the product 35 selected. By scanning selected product 35 for purchase at or very near its former place of display, that location is also registered since the shopper's presumed location is known via the location tracking device situated within FMOT
35 device 50. At such scanning, the product's identity may be transmitted through the communications network to a suitable device like a data collections device 23 (Figures 5 & 9) attached thereto or the product's identity may be stored in memory onto the FMOT device 50 or both.

5 [0073] As has been noted hereinabove, shopper's travel through store 5 is being tracked (i.e., preferably continuously or nearly continuously) with the identity of each product 35 chosen known and its location of selection known. By collection of this data, a shopper's behavior can be gathered in real time and assessed in real time or at a later point, e.g., when a shopper's shopping trip has been concluded.

10 [0074] In exemplary embodiments, once shopper 7 has gathered all of her desired items for purchase she checks out of store 5 in one or more methods of rendering payment including but not limited to paying at a check-out lane, paying the bill through the FMOT device 50, pre-paying the bill online, etc.

15 [0075] Store 5 comprises one or more products displayed about the store. In exemplary embodiments, each of the one or more products comprises a barcode. The shopper selects a selected product for purchase from said one or more products positioned with the store.

20 [0076] Then, shopper 7 scans the readable media belonging to the selected product 35 with FMOT device 50 to create product scanning data from scanned product 35. Such product scanning data includes but is not limited to each product's identity (by name and/or internal code) and price. In exemplary embodiments, the product scanning data also includes the identity of the product's manufacturer or supplier to the store. Product scanning data may also include the weight or some similar unit of measurement (volume) of product 35 selected by the shopper for purchase. Preferably, product scanning data incorporates a date and time stamp for the time of scanning of the readable medium belonging to selected product 35.

25 [0077] The communications network 10 included in the one or more systems disclosed herein is a communication multi-network, meaning that the communications network 10 comprises two or more similar or dissimilar communication networks 10. For example, communication multi-network comprises at least two mesh communication networks through which each FMOT device 50 operates. An alternative example of the communication multi-network includes a communication multi-network having at least one mesh communication network and at least one star communication network through which a FMOT device 50 herein operates. Also 35 alternatively, the communication multi-network may comprise two or more star communication networks.

[0078] In preferred practice herein, communication network 10 includes a "mesh network organizer" which is a radio within the mesh communication network.

5 The mesh network organizer routes information, also known as packets or data, to and from information routers and the central store computer. In one embodiment, the mesh network organizer routes location tracking data to and from information routers and data collections device 23. In one embodiment, the mesh network organizer communicates with the data collections device through an Ethernet cable, while
10 communicating wirelessly through the mesh communication network to the other electronic devices attached to the mesh communication network that include but is not limited to information routers, FMOT device 50, intelligent shopping carts, HVAC monitors and controls, security systems, traffic counters, and other electronic devices that a person with skill in the art foresees attached to the mesh communication
15 network.

[0079] Communication between information routers 12 may or may not be wired. Communication between information routers 12 and the mesh network organizer may or may not be wired. Functionally, the mesh network organizer routes location tracking data of the store associate's wireless end devices and the shopper's
20 FMOT device 50 to one or more managers herein. Because the mesh network organizer transmits data through a radio, it broadcasts or radiates out radio waves to other members of the mesh communication network.

[0080] By the term "data communication radio" as used herein means a radio within the star communication network. The data communication radio as used
25 herein means a hub node, also known as a central node, of a star communication network. The data communication radio routes data information, also known as packets or data, to and from FMOT devices 50 and data collections device 23. In one embodiment, the data communication radio transmits data through a wire, for example, an Ethernet cable, when communicating with the data collections device,
30 while simultaneously communicating wirelessly through the star communication network to the FMOT devices 50, intelligent shopping carts and/or other blind nodes and electrical devices attached to the star communication network. The data communication radio broadcasts or radiates out radio waves to other members of the star communication network instead of communicating strictly in straight lines.

35 [0081] By the term "information routers" means stationary reference end nodes within the mesh communication network that receive and send information through the mesh communication network to and from the First Moment of Truth devices, the mesh network organizer, other information routers and other network

5 devices. Functionally, the information routers communicate with other information
routers and the mesh network organizer wirelessly or over wires. In exemplary
embodiments, the information routers communicate with the data collections device
through the mesh network organizer. Each information router comprises one radio.
Examples include, but are not limited to, the following: Texas Instruments Models
10 2430 and 2431.

[0082] The term “multi-network router” means herein a device which houses
at least three microcontroller unit (MCU) radios, at least one that functions as an
information router for the mesh communication network and at least two that
functions as a data communication radio for the star communication network. Two of
15 the at least three radios, may be Texas Instruments Models 2430 or 2431, but the third
radio must be a controller with greater power, such as the Texas Instruments Models
above the 243x series. Functionally, multi-network routers communicate wirelessly
or over wires to other multi-network routers. Ideally, multi-network routers
communicate wirelessly to the FMOT devices 50 and other electrical devices used by
20 shoppers, associates and managers within the store and store premises. The multi-
network routers communicate with the data collections device through the multi-
network organizer.

[0083] The term “multi-network organizer” as used herein means a multi-
network router equipped with a mesh network organizer instead of an ordinary
25 information router of the mesh communication network. Thus, in the embodiment in
which the communication multi-network comprises one star communication network
and one mesh communication network, the multi-network organizer operates as both
the data communication radio for the star communication network and the mesh
network organizer for the mesh communication network present in the
30 communication multi-network. Functionally, the multi-network organizer may
communicate wirelessly or over wires to multi-network routers. Ideally, the multi-
network organizer communicates over wires, for example an Ethernet cable, to the
data collections device, though wireless communication is possible.

[0084] In some embodiments of the system, the data collections device
35 correlates the product location map with the actual, real time shopper behavior data.
Said correlation is extremely valuable data that may be used by the store and suppliers
alike to better influence shoppers at the First Moment of Truth. With improved ways

5 to influence shoppers, their product selections become increasingly predictable, which is, of course, beneficial to the business models of both stores and suppliers.

[0085] Figure 4 shows an exemplary First Moment of Truth device 50 for use herein. In particular, Figure 4 provides a frontal view of the front surface of the FMOT device with multiple interface keys. The FMOT device 50 herein is preferably
10 battery powered and is also preferably rechargeable. It has the ability to seek out and associate itself (i.e., attach itself wirelessly) to an existing communications network herein. The FMOT device 50 herein may either be a reduced function device or a full function device. Preferably, the FMOT device 50 comprises a scanner 25 (not shown)
15 useful for scanning items by shopper 7 for placement of one or more scanned items into a shopping cart. Herein, the FMOT device 50 acts as a blind node within an existing communications network.

[0086] The exemplary FMOT device 50 contains a location engine powered by one or more microcontroller units (MCUs). An exemplary embodiment of the MCU is the Texas Instruments MCU model number CC2431. The CC2431 MCU is
20 programmed with certain algorithms, for example, ray tracing calculations that use inputs from FMOT device 50 to determine its position. The location algorithm used in the CC2431 location engine is based on received signal strength indicator (RSSI) values. The RSSI value will decrease when the distance increases.

[0087] Figure 5 provides an exemplary schematic plan view of a store 5. In particular, Figure 5 shows a top view of a section of the store in which shoppers 7,
25 associates 8 and managers 9 are positioned and associated within a communication network 10 for wireless communication between members of the communication network 10.

[0088] In exemplary embodiments, the communication multi-network is
30 positioned within and about the store. In exemplary embodiments, a two-dimensional X and Y grid or a three-dimensional X, Y and Z grid is superimposed over a map of the store. In these embodiments, every device on the communication network that is stationary is assigned and is made aware of its positional coordinates on the grid.

[0089] Figure 5, shows an exemplary embodiment of the communication
35 multi-network, wherein the communication multi-network comprises one or more mesh communication networks 14 and one or more star communication networks 16. For greatest clarity, Figure 5 shows multiple multi-network routers 11, which operate for both the one or more mesh communication networks and the one or more star

5 communication networks. Thus, each multi-network router preferably contains the
components for transmission of data through said one or more mesh communication
networks and one or more star communication networks. In exemplary embodiments,
the shoppers, associates, and managers are each connected through multi-network
communication lines 6 and multi-network routers to both the one or more mesh
10 communication network and the one or more star communication networks 16 of
communication multi-network 10.

[0090] In exemplary embodiments, each multi-network router is placed in a
location that is out of reach of the shoppers shopping in the store. An exemplary area
of placement for each multi-network router is close to or in the ceiling of the store.
15 Preferably, though not necessarily, each multi-network router 11 houses at least three
radios: a first radio functioning as the information router 12 (as shown in Figures 6A,
6B, and 9) of the one or more mesh communication networks 14, and at least two
more radios functioning as the data communication radio 20 (as shown in Figures 7A,
7B, 8 & 9) of the one or more star communication networks 16.

20 [0091] In Figure 5, system communication lines 19 are shown connecting
each multi-network router 11 to the one or more data collections devices 23. System
communication lines 19 may be either wireless or wired. Preferably, system
communication lines 19 are wired and are shown with solid lines to indicate that they
are wired in Figures 5. Ethernet cable is the exemplary wired connection device
25 between each multi-network router 11 and one or more data collections devices 23.
Exemplary system communication lines for use herein are those of the type suitable
for use within an Ethernet physical layer operating within the IEEE 802.3
communications standard. An exemplary Ethernet cable is the "twisted pair": RJ45
and CAT-x copper type. Such cable is designed to facilitate digital transmission of
30 voice and data over copper wiring with high quality and at high speeds.

[0092] Also shown in Figure 5 are multi-network communication lines 6 that
correspond to zones of transmission between multi-network router 11 within mesh
communication network 14. In practice, the multi-network communication lines,
though represented as straight lines for purposes of illustration, are not necessarily
35 straight lines, but more accurately are circular zones of transmission emanating from
each multi-network router. The multi-network communication lines are also shown
between multi-network routers and shoppers, associates and managers. Although not
shown, multi-network communication lines also connect (1) managers to other

5 managers, associates and shoppers, (2) associates to managers, associates and
shoppers, (3) shoppers to associates and managers, but preferably do not connect
shoppers 7 to other shoppers 7 and (4) vendors to associates and managers. Through
the multi-network communication lines 6 of each multi-network router, actual, real-
time shopper data is transmitted and received from the wireless end devices and/or the
10 intelligent shopping carts used by shoppers as they shop and/or move about the store.

[0093] Preferably each multi-network router 11 operates for both the one or
more mesh communication networks 14 and the one or more star communication
networks 16. The multi-network router comprises at least three microcontroller units
(MCUs). One MCU is used for the one or more mesh communication network and at
15 least two are used for the one or more star communication networks. Each MCU is
preferably a system-on-a-chip type of MCU and comprises a control unit, one or more
registers, an amount of ROM, an amount of RAM and an arithmetic logic unit (ALU).

[0094] The Texas Instruments CC2431 MCU is an exemplary MCU for use as
one of the radios for the one or more mesh communication networks 14 and for one of
20 the at least two radios used on the one or more star communication networks 16,
because of its ability to readily transmit data through mesh communication network
14 and one or more star communication networks 16 at prescribed data transmission
rates. Also, the CC2431 MCU can provide location detection functions within
communication multi-network 10 herein. Alternatively, the Texas Instruments
25 CC2430 MCU is an exemplary and exemplary MCU for use as one of the radios for
the one or more mesh communication networks 14 and for one of two radios used on
the one or more star communication networks 16. The third radio of the at least three
radios of the multi-network router 11 is more powerful radio than those of the Texas
Instruments CC243x series.

30 [0095] In practice, the data transmission rate within the mesh communication
network 14 is preferably configured to be at least 125 kilobytes per second (KB/s).
The data transmission rate within one or more star communication networks 16 is
preferably configured to be at least 250 KB/s. The interface between the shopper and
the communication multi-network 10 is wireless and is accessed by the shopper
35 through the blind node.

[0096] Figure 6A provides a schematic representation of an exemplary mesh
communication network 14 for use in the invention herein. Provided herein are the
information routers 12 that are in wireless communication along the mesh

5 communication lines 17 with members of the one or more mesh communication networks. Members of the one or more mesh communication networks include blind nodes, weighing devices and one or more mesh network organizers 13.

[0097] Mesh communication lines 17 may be wired or wireless. Preferably, mesh communication lines are not actual wired lines, but are meant to portray the
10 direction and existence of wireless lines of communication between information routers 12 that make up the one or more mesh communication networks 14 and other components like the one or more wireless end devices 40 and a mesh network organizer 13. The mesh network organizer is connected along system communication lines 19 (shown in Figures 5, 7A, 7B, 8 & 9) to one or more data collections devices
15 23. The one or more mesh communication networks provide many benefits including low power consumption, low cost of operation, efficient communication within a defined space and low cost for maintenance.

[0098] As shown in Figure 6A, the information routers 12 have the ability to communicate with at least one of the other information routers 12 in the one or more
20 mesh communication networks 14. Preferably, information router 12 is able to communicate with every other mesh network member, for example at least one blind nodes 50.

[0099] In exemplary embodiments, the one or more mesh communication networks 14 are a local area network (LAN) that employs one of two connection
25 arrangements. One arrangement is a full mesh topology, while another arrangement is a partial mesh topology. In the full mesh topology, all of the information routers 12 are wirelessly connected to one another and may receive and transmit information to every other information router within the one or more mesh communication networks. In the partial mesh topology, each information router is wirelessly connected to some,
30 but not all, of the information routers available within the one or more mesh communication networks.

[0100] Suitable data transfer through the one or more mesh communication networks include location data and non-location information data, such as voice data and digital messages between associate and manager through the one or more mesh
35 communication networks. However in preferred embodiments, the one or more mesh communication networks are limited to small packets of data, such as the location data, which includes X and Y positional coordinates. Preferably, the location tracking functionality of the communication multi-network 10 is conducted over mesh

5 communication network, while larger packets of data, such as the non-location information data, are communicated through the one or more star communication networks. The information routers 12 do not necessarily communicate with each other, but instead provide location data to each blind node 50, which includes, but is not limited to wireless end devices and intelligent shopping carts.

10 [0101] In exemplary embodiments, herein, the location tracking devices associated with the blind nodes 50, calculate their own X and Y positional coordinates through triangulation software or other location tracking software installed onto the blind node. The information routers are aware of their respective X and Y positional coordinates. In exemplary embodiments, the one or more data collections devices 23
15 inform the information routers of their respective X and Y positional coordinates. The information routers are connected to the mesh network organizer 13 through the communication lines 19 (shown in Figure 6) to the one or more data collections devices 23 (Figures 1 and 2B).

[0102] An exemplary embodiment of the mesh communication network 14
20 used herein is a ZIGBEE network 15. As is shown in Figure 6A, the ZIGBEE network is formed in part by a mesh of information routers 12 whereby each information router 12 transmits to and receives transmissions from one or more information routers within the ZIGBEE network; i.e., either in a full mesh topology or a partial mesh topology.

25 [0103] The benefits of using ZIGBEE network 15 as the exemplary one or more mesh communication networks 14 herein are several. ZIGBEE networks in a mesh communication network are known for their low power consumption, low cost of implementation, high density of component use (e.g., the use of dozens, if not hundreds, of information routers 12 and/or FMOT device 50 for one mesh
30 communication network), and its simple communications protocol. ZIGBEE networks are intended for use in wireless communication networks requiring low data rates and low power consumption.

[0104] In its simplest form, the ZIGBEE network herein comprises one or more information routers 12, at least one mesh network organizer 13, and the one or
35 more blind nodes 50. The mesh network organizer is a device that routes data through the one or more of information routers within the ZIGBEE network. The mesh network organizer is connected to the one or more data collections devices 23

5 through the system communications line 19. ZIGBEE network 15 may either be of the non-beacon type or the beacon type.

[0105] ZIGBEE network 15 may either be of the non-beacon type or the beacon type. In a non-beacon enabled network (i.e., those whose beacon order is 15), information routers 12 have data receivers that are preferably continuously active.

10 The non-beacon enabled type of ZIGBEE network allows for heterogeneous networks of multiple device types in which some devices receive continuously, while others only transmit when an external stimulus from members of the ZIGBEE network, such as the blind nodes, is detected.

[0106] A known example of an element within a heterogeneous network is a lamp having a wireless light switch. The ZIGBEE node at the lamp receives constantly since it is connected to the lamp's power supply while a battery-powered light switch remains "asleep" or inactive until the light switch is thrown. The light switch then activates, sends a command to the lamp, receives an acknowledgment, and returns to a state of inactivation. In a beacon enabled network, information routers within ZIGBEE network transmit periodic beacons to confirm their presence to other network nodes, such as the blind nodes. In an exemplary beacon enabled ZIGBEE network, blind nodes and the information routers power down between beacons, thus lowering their duty cycle and extending battery life when applicable.

[0107] In non-beacon enabled networks, power consumption can be higher since at least some of the information routers within communication multi-network are always active, while some others may be inactive. In exemplary embodiments, substantially all of the information routers within communication multi-network are continuously active. To preserve power, a beaconing type of the ZIGBEE network is exemplary for grocery stores.

30 [0108] Figure 6B provides an exemplary schematic representation of the functionality of the one or more mesh communication networks 14 for use in the invention herein. This Figure 6B shows that ultimately the one or more mesh communication networks 14 transfer data between the members of the one or more mesh communication networks such as the information routers 12 and the blind nodes 35 50 to the one or more data collections devices 23.

[0109] Figure 7A provides an exemplary representation of the one or more star communication networks 16. Herein, the data communication radios 20, whether housed in their own devices or housed with the information routers 12 in a multi-

5 network router 11 (as shown in Figure 1), do not communicate directly with one-another but instead communicate directly with the one or more data collections devices 23 along system communication lines 19.

[0110] The one or more star communication networks 16 are particularly useful and important to the communication multi-network 10. The one or more star
10 communication networks are the exemplary communication networks of the communication multi-network to carry data streams that require higher data transmission rates for speed and efficiency. Preferably, the one or more star communication networks are used for communicating the non-location information data, such as the voice data, pictures, video, financial transaction data, and other data
15 types best suited for at least 250 KB/s transmission rate in place of or in addition to about 125 KB/s transmission rate provided by the one or more mesh communication networks. However, it is possible to transmit the non-location information data, requiring higher data transmission rates provided by one or more star communication networks, through the one or more mesh communication networks 14.

20 [0111] The exemplary one or more star communication networks herein operate within the Institute of Electrical and Electronics Engineers (IEEE) 802 communications protocol. IEEE 802 refers to a family of IEEE standards dealing with local area networks and metropolitan area networks. More specifically, the IEEE 802 standards are restricted to networks carrying variable-size data packets. In
25 contrast, in cell-based networks, data is transmitted in short, uniformly sized units called cells for use within, for example, cell phones. Though exemplary, it is acknowledged that one or more star communication networks 16 may operate within multiple communication protocols including but not limited to BLUETOOTH (IEEE 802.15.1 and 802.15.2), WIMEDIA (IEEE 802.15.3), WI-FI (IEEE 802.11b), Wi-Fi5
30 (IEEE 802.11a/HL2) and other wireless protocols like exemplary protocol 802.15.4 as noted hereinabove.

[0112] Figure 7B provides an exemplary representation of the communication multi-network 10. It shows clearly that the information routers 12 of the one or more mesh communication networks 14 provide a signal to FMOT device 50. In Figure
35 7B, the information routers provide FMOT device 50 with the X and Y positional coordinates of the information routers. The FMOT device 50 either perform the calculations necessary to provide its own location in the X and Y positional coordinates or it sends a signal out through the one or more star communication

5 networks 16 to the one or more store servers 29, such as the location tracking server, to have the calculations done at that level of the communication multi-network 10. Under either scenario, the location of each FMOT device 50 is known to the one or more data collections devices 23 (shown in Figure 5) or the location tracking server, through the data exchanged between the blind nodes and the information routers of
10 the one or more mesh communication networks.

[0113] In exemplary embodiments, substantially all substantive communication between the FMOT device 50, such as the wireless end devices and intelligent shopping carts, is conducted through the data communication radio 20 and the switch 25 and the gateway server 27 and the appropriate store server 29, which is
15 often the location tracking server.

[0114] Figure 8 provides an exemplary representation of the communication multi-network 10. It shows clearly that information routers 12 of the one or more mesh communication networks 14 provide a signal to FMOT device 50, which includes the wireless end devices and intelligent shopping carts, wherein as in the
20 exemplary embodiments above, FMOT device 50 are associated with one or more location tracking devices.

[0115] In Figure 8, the information routers provide the blind nodes with the X and Y positional coordinates of the information routers. The blind nodes either perform the calculations necessary to provide their own location in X and Y positional
25 coordinates or they send a signal out through the one or more star communication networks 16 to the one or more store servers, such as the location tracking server. As stated above, both the one or more data collections devices and the location tracking server are capable of performing the ray tracing and location tracking calculations. Under either scenario, the location of each blind node is known to one or more of
30 store servers through the data exchanged between FMOT device 50 and the information routers 12 of the one or more mesh communication networks 14. In exemplary embodiments, the location tracking server performs the location tracking computations instead of having said computational work being performed on the blind nodes.

35 [0116] The location tracking computations use information (the X and Y positional coordinates of the nearest information router) provided by blind node to the location tracking server. The nearest information router (to the blind node) receives the X and Y positional coordinates of the blind node from the mesh network organizer

5 13, which receives the X and Y positional coordinates from the location tracking server. In any event, the location of the blind node on the map of the store (shown in Figure 5) is known to both the blind node and location tracking server, through the one or more mesh communication networks 14 of communication multi-network 10.

[0117] Figure 9 shows an alternative exemplary embodiment, an exemplary top schematic view of the store with multiple star communication networks 16. Also shown in Figure 9 is the one or more mesh communication networks in combination with multiple star communication networks. Persons of skill in the art will readily recognize that though Figure 9 shows multiple star communication networks and one or more mesh communication networks, it is possible that the communication multi-network 10 comprises only multiple star communication networks without the presence of the one or more mesh communication networks.

[0118] In Figure 9 as in Figure 5, the mesh communication lines 17 are shown connecting each information router 12 to the mesh network organizer 13 within the one or more mesh communication networks 14. In addition, the mesh communication lines exist between the information routers within the mesh communication network. In practice, the line of communication, though represented as straight lines for purposes of illustration, are not necessarily straight lines. Rather, each information router operable within the one or more mesh communication networks produces a limited zone of communication through which intra-communication between information router occurs.

[0119] The system communication lines 19 are shown connecting data communication radio 20 and the one or more data collections devices 23. The system communication lines are shown connecting the mesh network organizer 13 with the one or more data collections devices 23. For the communication multi-network 10 that contains the two or more star communication networks 16, each data communication radio shown for each of the one or more star communication networks is connected through system communication lines to the one or more data collections devices 23 that operate as a master network coordinator for substantially all of the members of the communication multi-network.

[0120] Figure 10 provides a flowchart of an exemplary method for determining in real time the location of a FMOT device 50 within a communications network. In practice, the FMOT device 50 sends a signal that is received by the closest information router 12 within the communications network, which is preferably

5 a ZigBee mesh communication network 15 of a communication multi-network 10. The signal sent a FMOT device 50 seeks to establish its location within the store. In return for the sent signal each information router 12 sends a signal back to FMOT device 50 that indicates its own location. Each received signal from the information router has an attendant signal strength that the blind node can measure.

10 [0121] Next, with the signal strengths of each received signal measured and thereby known by the FMOT device 50, the blind node preferably uses ray tracing calculations with the signal strengths as inputs to calculate its position with respect to the information routers and thereby calculates its position along an X and Y coordinate system. Once calculated, the blind node transmits its set of X and Y
15 positional coordinates through the network to the one or more data collections devices that can then store and keep track of the blind node's various locations throughout the store.

[0122] Ideally, the one or more data collections devices or a location tracking server (not shown) keeps track of every FMOT device 50 within the store and thereby
20 regulates and controls operation of the one or more methods herein. Also ideally, the location tracking subsystem operates continuously or substantially continuously for tracking the location of each FMOT device 50 during the time of its operation within the store equipped with a communications network herein. Thus, the process described hereinabove for Figure 10 preferably occurs substantially continuously such
25 that the location of any given blind node within the store may be calculated and thereby known moment by moment and stored by the one or more data collections devices 23 (Figures 5 & 9). Such storage of the blind node's position at all or substantially all of its locations within the store builds shopper behavior pattern data, which includes an important history of the blind node's presumed locations in the
30 store.

[0123] When the location engine portion of a blind node is housed within a FMOT device 50 used by the shopper to scan items within the store for purchase, actual, real-time shopper data is gathered by the one or more data collections devices. Gathering of such actual, real-time shopper data, which can be stored for later
35 analysis or same-time transmitted to one or more interested parties (e.g., consumer goods companies) is paramount. To date, companies that sell their wares in retail stores are rarely able to track actual shopper behavior, such as product selection at the point of such selection, but have instead used electronic simulations and imprecise

5 sales data to approximate shoppers' behavior and influences to their spending within the retail store.

[0124] With the advent of the disclosed technology, now when a merchandiser requests a retail store to place an end cap 22 of its product at the end of an aisle for a predetermined amount of time, the retail store can (1) gauge the shopper traffic
10 around the end cap, (2) determine how long the shoppers remained adjacent to the end cap 22 and (3) identify any and all items the shoppers scanned from the end cap 22 (Figures 1A-1D) and placed into their shopping carts and/or subsequently paid for and took home. Such an ability by the inventions herein, therefore, provide insight into actual, real-time shopper behavior prior to and at the point of product selection—such
15 behavior being known by the stores at the First Moment of Truth as noted hereinabove. Monitoring and cataloging such actual shopper behavior in real time is a sea change in the nature of such shopper evaluation and analysis. This change is powered by the ability of the inventions herein, i.e., the one or more methods for locating a shopper's presumed location in a store.

20 [0125] Figures 11A, 11B, 11C, and 11D provide flowcharts of exemplary location tracking subsystems of the disclosed invention. In Figure 11A, the FMOT device 50 asks all of the information routers 12 within its range of transmission for their locations. Each of the information routers 12 within range will send its location coordinates to the FMOT device 50. At least two information routers 12 transmit
25 their location information to FMOT device 50. The location information belonging to the information routers 12 is in terms of an X and Y coordinates superimposed over a map of the store, longitude and latitude coordinates, or other location data known to persons of ordinary skill in the art.

[0126] Figure 11A provides an exemplary non-beaconing communication
30 multi-network as shown in steps 410 through step 425, where it is the blind node that initiates contact with the information routers 12. In contrast, Figure 11B provides an exemplary beaconing mesh communication network as shown in steps 460 to 470, where it is the information router 12 that periodically and rhythmically sends out signals to whatever devices that may be listening, which in this case is the blind node
35 12. Other than this difference, the location tracking subsystems of Figures 11A and 11B are the same.

[0127] In Figure 11A and Figure 11B, the ray tracing calculations necessary to determine the real time location information pertaining to the FMOT device 50 are

5 performed by the FMOT device 50. FMOT device 50 then transmits the location information pertaining to the blind node to the data communication radio, which in turn provides the location information to the one or more data collections devices 23.

[0128] Figure 11C provides one or more exemplary methods of determining the location of FMOT device 50 within the communication multi-network 10. In
10 Figures 10, 11A and 11B, the FMOT device 50 conducts the ray tracing calculations thus calculating its own X and Y coordinates within a store. In Figures 11C and 11D, the blind node still measures the strength of the signals received from available information routers, but once the blind node has measured the strength of the signals received from the information router 12, it transmits those measured signal strengths
15 through the communications network to a data communication radio 20, which in turn transmits the measured signal strengths to the one or more data collections devices 23. Then, the data collections devices performs ray tracing calculations using the measured signal strengths as inputs into the relevant ray tracing calculations. The output of such calculations is the location, presented in a set of X and Y positional
20 coordinates of the blind node that measured the signal strengths.

[0129] Figure 11C provides an exemplary non-beaconing communication multi-network as shown in steps 505 through step 520, where it is the blind node that initiates contact with the information routers 12. In contrast, Figure 11D provides an exemplary beaconing mesh communication network as shown in steps 565 to 575,
25 where it is the information router that periodically and rhythmically sends out signals to whatever devices that may be listening. Other than this difference, the location tracking subsystems of Figures 11C and 11D are the same.

[0130] Other exemplary embodiments of the location tracking subsystem not shown include the above exemplary subsystems of Figures 11A, 11B, 11C and 11D,
30 wherein each information router 12 and each data communication radio 20 is replaced with a multi-network router 11 as shown in the exemplary communication multi-network of Figure 5.

[0131] Figure 12 shows a simplified schematic of the location tracking subsystem for location detection. Each information router 12 is a static (i.e.,
35 unmoving) node placed at a known position within store 5 and remains stationary. For simplicity each information routers 12 knows its own position and can tell other nodes or other components within the schematic where it is on request by transmissions of a signal.

5 **[0132]** An information router 12 can operate on various types of MCUs. For example, suitable MCUs from Texas Instruments are model numbers CC2430, CC2431 and or CC2420.

10 **[0133]** In exemplary embodiments, when the blind node 50 herein receives a data packet containing X and Y coordinates from each information router 12 in range, the FMOT device 50 automatically adds an RSSI value to the received packet. The RSSI value is preferably averaged over the 8 first symbol periods (128 μ s). In an exemplary embodiment, this RSSI value is represented as a one byte value, as a signed 2's complement value. When a packet is read from the FIFO on the CC2431 the second last byte will contain the RSSI value that was measured after receiving 8
15 symbols of the actual packet. Even if the RSSI value is captured at the same time as the data packet is received, the RSSI value will reflect the intensity of received signal strength at that time or possibly also the signal power belonging to the received data.

20 **[0134]** Blind node 50 herein may preferably contain a register termed RSSI. This register holds the same values as described above, but it is not locked when a packet is received, hence the register value should not be used for further calculations. Only the locked RSSI value attached to the received data can be interpreted as the RSSI value measured exactly when the data is received.

25 **[0135]** The received signal strength is a function of the transmitted power and the distance between the sender and the receiver. In exemplary embodiments of the systems, the received signal strength decreases with increased distance as the equation below shows:

$$\text{[0136] } (10 \log) 10 \text{RSSI} = -nd + A$$

30 **[0137]** Wherein, n is a signal propagation constant, also named propagation exponent; d is a distance from sender; and A is a received signal strength at a distance of one meter.

35 **[0138]** If too few information routers 12 are used, then the influence from each of each information router becomes higher, and one erroneous RSSI value can change the calculated position in a significant way. Erroneous RSSI values in this context means an RSSI value that does not fit well with the theoretical value, e.g. due to multi-path or if the signal is blocked by walls or other obstruction. Thus, it is advantageous to include a multitude of information routers within an environment, such as a store.

5 **[0139]** This written description uses examples to disclose the invention,
including the best mode, and also to enable any person skilled in the art to make and
use the invention. The patentable scope of the invention is defined by the claims, and
may include other examples that occur to those skilled in the art. Such other examples
are intended to be within the scope of the claims if they have structural elements that
10 do not differ from the literal language of the claims, or if they include equivalent
structural elements with insubstantial differences from the literal language of the
claims.

WHAT IS CLAIMED IS:

1. A system of acquiring actual real-time shopper behavior data approximate to a moment of decision by a shopper in a store filled with one or more purchasable items, comprising:
 - a. a first moment of truth device that collects said actual real-time shopper behavior data approximate to said moment of decision by said shopper of said one or more purchasable items and further comprises a location tracking device that operates to create location tracking data;
 - b. at least one data collections device that receives and stores said actual real-time shopper behavior data and historical progression data comprising substantially all of said location tracking data; and
 - c. a communications multi-network positioned about said store, said first moment of truth device being communicatively coupled to said communications multi-network, and said data collections device being in operative communication with said communications multi-network, said communications multi-network comprising
 - at least one mesh communication network through which said first moment of truth device is tracked throughout said store based on said location tracking data produced by said first moment of truth device; and
 - at least one star communication network through which said first moment of truth device transfers said shopper behavior data to said data collections device.
2. The system of claim 1 wherein said actual real-time shopper behavior data comprises the identity of said one or more purchasable items considered for purchase, the amount of time taken by said shopper to choose or not choose said one or more purchasable items, and said shopper's presumed location in said store.

3. The system of claim 2 wherein said actual real-time shopper behavior data comprises the identity of said one or more purchasable items chosen for purchase by said shopper.
4. The system of claim 3 wherein said actual real-time shopper behavior data comprises the identity of said one or more purchasable items unchosen for purchase by said shopper.
5. The system of claim 2 wherein said actual real-time shopper behavior data is transmitted to said one or more data collections devices, wherein said data collections device is communicatively coupled to said communications multi-network.
6. The system of claim 5 wherein said data collections device acquires and organizes said actual real-time shopper data.
7. The system of claim 5 wherein each said shopper has a presumed location in said store whereby said presumed location of each said shopper has said first moment of truth device being held in proximate position to each said shopper.
8. The system of claim 1 wherein said location tracking data is collected by said first moment of truth device starting at from about the time the location tracking device is associated with said communications multi-network to about said time said location tracking device disassociates from said communications multi-network.
9. The system of claim 1 wherein said one or more purchasable items comprise readable media thereon for scanning by said first moment of truth device, said readable media containing product identity information for each said one or more purchasable items.
10. A system of acquiring actual real-time shopper behavior data approximate to a moment of decision by a shopper in a store filled with one or more purchasable items, comprising:
 - a. a first moment of truth device configured to be held in proximate position of the shopper and capable of scanning readable media on each said one or more purchasable items and collecting said actual real-time shopper behavior data approximate to said

moment of decision by said shopper of said one or more purchasable items and further comprises a location tracking device that operates to create location tracking data;

- b. at least one data collections device that receives and stores said actual real-time shopper behavior data and historical progression data comprising substantially all of said location tracking data; and
- c. a communications multi-network positioned about said store, said first moment of truth device being communicatively coupled to said communications multi-network, and said data collections device being in operative communication with said communications multi-network, said communications multi-network comprising

at least one mesh communication network through which said first moment of truth device is tracked throughout said store based on said location tracking data produced by said first moment of truth device; and

at least one star communication network through which said first moment of truth device transfers said shopper behavior data to said data collections device.

- 11. The system of claim 10 wherein said actual real-time shopper behavior data comprises the identity of said one or more purchasable items considered for purchase, the amount of time taken by said shopper to choose or not choose said one or more purchasable items, and said shopper's presumed location in said store.
- 12. The system of claim 11 wherein said actual real-time shopper behavior data comprises the identity of said one or more purchasable items chosen for purchase by said shopper.
- 13. The system of claim 12 wherein said actual real-time shopper behavior data comprises the identity of said one or more purchasable items unchosen for purchase by said shopper.
- 14. The system of claim 11 wherein said actual real-time shopper behavior data is transmitted to said one or more data collections devices, wherein said data collections device is communicatively coupled to said communications multi-network.

15. The system of claim 14 wherein said data collections device acquires and organizes said actual real-time shopper data.
16. The system of claim 10 wherein said location tracking data is collected by said first moment of truth device starting at from about the time the location tracking device is associated with said communications multi-network to about said time said location tracking device disassociates from said communications multi-network.
17. The system of claim 10 wherein said readable media contains product identity information for each said one or more purchasable items.



FIG. 1A



FIG. 1B



FIG. 1C



FIG. 1D

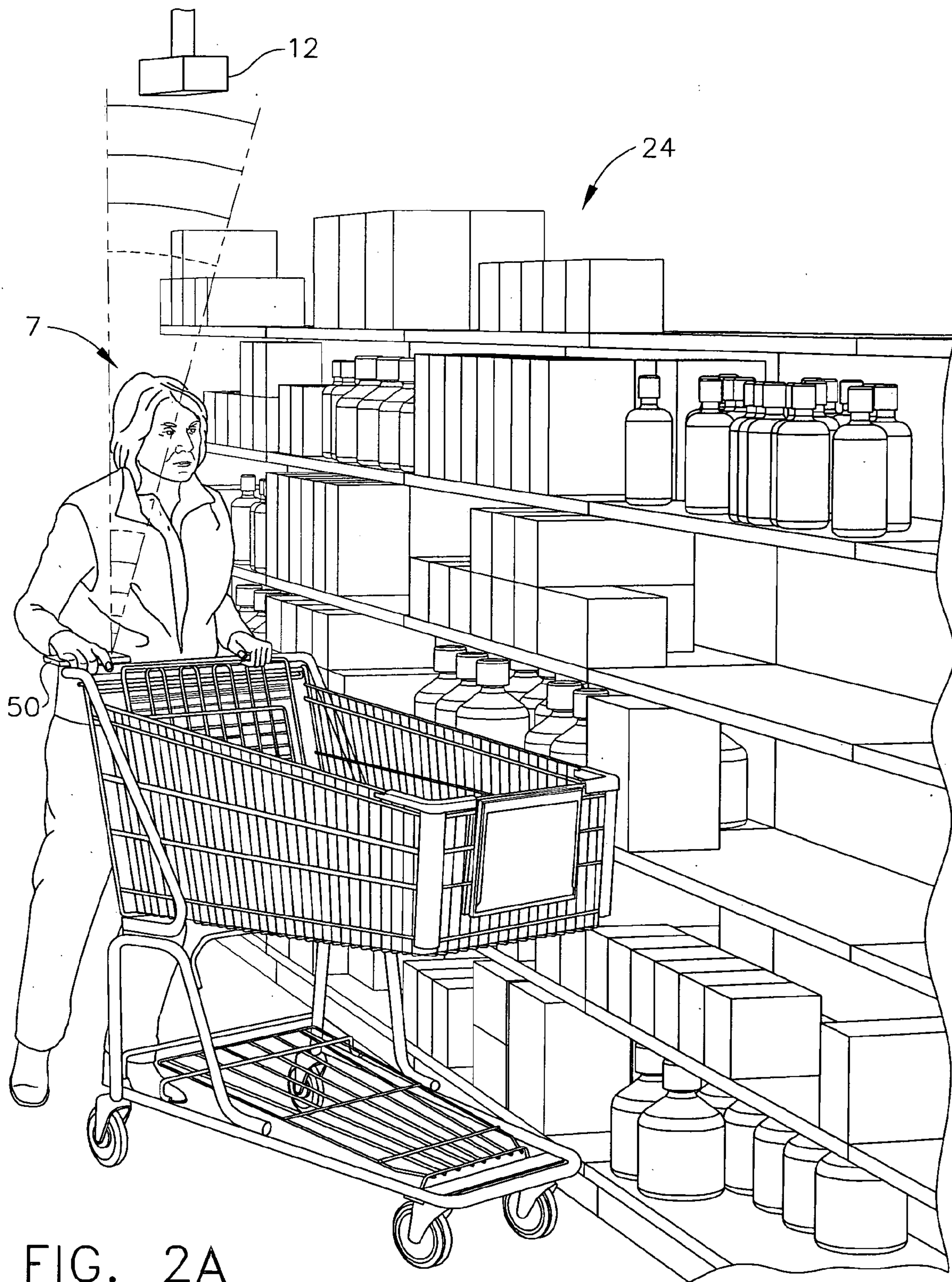


FIG. 2A



FIG. 2B



FIG. 2C



FIG. 2D

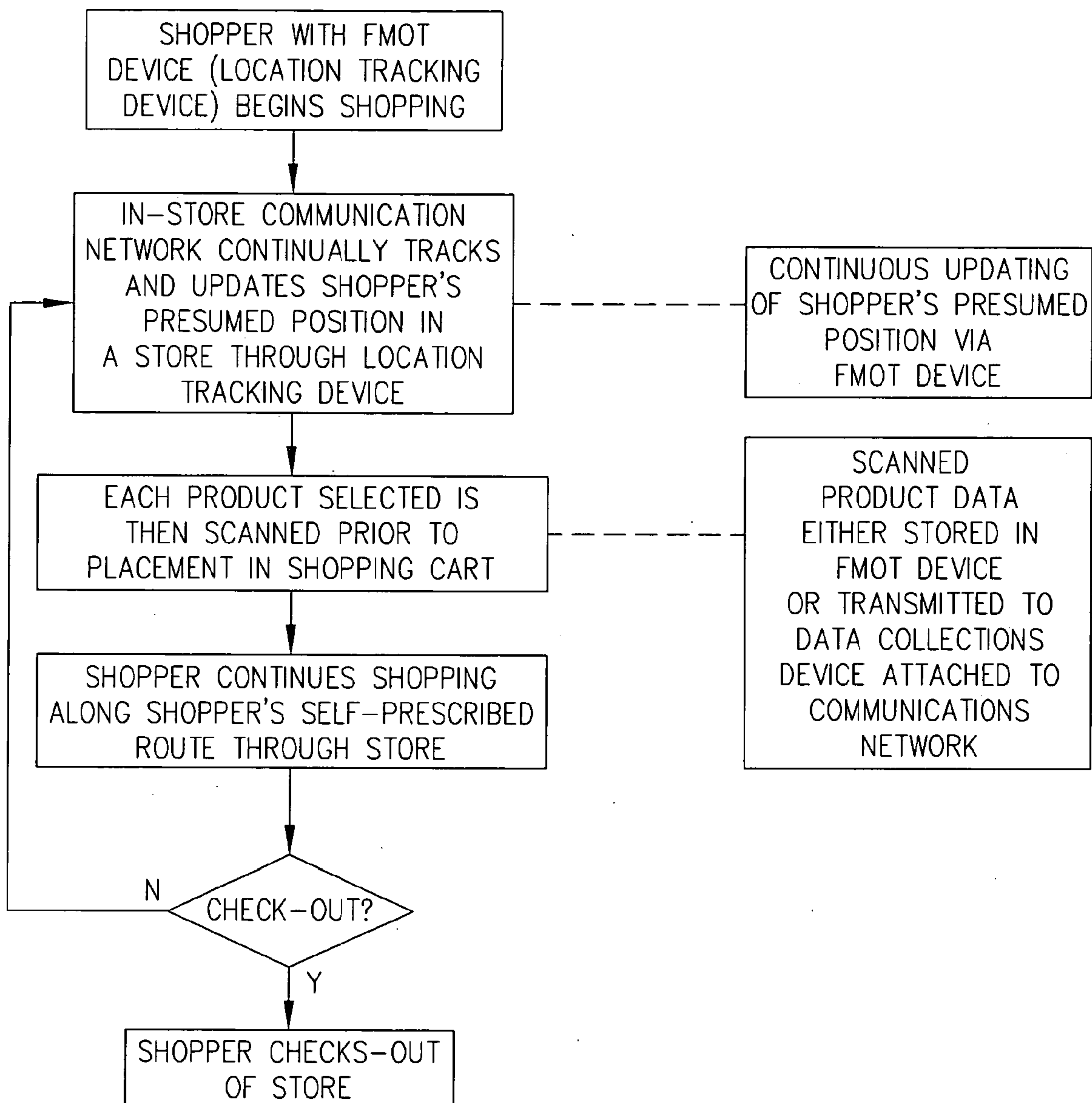


FIG. 3

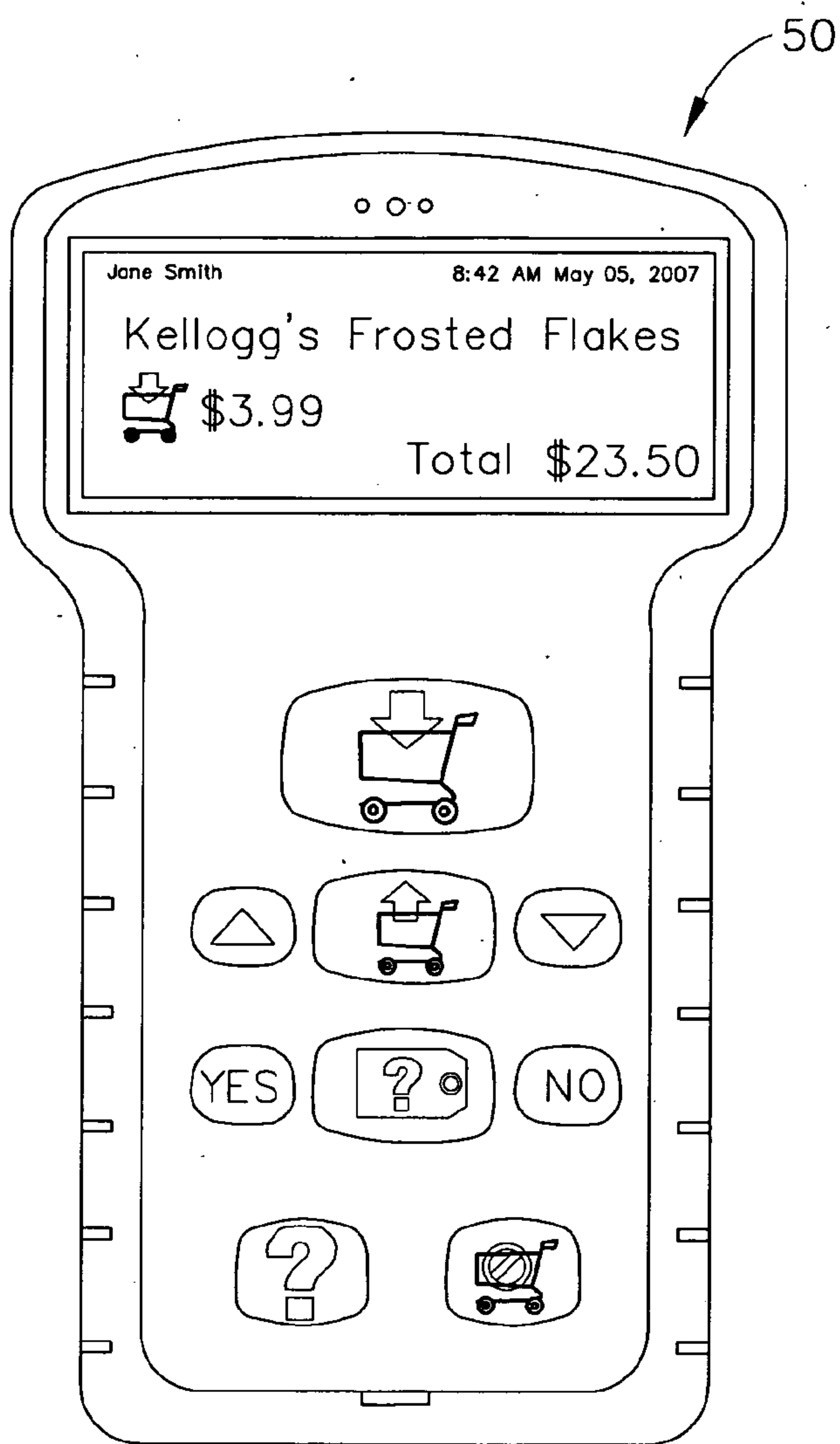


FIG. 4

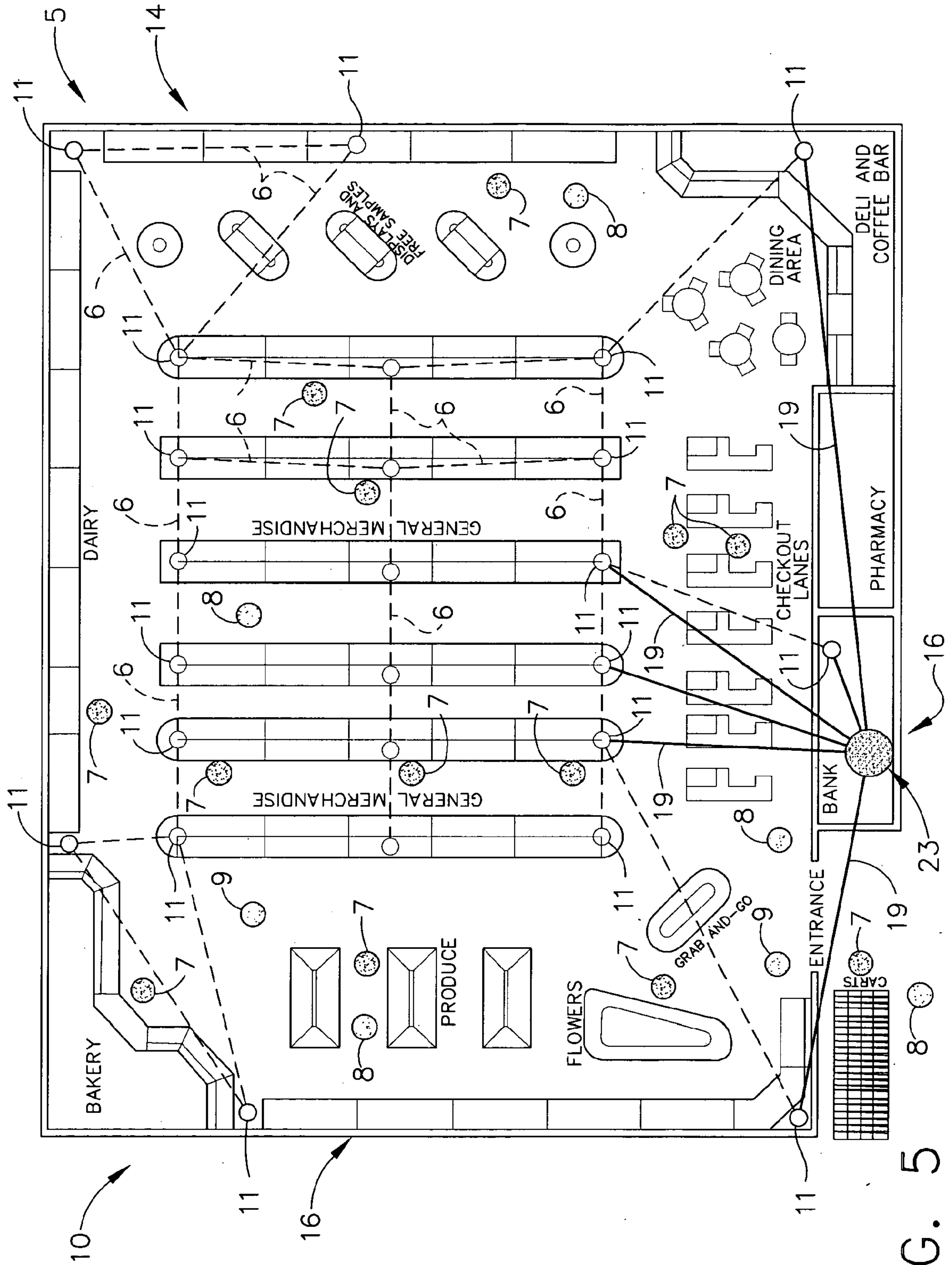


FIG. 5

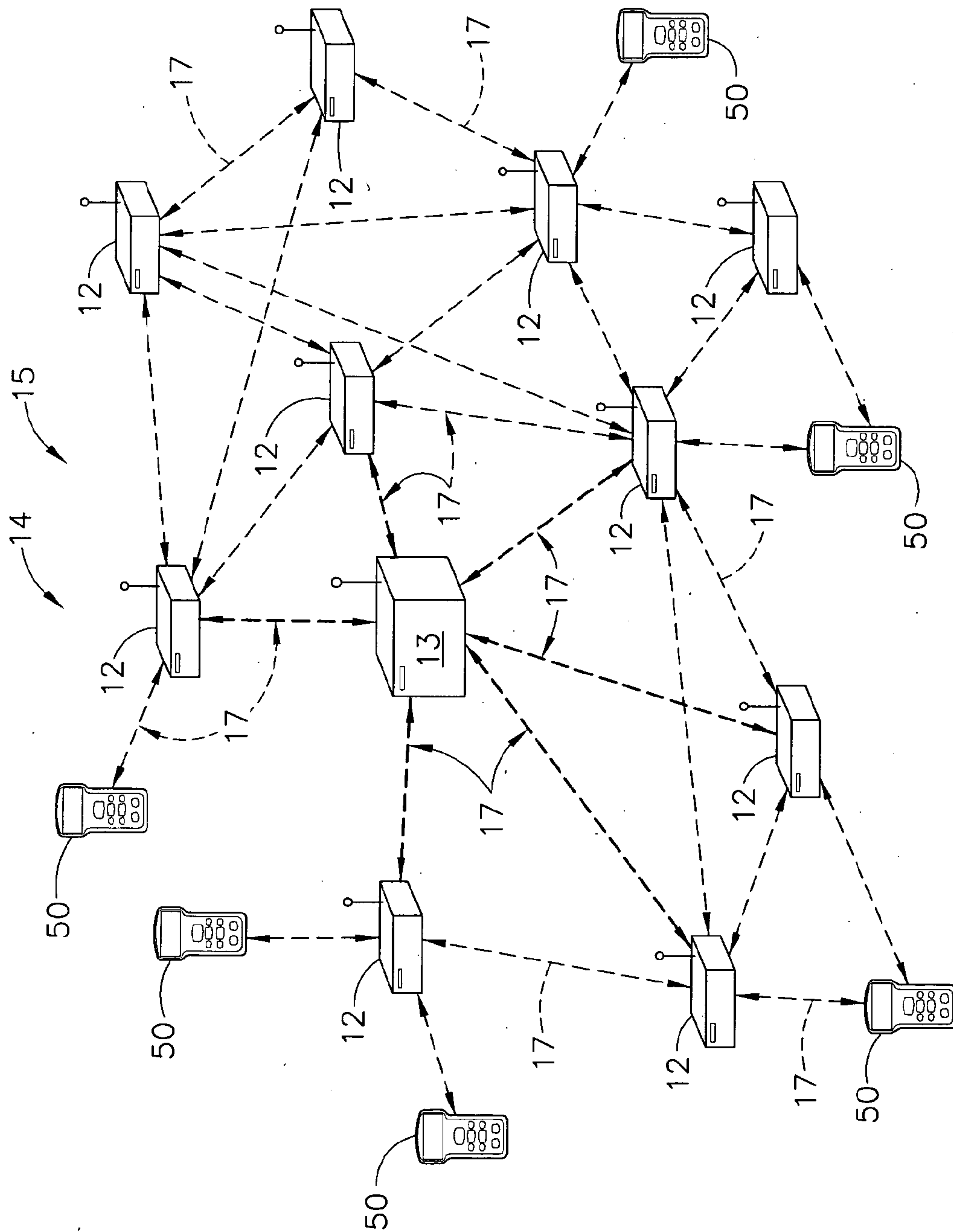


FIG. 6A

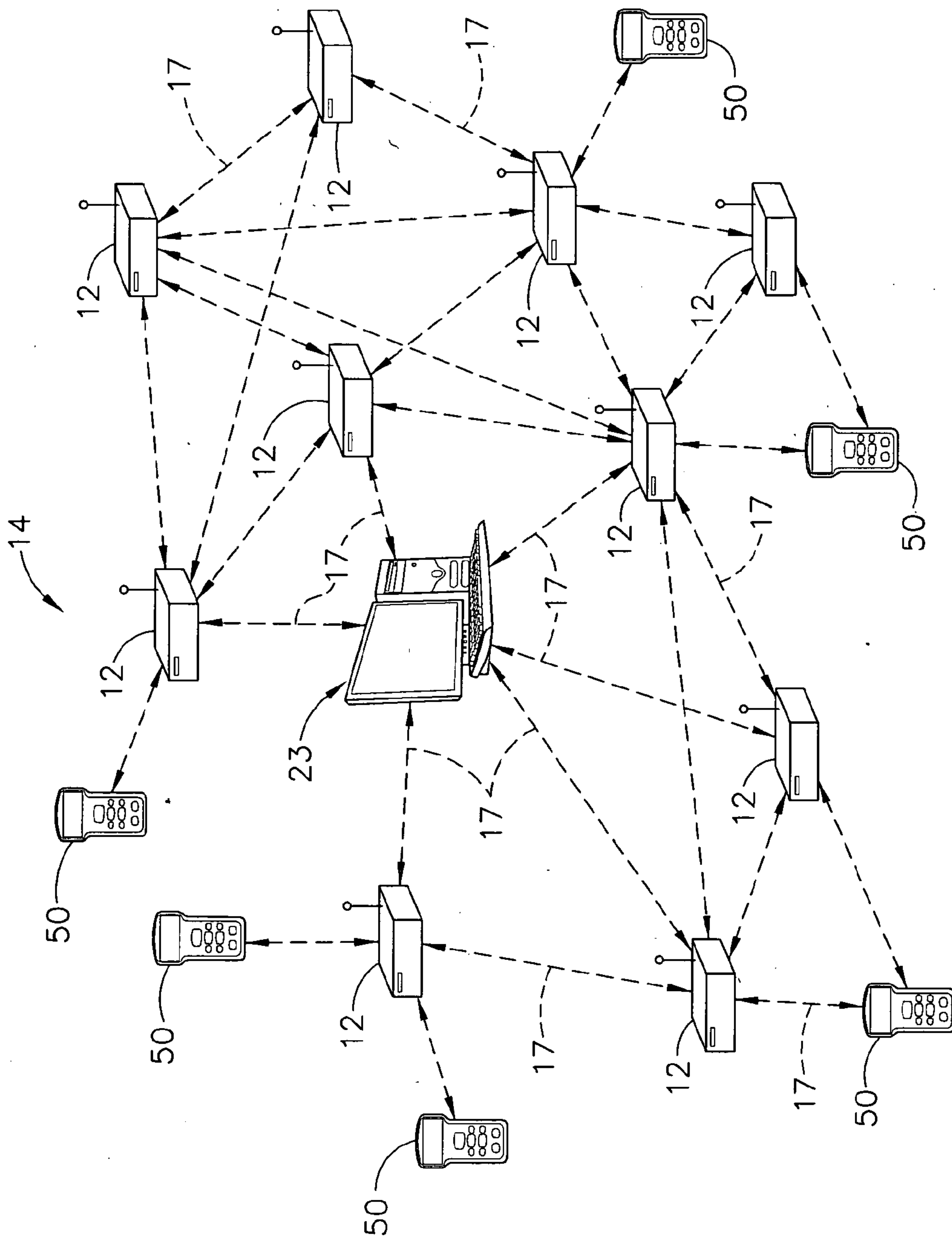


FIG. 6B

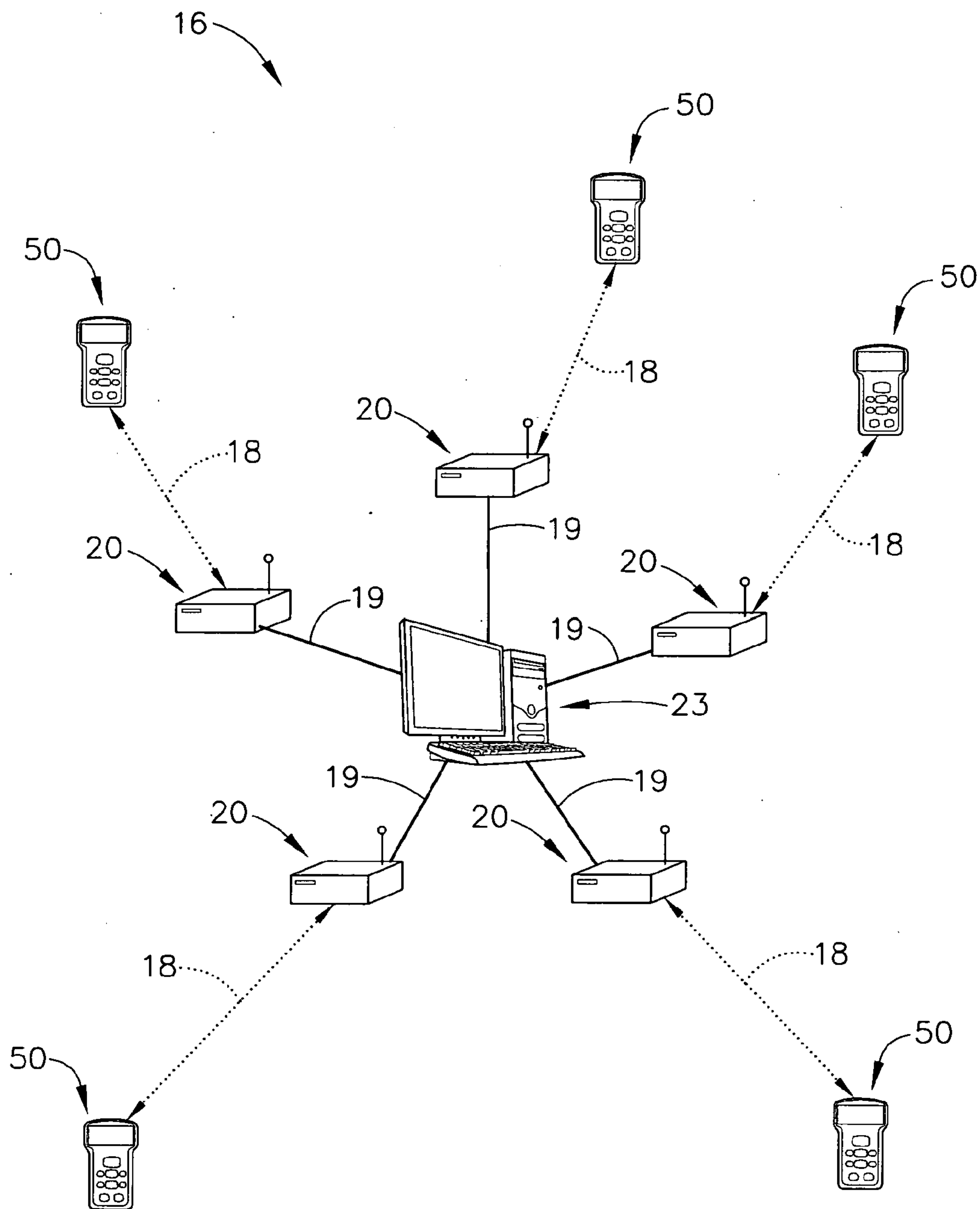


FIG. 7A

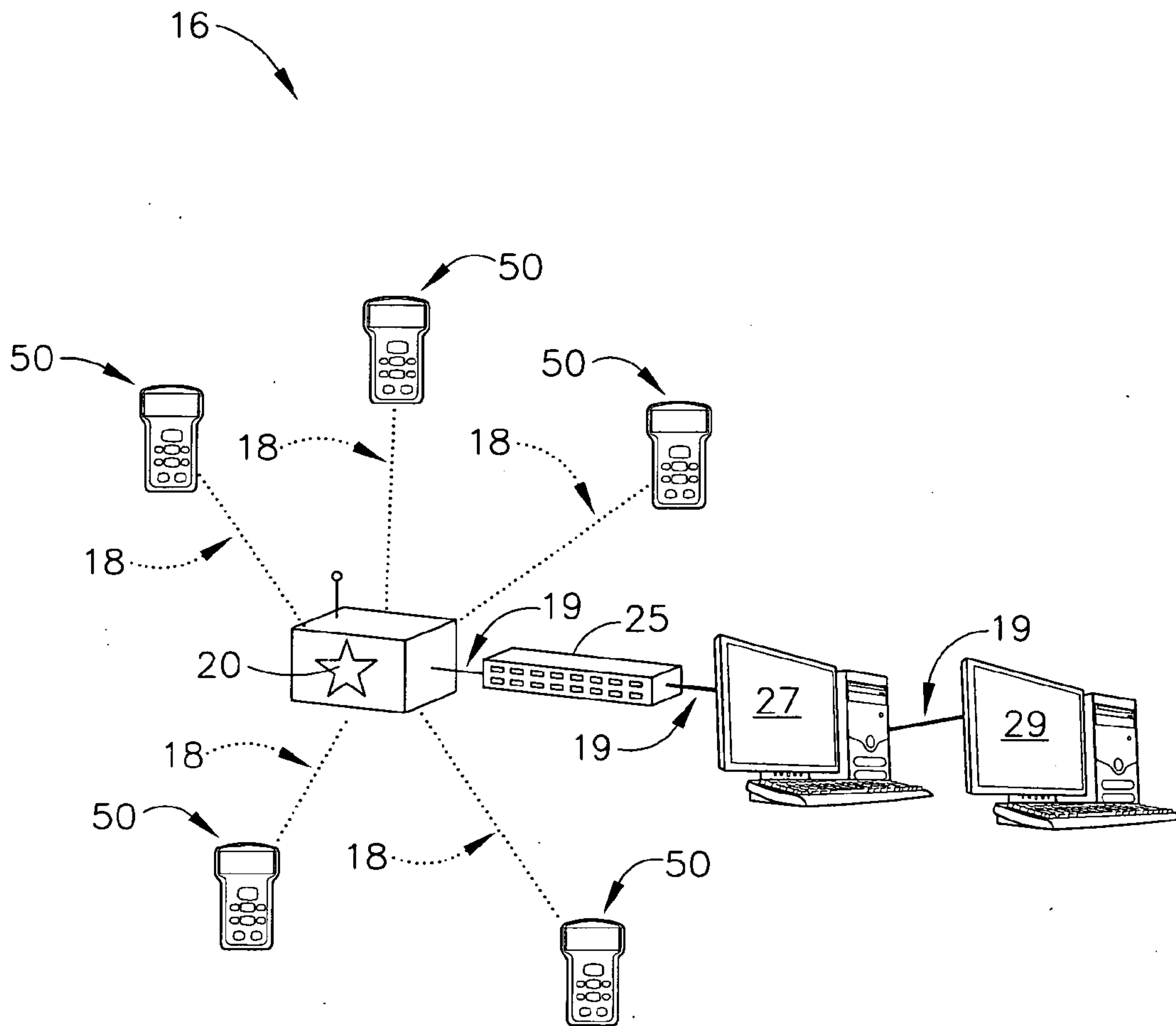


FIG. 7B

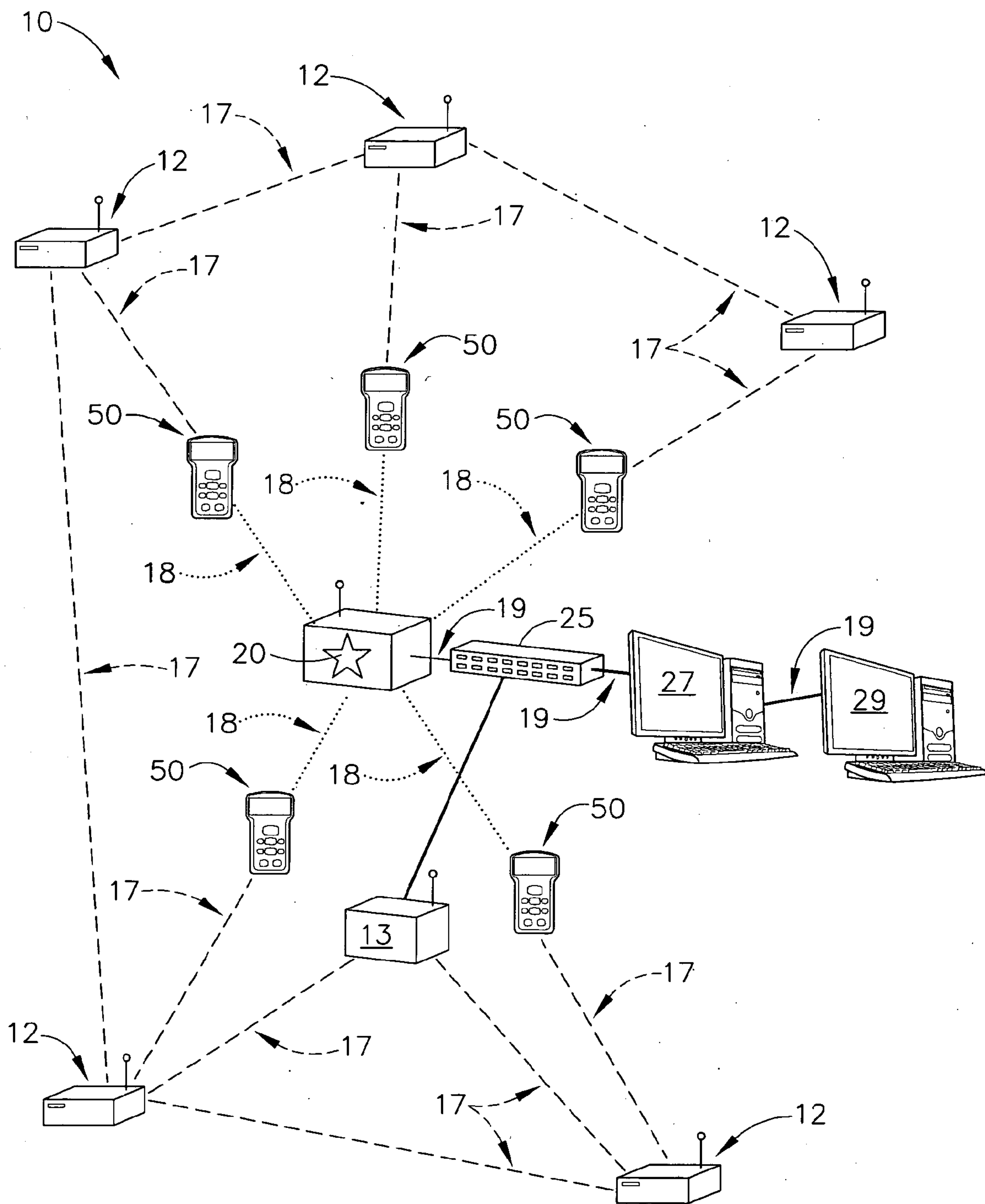


FIG. 8

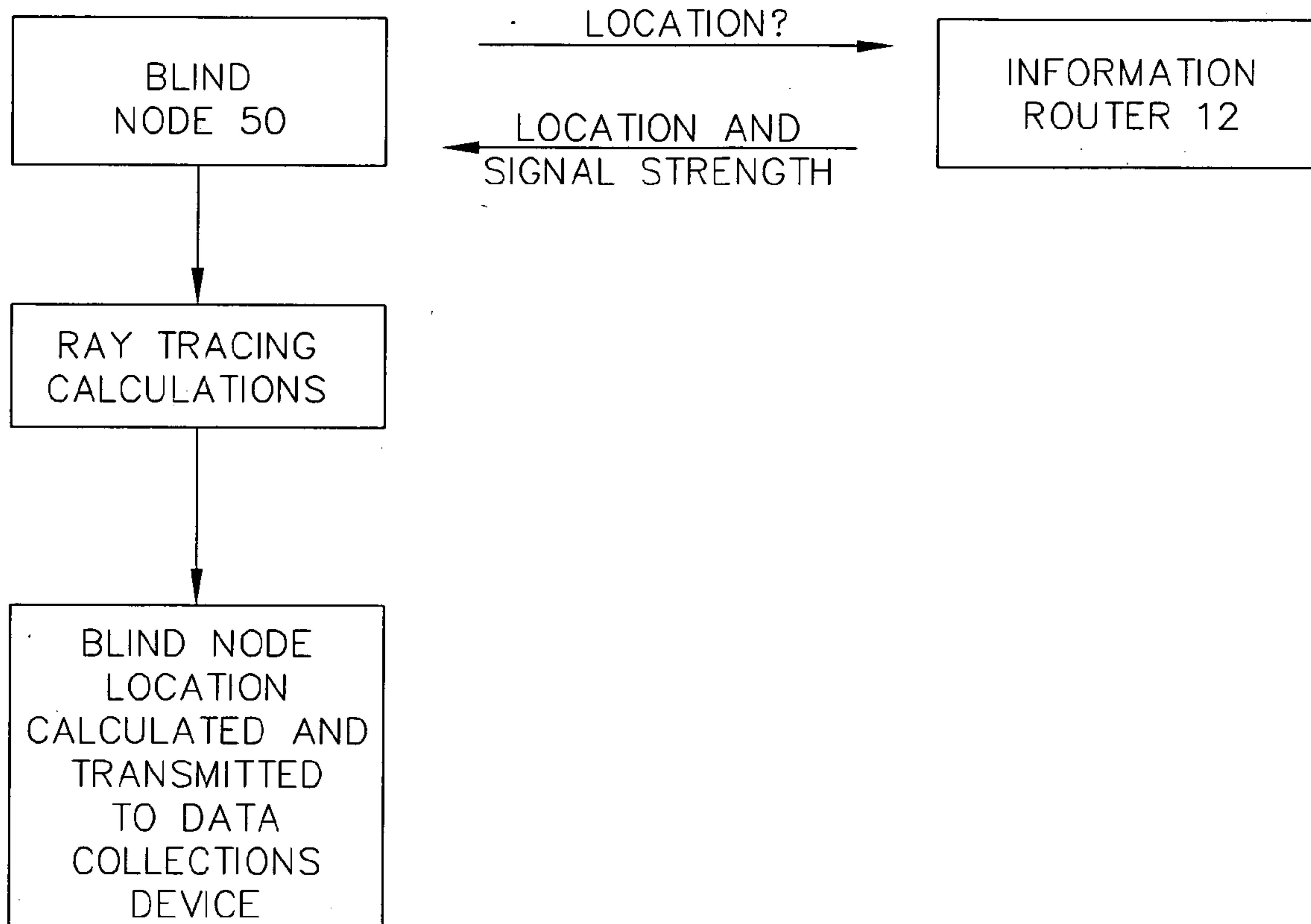


FIG. 10

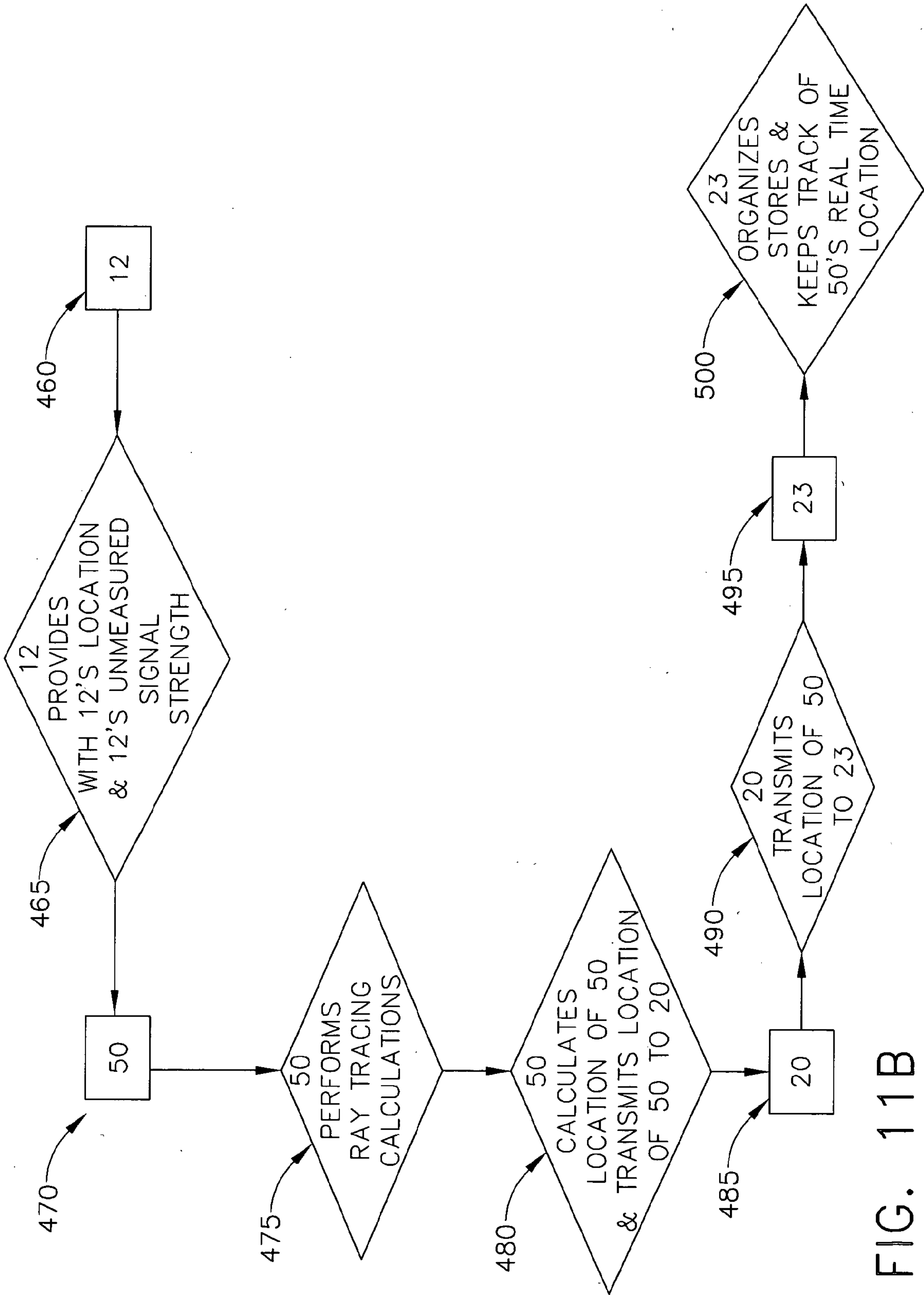


FIG. 11B

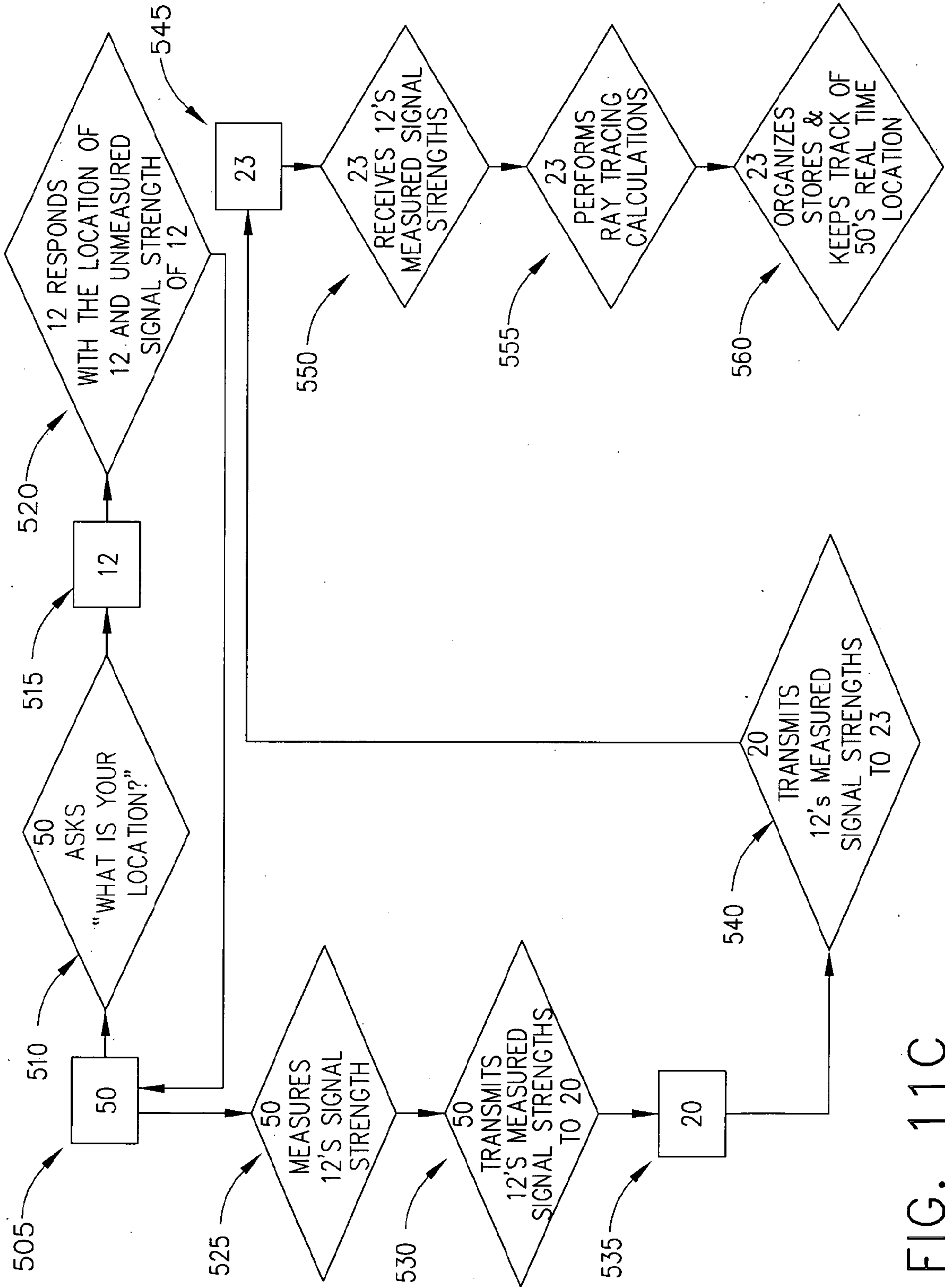


FIG. 11C

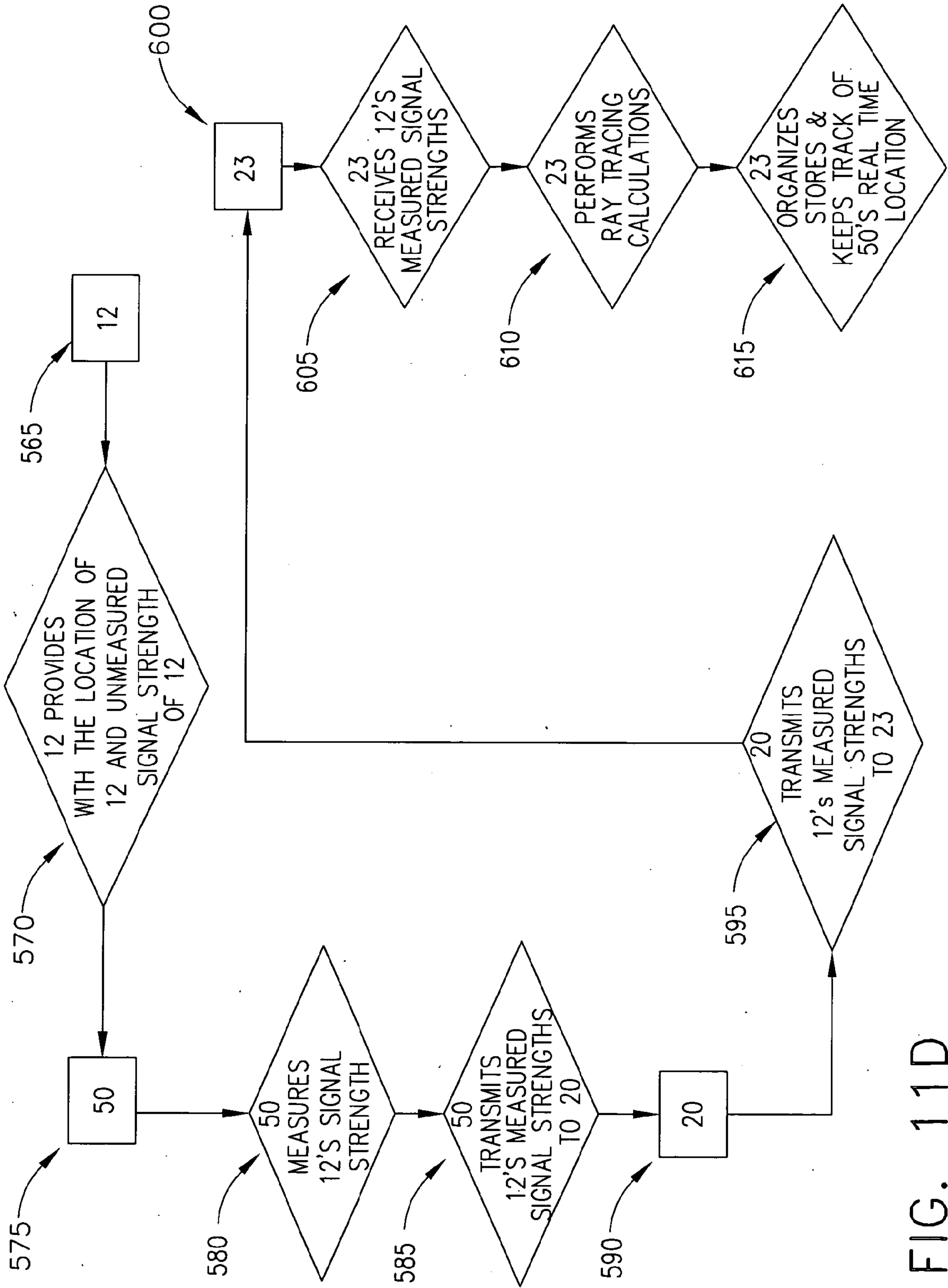


FIG. 11D

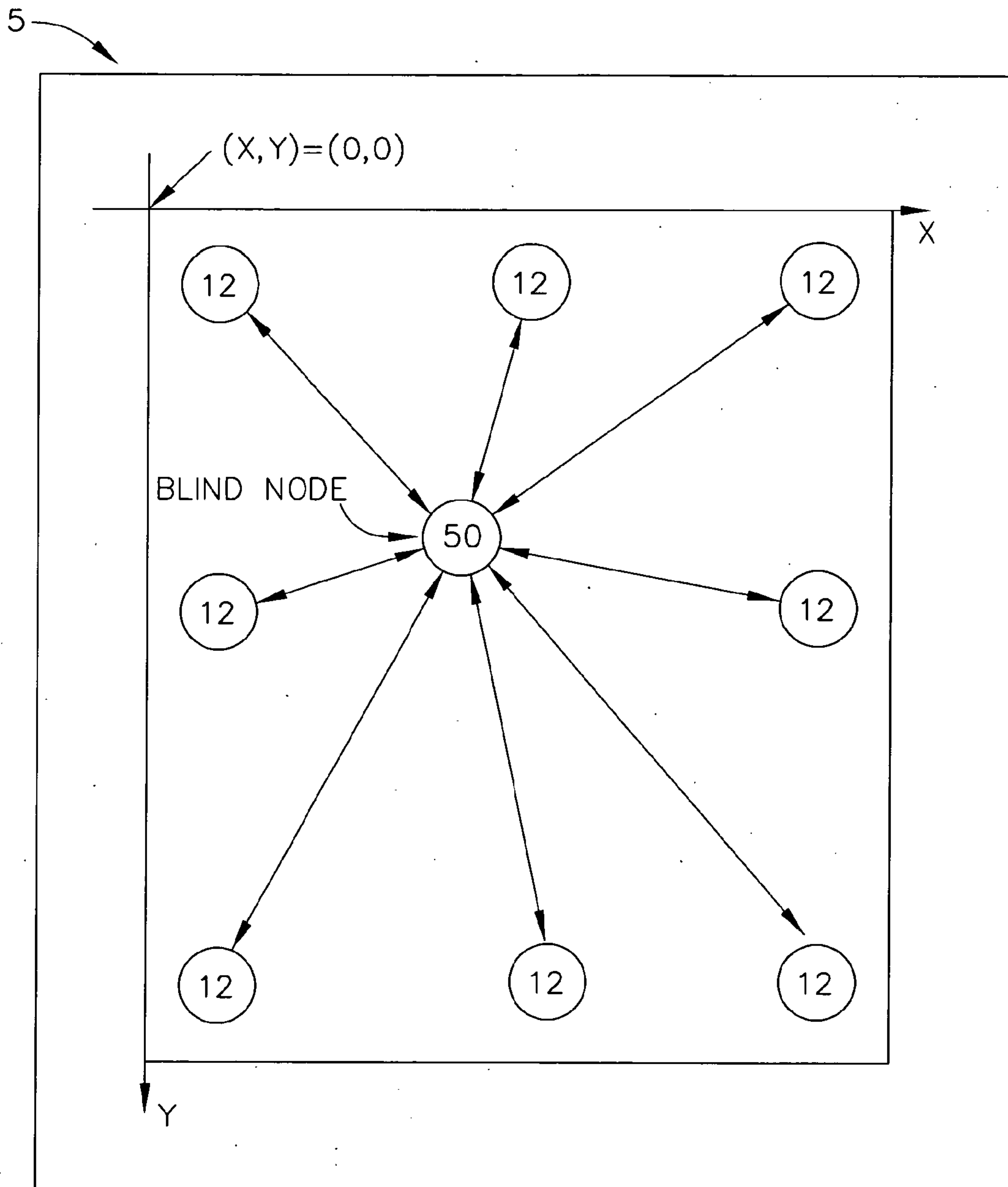


FIG. 12

