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(54) Title: PRODUCT ORDERING SYSTEM FOR A PRODUCT PROVISIONING SYSTEM

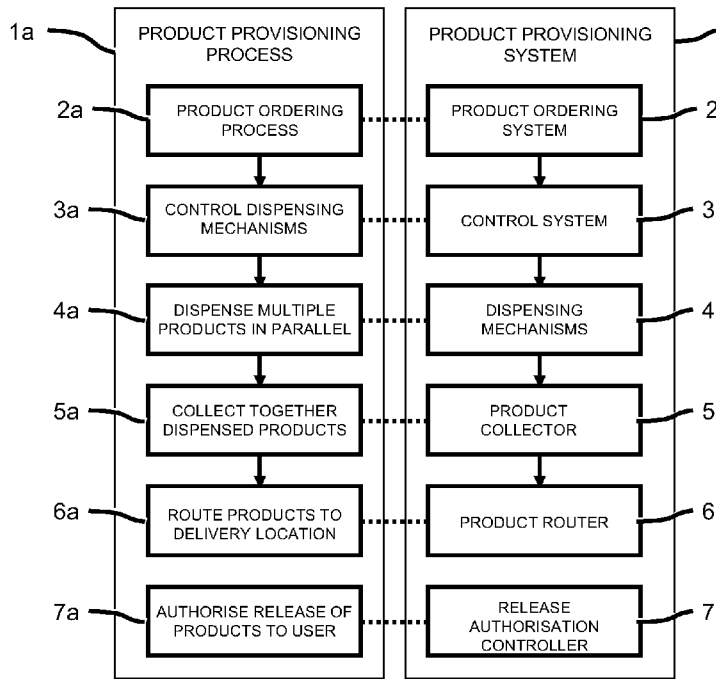


Figure 1

(57) Abstract: Product ordering systems and methods for a product provisioning systems are provided. The product ordering system comprises a product ordering interface for receiving a user interaction to order products. The product ordering interface is arranged to display a product menu of orderable products to a user. The product ordering interface is arranged to receive a user interaction to select a set of products of that menu to thereby generate a user-specified product order. The product ordering interface is further arranged to receive a user-initiated command to transmit said user-specified product order to the product provisioning system so that the product provisioning system can dispense to the user the set of products of the product order in parallel.

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Product Ordering System for a Product Provisioning System

Field of the Invention

The present invention relates to an improved product ordering system and its various components. In particular, the present invention relates to a product ordering system that is arranged to receive orders for multiple discrete, generally packaged products and control a product provisioning system so as to simultaneously dispense those products, thereby increasing product delivery throughput.

Background to the Invention

Product provisioning systems such as vending machines vend packaged products to users on-demand, and can conveniently be provided at locations where it is difficult or uneconomical to station staff, especially at all hours of the day. A common example of a vending machine is a soft drinks machine.

Such vending machines contain and dispense a limited number of products, and may be restricted to certain product ranges (for example, drinks, confectionary or tobacco products). As such, products may sell-out quickly and so these systems need to be frequently restocked by staff. Furthermore the limited range restricts consumer choice.

There are a number of reasons why such prior known systems may be restricted in terms of the number of or range of products. One reason relates to how many different products can be physically contained within the machine. Separate dispensing mechanisms are generally required for each set of products. Therefore, a large number of different sized and shaped products generally require a large number of different dispensing mechanisms - each of which take up valuable space within the vending machine.

Another issue is the difficulty in showing which product brands are contained within the machine, and which of those brands are in stock. One way to do this is to show a picture of the brand of a product on a product selection button on the vending machine. Each button may be illuminated in a way that indicates whether that corresponding product is in stock. Unfortunately, this arrangement makes it difficult to change the brand of products within the vending machine, as the selection buttons would need to be changed to reflect a substitute product brand.

It will be appreciated that in such vending machines, it is not actually possible for users to see the products that are on offer until purchase. This may make a user uncertain about the quality and quantity of a product, even if the quality is assured and the quantity is listed. Specifically, unlike a shop, the user cannot pick up and examine the product in detail before purchase.

To address this issue, some vending machines have transparent fascias that allow a user to see the products that are in stock. Generally, multiple products of the same type are arranged in rows, with the price of the product listed adjacent the row, along with a

reference associated with the row. Once a product has been decided upon, and correctly paid for, users need to select the correct item through the use of an alphanumeric keypad. The keypad is used to key in the reference associated with the product row. Choosing products in this way can be time consuming and the user may accidentally select the wrong product if the reference is not keyed-in correctly. Unfortunately, these vending machines are prone to damage or vandalism. In particular, as the fascia is transparent – and so made of glass or plastic – it can be relatively easy for criminals to attempt to break into the vending machine to gain access to the products within it. Criminals may be particularly tempted when the machine is visibly well stocked.

Another problem with such systems in general is that they are not set up to be able to efficiently dispense more than a single product at time. If multiple products are required, each product generally needs to be paid for, selected and dispensed individually. This can be frustrating for users wanting to purchase multiple products quickly.

Part of the reason for this stems from a poor user interface. Users may need to check whether a particular product is in stock, then feed the vending machine with coins totalling the exact price of the product, and then select the product to be dispensed. This process needs to be repeated for each product and requires a user to have the correct coin denominations. Another reason for this is that the mechanisms within the vending machines are generally only able to dispense only single items at a time.

A further consideration is that associated with energy efficiency. Firstly, a lot of energy can be consumed dispensing products. For example, a substantial amount of energy may be consumed by a vending machine attempting to drive a row of products horizontally against the frictional forces presented by the floor of the row. Additionally, the necessarily limited product range of such vending machines cannot benefit from the economies of scale, and so heating and/or cooling of products within the vending machine is energy inefficient.

It is against this background that the present invention has been devised.

Summary of the Invention

According to a first aspect of the present invention there is provided a product ordering system for a product provisioning system, the product ordering system comprising a product ordering interface for receiving a user interaction to order products. Preferably, the product ordering interface is arranged to display a product menu of orderable products to a user. Preferably, the product ordering interface is arranged to receive a user interaction to select a set of products of that menu to thereby generate a user-specified product order. Preferably, the product ordering interface is arranged to receive a user-initiated command to transmit said user-specified product order to the product provisioning system so that the product provisioning system can dispense to the user the set of products of the product order. Ideally, products are dispensed in parallel.

Preferably, the product ordering interface is further arranged to display to a user a list of the set of selected products.

Preferably, the list is dynamic and is arranged to receive a user input to remove items from the list.

5 Preferably, the product ordering interface is further arranged to display to a user a sum cost of the set of selected products.

Preferably, the product ordering system further comprises a progress indicator arranged to provide dynamic feedback to a user about an expected delivery time of the set of products.

10 Preferably, the product ordering interface further comprises an electronic menu system having a touch-screen display. Preferably, the electronic menu system comprises a hand-portable device.

Preferably, the product ordering system further comprises an authentication device arranged to determine that the user is authorised to receive products of the product order. Preferably, the authentication device comprises a payment card reader.

15 Preferably, the user initiated command to transmit the user-specified product order is initiated in response to the authentication device determining that the user is authorised to receive products of the product order.

20 Preferably, the product ordering system further comprises a communication module arranged to establish a communication channel between the user and a remote monitoring station, the remote monitoring station being configured to remotely monitor and/or control the product ordering system.

25 Preferably, the product ordering interface is arranged to display a plurality of product menus to a user in a sequence and receive a user interaction therewith to generate and transmit in a corresponding sequence a plurality of product orders to the product provisioning system so that products having a longer delivery time are ordered before products having a relatively shorter delivery time.

30 According to a second aspect of the present invention there is provided a product provisioning system comprising a product ordering system according to the first aspect of the present invention.

Preferably, the product provisioning system is arranged in use, to deliver to a user substantially simultaneously a plurality of heterogeneous discrete products in response to receiving a product order from the product ordering system.

35 Preferably, the product provisioning system further comprises a plurality of independently-controllable product dispensing mechanisms each configured to dispense different predetermined types of said discrete products from one another;

a product collector arranged to collect together products dispensed by the plurality of product dispensing mechanisms; and

a control system in communication with the product dispensing mechanisms, the control system being arranged to receive a user-specified product order for a set of heterogeneous products and, in response, control a set of the plurality of product dispensing mechanisms in parallel to dispense specified products of that product order.

5 Preferably, the product provisioning system is arranged to receive a queue of product orders from a plurality of product ordering systems, and is arranged to dispense a respective set of products to the originator of each order. Advantageously, as orders are fulfilled in dependence on the speed of a complete order, product ordering users that may have started ordering earlier, but are taking a long time in completing their order do not hold
10 up product ordering users that are quick to lodge their orders, but may have started their order relatively later.

Advantageously, the product ordering interface may comprise mechanical product selection means, as this is cheaper to implement and can provide better tactile feedback to a user. Preferably, the product ordering interface comprises a graphical user
15 interface. The graphical user interface may comprise a slider with which the user can interact to select a quantity and associated cost of a metered product such as fuel. Preferably, the graphical user interface is arranged to simultaneously display the cost and quantity of the metered product. Preferably, the graphical user interface is arranged to update the display in response to a user interaction with the slider.

20 According to a third aspect of the present invention there is provided a method of receiving a user interaction to order products to be dispensed by a product provisioning system, the method comprising:

displaying a product menu of orderable products to a user;
receiving a user interaction to select a set of products of that menu to thereby
25 generate a user-specified product order; and

receive a user-initiated command to transmit said user-specified product order to the product provisioning system so that the product provisioning system can dispense to the user the set of products of the product order in parallel.

According to other aspects of the present invention there may be provided a
30 product provisioning system arranged, in use, to deliver to a user substantially simultaneously a plurality of heterogeneous discrete products, the product provisioning system comprising: a plurality of independently-controllable product dispensing mechanisms each configured to dispense different predetermined types of said discrete products from one another; a product collector arranged to collect together products dispensed by the plurality of product dispensing
35 mechanisms; and a control system in communication with the product dispensing mechanisms, the control system being arranged to receive a user-specified product order for multiple heterogeneous products and, in response, control a set of the plurality of product dispensing mechanisms in parallel to dispense specified products of that product order.

Preferably, at least one of said product dispensing mechanisms comprises a substantially vertically-oriented channel through which said discrete products travel under action of gravity during product dispensing, said product dispensing mechanism being configured to control the passage of products through the channel.

5 Preferably, the at least one product dispensing mechanism comprises a restriction means for controlling the effective cross-sectional area of the channel, and thereby controlling the passage of products through the channel.

10 Preferably, the product provisioning system further comprises a plurality of product channels, each corresponding to a respective product dispensing mechanism and each product channel comprising a channel inlet arranged to receive products, said channel inlets being located adjacent to one another to facilitate restocking of products into each channel inlet, and maximising the utilisation of space. Said product channels may be aligned with one another.

15 The product collector may comprise a cushioned surface onto which said dispensed products are dropped. Said cushioned surface may be inclined and may comprise a friction-reducing means for facilitating collection together of products dispensed thereon under action of gravity.

20 The product provisioning system may further comprising a product ordering interface configured to display a list of orderable products to a user, receive a user interaction to select multiple products of that list, and receive a user-driven command to transmit said selected multiple products as the user-specified product order to the control system.

The product ordering interface may be configured to display the multiple selected products together with their total price to the user, prior to receiving the user-driven command to transmit the product order to the control system.

25 Preferably, the product ordering interface is arranged to receive payment in respect of the product order. Advantageously, as individual items of the product order are not paid for individually but rather as a whole, the ordering, paying for and dispensing of those products can be achieved more quickly than prior known systems.

30 The product provisioning system may further comprise an authentication device arranged to determine that a product-ordering user is authorised to receive products of the user-specified product order, and in response control user-access to said products. Said authentication device may comprise a payment card reader.

35 The product provisioning system may comprise a product router for routing products of a product order to one of a plurality of delivery locations, each associated with an individual product-ordering user.

According to a further aspect there may be provided a product dispensing mechanism for use with at least one of said product provisioning systems.

According to a further aspect there may be provided a vehicle service station comprising at least one of said product provisioning systems.

According to a further aspect there may be provided a product provisioning method for delivering to a user substantially simultaneously a plurality of heterogeneous discrete products, the method comprising receiving a user-specified product order for multiple heterogeneous products and, in response, controlling a set of a plurality of product dispensing mechanisms in parallel to dispense products of that product order.

It will be appreciated that different aspects of the present invention may be combined or substituted where context allows. For example, the product ordering system of one aspect may comprise components, features or advantages of the product provisioning system of other aspects.

According to a further inventive aspect there may be provided a product ordering system arranged to receive product orders from users for use in determining products to be delivered to at least one delivery station. The product ordering system may be suitable for use with a vehicle service station. The product ordering system may be arranged to receive product orders from vehicle service station users for use in determining the products to be delivered at the at least one delivery station. It will be understood that the product ordering system will typically be associated with a product provisioning system that can subsequently deliver the ordered products.

Optionally, the product ordering system comprises a product menu arranged to receive an input from a user to signify which products the user would like to order.

Optionally, a product menu is presented to vehicle users at the entry point of the vehicle service station, the product menu being arranged to receive an input from a user to signify which products the user would like to order.

Advantageously, the use of a product ordering system allows receipt of product orders before a vehicle or user has reached a delivery station where product orders can be fulfilled. Therefore, product orders can be received when a vehicle may be in a queue for a delivery station. This is particularly useful for fulfilling orders that have a lead-time, for example associated with the picking of that product and transporting it to the appropriate delivery station. Furthermore, a user requiring time to decide which products to order can do so without occupying a vacant delivery station. This maximises order processing and where appropriate, vehicle flow through the service station.

It will be understood that the product menu will be associated with a user or vehicle so that subsequent delivery of products can be directed to the appropriate user or vehicle.

Optionally, the product menu is hand-portable, and so may be taken by a user into a vehicle.

Advantageously, this allows a user to move along the vehicle path into the service station beyond the entry point, thereby improving vehicle flow through the station. At the same time, the user retains access to the product menu. This is advantageous over prior product ordering systems in which a menu is presented in the form of a display fixed at one position, for example at the entry point of the vehicle service station.

Optionally, a support structure may be provided to aid manipulation of the product menu. Optionally, the support structure may comprise mounting arms to allow the product menu to rest against a steering wheel of a vehicle. Advantageously, this provides an ergonomic way for a user to view and interact with the product menu.

Optionally, the product menu comprises non-electronic media, such as paper, displaying a listing of orderable products, the media being user-markable to denote products to be ordered.

It will be understood that when the product menu is provided on flexible media such as paper, the support structure can provide a rigid planar backing surface to support the media during marking.

Optionally, the product menu comprises predefined markable areas corresponding to the listed products that are readable by an electronic scanner to automatically determine product orders.

Advantageously, providing a markable non-electronic menu provides a cheap and convenient way to allow vehicle users to see and select a listing of the available products.

Optionally, the product menu is printed in response to a vehicle arriving at the vehicle entry point.

Advantageously, this ensures that product menus are not supplied needlessly, nor contain out-of-date information. In particular, the product ordering system may be in communication with a stock control system to ensure that only available products are listed on the product menu.

Optionally, the product menu comprises an electronic menu system such as a touch-screen computing device, the electronic menu system displaying a listing of orderable products, the electronic menu system being arranged to receive a user selection of products.

A further inventive aspect may be an electronic menu system such as a touch-screen computing device, the electronic menu system displaying a listing of orderable products, the electronic menu system being arranged to receive a user selection of products.

Optionally, the electronic menu system comprises an integrated payment card reader for receiving payment for ordered goods.

Optionally, the electronic menu system is arranged to wirelessly communicate a product order.

Optionally, the electronic menu system is arranged to present a series of pages to a user in a sequence to receive user selections relating to products having a longer delivery

time before receiving user selections relating to products having a relatively shorter delivery time.

Optionally, the product ordering system comprises a progress indicator providing dynamic feedback regarding the progress of the delivery of one or more ordered products.

5 Optionally, the progress indicator provides dynamic feedback regarding the expected time at which ordered products will be delivered.

10 It will be understood that the progress indicator may be provided via the electronic menu system and/or may be provided by another means – for example a display mounted adjacent the delivery station. Components of the traffic guidance system may provide said progress indicator.

Optionally, the product ordering system comprises a shopping area in which product representations, such as images and/or text, are shown on one or more displays, the shopping area being arranged to receive a user selection of products.

15 A further inventive aspect may be a shopping area in which product representations, such as images and/or text, are shown on one or more displays, the shopping area being arranged to receive a user selection of products.

20 It will be understood that the shopping area may be accessible to users from a delivery station. In such an arrangement, users would need to leave their vehicles to access the shopping area. Alternatively or in addition, the shopping area may be accessible to pedestrians from an exterior of the vehicle service station.

Optionally, the product representations are shown to substantially life-size scale.

Optionally, the product ordering system further comprises a user hand-held scanner arranged to allow user selection of products through interface of the scanner with the one or more displays.

25 Optionally, the user hand-held scanner is uniquely identified with a user, or a vehicle of a user.

30 It will be understood that the product ordering system may comprise a plurality of order receiving devices – for example, the electronic product menus. The plurality of order receiving devices may be arranged to allow product orders to be compiled in parallel. After each product order is compiled, it may be confirmed as being completed. Advantageously, the product ordering system may be arranged to sequence product order fulfilment in order of completion. Advantageously, this reduces the amount of time taken for a group of product orders to be compiled, confirmed and then completed.

35 According to a further inventive aspect there is provided a product provisioning system arranged to receive product orders from a product ordering system and schedule the delivery of the ordered products to a delivery target.

Optionally, the product provisioning system comprises a plurality of delivery targets each relating to a separate product delivery order. It will be appreciated that each

delivery target will generally relate to an order originating from a specific user. A user may order multiple products as part of the same order, and these products will generally be assigned to one of the delivery targets.

5 Optionally, the product provisioning system comprises a routing mechanism arranged to route delivery targets to an appropriate product delivery channel at an appropriate time.

The product delivery system may comprise the routing mechanism. The routing mechanism may comprise one or more conveyor belts.

10 Optionally, the routing mechanism determines the appropriate product delivery channel at the appropriate time in response to a routing input associated with a tracked position of a product-ordering user, or vehicle associated with that user.

A further inventive aspect may be a routing mechanism arranged to route delivery targets in response to a routing input associated with a tracked position of a product-ordering user, or vehicle associated with that user.

15 Optionally, the tracking input is derived from a tracking system arranged to track the position of a product-ordering user, or vehicle associated with that user.

Optionally, the tracking system is arranged to track the position of the or each delivery target.

20 Optionally, the or each delivery target comprises a receptacle into which one or more products from a common product delivery order are received.

Alternatively, the delivery target may relate to an allocated position of one or more products relating to an order that is controlled by the product provisioning system. For example, the delivery target could be an allocated position of products on a series of conveyor belts.

25 The product ordering interface may be configured to display the multiple selected products together with their total price to the user, prior to receiving the user-driven command to transmit the product order to the control system.

30 The product provisioning system may further comprise an authentication device arranged to determine that a product-ordering user is authorised to receive products of the user-specified product order, and in response control user-access to said products. Said authentication device may comprise a payment card reader.

35 Preferably, the product provisioning system comprises a product-ordering interface arranged to communicate to the product dispensing mechanisms the products to be dispensed. Preferably, the product-ordering interface comprises a touch-screen device tablet device. The product-ordering interface may comprise the authentication device.

Preferably, the product dispenser may be arranged to dispense goods other than discrete goods. For example, the product dispenser may be arranged to dispense liquids – including fuel, and beverages such as tea or coffee.

It will be appreciated that the product provisioning system may be used in contexts broader than simply vending discrete products. In particular, the product provisioning system may be arranged to dispense products in response to receiving an authorisation to do so that is not necessarily associated with receiving payment for the products to be dispensed. For example, the authorisation to dispense products may be associated with the identification of a user entitled to receive products. The product provisioning system may comprise an authentication device for authenticating the identity of a user and/or authenticating the products for dispensing. The authentication device may comprise a user database. The user database may list the products that users may be entitled to receive.

As mentioned above, the product provisioning system may be applicable to situations broader than simply vending of products in exchange for payment. For example, the product provisioning system may be used in a scenario where products contain medicines, and the users are entitled to those medicines without necessarily paying for them. In such a situation, it will be appreciated that it is important for users to be correctly identified by the product provisioning system, so that the correct products can be dispensed. If medicines are incorrectly dispensed, then this could have disastrous implications for the recipients of that medicine. Even if the recipient of a medicine realises that the incorrect medicine has been dispensed, then this still presents a problem of depleting the stock of medicines that can otherwise go towards helping others. In such a scenario, it is envisaged that users requiring medicines would pre-register themselves with the system – for example, via a doctor or clinic. At this stage, the doctor or clinician – or other authority - could specify a number of different parameters to the product provisioning system. For example, the identity of the user could be associated with the type of medicine required for that user and/or dependent users. The language that the user understands may be recorded by the system. Furthermore, data relating to repeat prescriptions can be entered into the system. Also at this pre-registration stage, data associated with uniquely identifying a user can be received. For example, the user's eyes can be scanned with an iris scanner or the user's fingerprints can be scanned. Alternatively, the user may be assigned with a unique identifier and be provided with a way of communicating that identifier with the product provisioning system. For example, if the identifier is a number, the user may be given a printout of that number and be informed that the number can be keyed into the system. Alternatively, the user may be given a barcode, or other unique machine-readable code.

As such, once a user has been registered with the system, the user does not necessarily need to consult the doctor for prescriptions. The user simply needs to approach the product provisioning system, provide the system with information relating to user's identity – and received the dispensed products.

The product provisioning system may comprise a user interface that guides the user into providing the requisite data needed for authentication and/or product ordering. For example, if the authentication device comprises an iris scanner, the user-interface may guide the user to face the iris scanner in the correct manner. Alternatively, the user-interface may prompt the user to receive a fingerprint scan, or to provide other information, for example, to type in a code uniquely identifying the user. Of course, the information may be presented in the predetermined language that the user understands. Alternatively, instructions or information may be provided in a set of different languages.

Once identified by the authentication device, the system may then consult a set of rules to determine which products to dispense to the identified user – if any. For example, if the user is attempting to access repeat prescriptions of a medicine too early, then such medicines may not be dispensed. Instead, the user-interface may provide the user with a message to signify that the user has attempted to access the medicines too early, and may also provide information about when the user should next return to access medicines.

If users attempt to access the product provisioning system without pre-registering and/or if the product provisioning system does not have information relating to an identified user, the user can be instructed to pre-register, or take another appropriate action.

Preferably, the product provisioning system comprises a storage region in which products are stored prior to dispensing. The product provisioning system and/or storage region may comprise a plurality of product channels. Each product channel may feed a product dispensing mechanism. Each product channel may comprise a channel inlet arranged to receive products into the product channel. Channel inlets may be located adjacent to one another. Advantageously, locating channel inlets adjacent to one another facilitates restocking of products into each channel inlet, and can also maximise the utilisation of space

Preferably, the product channels are aligned with one another. Advantageously, products can be loaded into the channels by transferring (e.g. driving) the products into the inlets along a common direction. This can facilitate automated loading of multiple products into the product channels.

It will be appreciated that the storage region may be physically large in size, and so can be very heavy, especially when laden with a variety of different products. As such, the storage region may be part of a fixed installation to which products will need to be transported for the purposes of refilling the storage region.

Preferably, the product provisioning system comprises a product refill module. Preferably, the product refill module comprises a product buffer from which products can be transferred into the storage region. The product buffer may be divided into a plurality of buffer sections, a separate section intended for each product type. The product refill module may be arranged to align with the storage region to refill products within the product channels. Each

buffer section may comprise a plurality of outlets that correspond to channel inlets of the storage region. As such, when the product refill module is aligned with the storage region, the outlets of the product refill module can align with the channel inlets, and products can be transferred from the product buffer into respective product channels within the storage region.

5 It will be appreciated that each of the product channels ideally is dedicated to a single type or brand of product; with different product channels holding heterogeneous discrete products. As such, it is desirable for the product buffer to have products arranged within its sections so as to restock the product channels with the correct product lines.

10 Preferably, each buffer section is independently operable to allow products to be transferred into the storage region. Advantageously, this allows product channels to be restocked independently. It will be appreciated that one consideration for product restocking is that certain product lines may be more popular than others. As such, some product channels may be more depleted of products than others. Advantageously, the product refill module can provide a convenient way in which depleted product lines can be restocked to the
15 same level as less popular items.

The buffer sections may be operable to transfer products into the storage region by allowing the products to fall, under the action of gravity, into the appropriate product channel. Accordingly, the buffer sections may comprise a release mechanism to control the dispensing of products. Advantageously, this can prevent the products being dispensed
20 prematurely – for example, before the product refill module and the storage region have been aligned.

Alternatively, the product refill module may be provided with one or more drive means to drive the products from the buffer sections into the appropriate product channels. This can be particularly useful to drive products into the storage region against the action of
25 gravity – for example, when transferring the product up into the storage region.

Preferably, the product refill module is separably engageable with the storage region. Advantageously, this allows the product refill module to be a modular component of the product provisioning system. In particular, this can allow a depleted product refill module to be substituted with a fully stocked product refill module. For example, multiple product refill
30 modules may be transported to the product provisioning system and substituted to quickly replenish multiple product lines.

A loading system may be provided to unload depleted product refill modules, and replace the depleted product refill modules with fully-stocked product refill modules.

35 The loading system may comprise a transfer mechanism for loading and/or unloading product refill modules from the product provisioning system. The transfer mechanism may comprise a crane arm. The transfer mechanism may comprise sliding structures to allow depleted product refill modules to be slidingly transferred from the product provisioning system. The sliding structures may comprise rails and/or ramps. The rails

and/or ramps may comprise rolling members, such as wheels, to facilitate sliding movement between the product refill modules and the storage region.

The loading system may be provided on a transport vehicle. In such a case, it is envisaged that the loading system would unload depleted product refill modules from the provisioning system onto a carriage of the transport vehicle. Furthermore, the carriage of the transport vehicle could support fully-stocked product refill modules which could be unloaded and transferred to the product provisioning system.

It will be appreciated that once a product refill module has been depleted, it does not necessarily need to be replaced with another completely fully-stocked product refill module. So long as a replacement product refill module contains sufficient products to restock – in whole or in part - at least one of the product channels, then a product restocking operation may be considered to be acceptable.

Furthermore, a product refill module does not necessarily need to be replaced at all. Rather, the products within it can be restocked – for example, manually by restocking staff. In such a situation, it will be appreciated that it can be advantageous to provide a product refill module that is easily accessible to restocking staff.

For purposes of security the storage region may be located at a position that is relatively inaccessible. For example, the storage region may be at a raised position above the normal reach of users. Advantageously, this can reduce the chance of product theft – and also has a synergistic effect with regard to the operation of the product provisioning system. In particular, by raising the height of the storage region, gravity can play a useful role in the dispensing of products. Furthermore, if the storage region is raised above head-height, for example, then this can lead to a better utilisation of space. I.e. it makes it possible to utilise the space underneath the storage region for accommodating users and vehicles. Generally, the term 'above head-height' will be understood to mean safely above the height of at least 98% of users. This height would typically be at a minimum of 1.9 to 2 metres above the ground.

As mentioned, in the case where the storage region is located above head height (along with the product refill module), it is useful to allow restocking staff to easily access the product refill module to facilitate restocking. As such the product provisioning system may be provided with access means to allow the restocking staff to access the product refill module. For example, the access means may be a ladder to allow staff to access the top of the and to load products directly to the product refill module and/or the storage region.

Alternatively, the access means may be arranged to reconfigure the product provisioning system so that the product refill module and/or the storage region is accessible at ground level. For example, the product provisioning system may comprise guides for guiding the product refill module between a first position in which the product refill module is engaged

with the storage region, and a second position in which the product refill module is separated from the storage region. The second position would typically be at a lowered position at which the product refill module becomes easily accessible to restocking staff. Preferably, the guides substantially support the weight of the product refill module, as well as any products contained within the product refill module. The product refill module may be counterweighted to facilitate manual handling of the product refill module and reduce the chance of injury.

The product provisioning system may be provided with indicia to guide correct manual restocking of the product provisioning system. Typically, the indicia can indicate where specific products are to be inserted into the storage region and/or the product refill module. In particular, a product channel should generally only be stocked with a product of a particular type. As such, it is important to be able to indicate where that product of a specific type is to be loaded to obviate the automatic dispensing of incorrect products. Thus, the indicia provide restocking staff with useful feedback as to which products are to be restocked, and where they go. The indicia may be a picture of the product. Advantageously, this can improve the speed of restocking, as there can be very little confusion as to where a product is to be loaded.

Preferably, the storage region is in communication with, or is integrated with a product picking system. The product picking system may comprise a plurality of product dispensing mechanisms. Preferably, each product channel within the storage region is associated with a product dispensing mechanism. Thus, each product dispensing mechanism is arranged to dispense a different product type.

Preferably, the product provisioning system comprises a product collector for collecting together a plurality of products. The product collector may be arranged to collect together a plurality of products under action of gravity. The product collector may comprise a cushioning device to cushion the fall of products dispensed onto the product collector. The cushioning device may comprise friction-reducing means for facilitating collection under the action of gravity. The friction-reducing means may comprise rollers and/or a net. The net may comprise cords about which the rollers are arranged to pivot.

Ideally, the product collector is arranged to collect together a plurality of products for delivery to a delivery station or location. The delivery station may comprise a product dispenser. The product collector may channel the collected products to the product dispenser via a routing means. The routing means may be a chute. The routing means may be a vertical conveyor. Preferably, the routing means is arranged to control the movement of the collected products to the product dispenser. Ideally the product collector and/or the routing means is arranged to operate under the action of gravity. Advantageously, the controlling of movement can minimise product damage and also can ensure that the collected products are correctly routed to the product dispenser. In particular, this avoids products becoming stuck or moving too quickly.

Preferably, the product provisioning system comprises a product dispenser to which dispensed products are delivered. Preferably, the product provisioning system and/or the product dispenser comprises an authentication device to obtain authorisation for the dispensing of goods. Preferably, the authentication device comprises a payment card reader – such as a credit card reader – to receive payment for goods to be dispensed.

Preferably, the product dispenser comprises a window through which dispensed items are visible. Preferably, the window can be opened under the control of the product dispenser in response to receiving an authorisation, for example as received when the ordered products have been paid for.

Advantageously, this allows the products that have been ordered to be viewed by users before deciding whether or not to pay for those products. It will be further understood that by limiting the products on display to those as ordered (but not yet paid for) reduces the motivation for criminally damaging the product provisioning system to gain access to the products. In other words, unlike prior art vending machines that display all of the stocked products, only a limited number of items are displayed.

Furthermore, the product provisioning system may be arranged to limit the quantity of items that can be ordered. This can minimise the motivation for theft, and may also be required in view of the capacity of the product dispenser to hold a certain quantity of items.

Preferably, the product dispenser comprises a rejection bin. The product dispenser may be arranged to route products to the rejection bin on receipt of a rejection command. For example, if a user has ordered certain products, viewed them through the window, and decided that they are not suitable for purchase, the user thus can send the rejection command instead of paying for the products. The rejection command can be issued via the product-ordering interface.

Preferably, the product dispenser comprises a receptacle dispenser – for example, a plastic bag dispenser. Thus if a user has ordered and paid for a number of products, the user can advantageously gather those products together within a receptacle thereby aiding with the handling and portability of those products.

Preferably, the product provisioning system is arranged for use within a vehicle service station.

Advantageously, the inventors of the present invention have realised that providing a product provisioning system within a service station allows certain advantages to be realised in an environment where such systems are not usually encountered. By providing a product provisioning system within a vehicle service station allows the problems associated with inefficient use of time and space to be overcome. In particular, products can be dispensed at the location of a user's vehicle, minimising the time needed for a user to travel between the vehicle and a shopping area, or even a shopping area at all. This increases the

comfort of users – who may not even need to leave their vehicles as products can be delivered directly to an open vehicle window. This is particularly advantageous for disabled users who may not be able to easily leave their vehicles. Furthermore, delivery of products directly to the vehicle also increases safety, as users do not need to traverse a potentially
5 dangerous vehicle forecourt.

It will be understood that the term ‘service station’ refers mainly to passenger vehicle petrol filling stations or forecourts. However, the present invention can also extend to other types of service stations.

As mentioned previously, the delivery station may comprise the product
10 dispenser. The delivery station may also comprise other features relevant to the context of a vehicle service station. In particular, the delivery station may comprise a bay in which vehicles can be stationed during product dispensing. The bay may be marked to indicate where a vehicle should be positioned. Advantageously, the product dispenser is positioned relative to the bay to facilitate access to the product dispenser from the interior of the vehicle.
15 In particular, when the vehicle is stationed within the bay, as indicated by the markings of the bay, the product dispenser is positioned to be accessible via an open driver’s window of a typical road vehicle.

The delivery station may comprise one or more vehicle fluid dispensers. For example, the delivery station may comprise one or more fuel pumps for refuelling a vehicle,
20 an air hose for inflating tyres of the vehicle, a windscreen-wiper fluid dispenser, a water dispenser and/or an antifreeze fluid dispenser. Advantageously, by providing multiple dispensers within the vicinity of a common delivery station allows multiple services to be conveniently provided to the vehicle and users. Of particular advantage is being able to service the vehicle – for example, refuelling it, at the same time as dispensing products to it,
25 without requiring users to leave the vicinity of the vehicle, or even the vehicle at all. Naturally, if users are not to leave the vehicle at all, and require the vehicle to be refuelled, then a fuel pump attendant may be necessary. Alternatively, an automated refuelling system may be provided.

Optionally, the vehicle service station comprises a plurality of storeys, at least a
30 first storey accommodating the product provisioning system for the delivery of products to one or more product delivery stations situated on another storey.

Advantageously, by situating product storage and delivery systems at storeys separate to the delivery stations, the space efficiency of the service station can be maximised. For example, non-fuel products such as packaged food can be stored on a level of the service
35 station separate to those levels accommodating user vehicles. In particular, the delivery systems can be positioned on one or more levels above the vehicles and can be arranged to selectively drop the products to appropriate delivery stations in response to an order from a user of that vehicle. By comparison with a traditional shopping area of a petrol station, the

goods do not need to be set out for display and user picking but rather can be stored in a more space efficient arrangement within the product storage and delivery system.

Furthermore, the security of service station can be maximised. As users cannot necessarily gain access to the products prior to ordering and payment of those goods, this reduces the chance of product theft.

According to a further inventive aspect there may be provided a product ordering system arranged to receive product orders from users for use in determining products to be delivered to at least one delivery station.

The product ordering system may be suitable for use with a vehicle service station. The product ordering system may be arranged to receive product orders from vehicle service station users for use in determining the products to be delivered at the at least one delivery station. It will be understood that the product ordering system will typically be associated with a product provisioning system that can subsequently deliver the ordered products.

Optionally, the product ordering system comprises a product menu arranged to receive an input from a user to signify which products the user would like to order. Optionally, the product menu comprises an electronic menu system such as a touch-screen computing device, the electronic menu system displaying a listing of orderable products, the electronic menu system being arranged to receive a user selection of products.

Optionally, the product menu may be tethered to an appropriate delivery station to prevent removal of the product menu from the delivery station. Advantageously, the tether may comprise a power and/or data cable. A further inventive aspect may be an electronic menu system such as a touch-screen computing device, the electronic menu system displaying a listing of orderable products, the electronic menu system being arranged to receive a user selection of products. Optionally, the electronic menu system comprises an integrated payment card reader for receiving payment for ordered goods. Advantageously, this can provide authorisation to release ordered products to a user.

Optionally, the electronic menu system is arranged to wirelessly communicate a product order. Optionally, the electronic menu system is arranged to present a series of pages to a user in a sequence to receive user selections relating to products having a longer delivery time before receiving user selections relating to products having a relatively shorter delivery time.

Optionally, the product ordering system comprises a progress indicator providing dynamic feedback regarding the progress of the delivery of one or more ordered products.

Optionally, the progress indicator provides dynamic feedback regarding the expected time at which ordered products will be delivered. It will be understood that the progress indicator may be provided via the electronic menu system and/or may be provided by another means – for example a display mounted adjacent the delivery station.

It will be understood that the product ordering system may comprise a plurality of order receiving devices – for example, the electronic product menus. The plurality of order receiving devices may be arranged to allow product orders to be compiled in parallel. After each product order is compiled, it may be confirmed as being completed. Advantageously, the product ordering system may be arranged to sequence product order fulfilment in order of completion. Advantageously, this reduces the amount of time taken for a group of product orders to be compiled, confirmed and then completed.

The product provisioning system may be arranged to receive product orders from the product ordering system and schedule the delivery of the ordered products to a delivery target.

Optionally, the product provisioning system is arranged to direct a delivery target to a product delivery system located at a delivery station.

Optionally, the product delivery system comprises a product delivery channel arranged to dispense discrete goods to a vehicle located at the delivery station.

Advantageously, by delivering discrete goods to the delivery station means this minimises the amount of carrying involved in getting the goods into the vehicle. If there are a large number of items, or the items are bulky, the user does not need to travel back and forth between the vehicle and a shopping area.

There may be a plurality of product delivery channels located at each delivery station. Advantageously, this allows convenient delivery of different types, sizes, shapes and/or weights of products.

Optionally, the product provisioning system comprises a detector arranged to detect an appropriate product delivery position relative to the vehicle and/or a user within the vehicle.

It will be understood that an appropriate position may be an open window of the vehicle. However, there may be other appropriate positions, such as a boot/trunk opening.

Optionally, the detector is arranged to determine the appropriate product delivery position by analysing images of the vehicle.

Optionally, the detector is arranged to determine the appropriate product delivery position by detecting the registration number of the vehicle, and using the detected registration number to query a servicing requirements database.

For example, the servicing requirements database may comprise data relating to the height of a vehicle window from the floor.

Optionally, the product provisioning system comprises at least one adjustment mechanism for adjusting the relative position of the vehicle and the product delivery channel so as to deliver products to the detected appropriate product delivery position.

A further inventive aspect may constitute an adjustment mechanism for adjusting the relative position of a vehicle and a product delivery channel so as to deliver products via the product delivery channel to an appropriate product delivery position.

Optionally, the at least one adjustment mechanism comprises a vehicle support
5 plate for supporting and moving a parked vehicle thereon relative to the product delivery system.

Optionally, the product delivery channel comprises the at least one adjustment mechanism.

Optionally, the product delivery channel comprises an adjustable arm, operable
10 for extension towards an open window of a vehicle, ordered products being deliverable via said adjustable arm.

Advantageously, this allows a user of the vehicle to receive ordered goods without needing to leave the vehicle. In particular, the extendible arm is arranged to deliver goods to within reaching distance of a user sitting aside the open window of the vehicle.

Optionally, the adjustable arm may be used to deliver a receptacle containing
15 ordered products to the open window. Preferably, the receptacle is arranged to allow a user to remove products therefrom, the receptacle being retrieved after user product collection. For example, where the receptacle is a smart-box, the extendible arm may provide a smart-box return system.

Optionally, the product delivery channel is gravity-fed ordered goods.
20

Optionally, the product provisioning system comprises a plurality of delivery targets each relating to a separate product delivery order. It will be appreciated that each delivery target will generally relate to an order originating from a specific user. A user may order multiple products as part of the same order, and these products will generally be
25 assigned to one of the delivery targets.

Optionally, the product provisioning system comprises a routing mechanism arranged to route delivery targets to an appropriate product delivery channel at an appropriate time. The product delivery system may comprise the routing mechanism. The routing mechanism may comprise one or more conveyor belts.

Optionally, the routing mechanism determines the appropriate product delivery
30 channel at the appropriate time in response to a routing input associated with a tracked position of a product-ordering user, or vehicle associated with that user.

A further inventive aspect may be a routing mechanism arranged to route delivery targets in response to a routing input associated with a tracked position of a product-
35 ordering user, or vehicle associated with that user. Optionally, the tracking input is derived from a tracking system arranged to track the position of a product-ordering user, or vehicle associated with that user. Optionally, the tracking system is arranged to track the position of the or each delivery target. Optionally, the or each delivery target comprises a receptacle into

which one or more products from a common product delivery order are received.

Alternatively, the delivery target may relate to an allocated position of one or more products relating to an order that is controlled by the product provisioning system. For example, the delivery target could be an allocated position of products on a series of conveyor belts.

5 Optionally, where the delivery target is a receptacle, the receptacle may comprise a smart box.

A further inventive aspect may comprise a receptacle for use with a product provisioning system. Optionally, the receptacle comprises a support frame and a carrier insert positioned about the support frame, the insert being removable from the support frame so as
10 to separate received products away from the support frame. Optionally, the insert may comprise a flexible material, such as a plastics material. The insert may be a carrier bag. Optionally, the receptacle comprises a release mechanism for releasing the insert. The release mechanism may comprise a hinged flap. Optionally, the receptacle comprises a unique identifier to allow tracking of the receptacle. Optionally, the identifier of the receptacle
15 is a visual identifier such as a barcode. Optionally, the receptacle comprises a product sensor arranged to detect the presence of products contained within the receptacle. Optionally, the product sensor is arranged to detect the quantity of products contained within the receptacle. Optionally, the product sensor comprises a weight sensor for detecting the weight of products within the receptacle. Optionally, the receptacle comprises a transceiver for transmitting data
20 relating to the receptacle. Optionally, the transceiver is arranged to transmit data relating to the quantity of products contained in the receptacle. Advantageously, such data can be received by the product provisioning system and used to control delivery of items to the receptacle. For example, if the receptacle is full, the provisioning system can prevent further products being deposited within the receptacle. Optionally, the transceiver is arranged to
25 transmit data relating to the location of the receptacle. Optionally, the transceiver comprises a positioning module, such as a GPS module.

Optionally, the product provisioning system may comprise a product picking system. Optionally, the product provisioning system comprises a product collector for collecting together a plurality of products ordered as part of a product order for delivery to the
30 or each delivery target. Optionally, the product collector is arranged to collect together a plurality of products under action of gravity. For example, the product collector may comprise a collating funnel or series of slides that allow multiple products to be collected together under the action of gravity. Advantageously, mechanisms such as slides make use of gravity to propel products to an appropriate location, reducing the complexity and energy utilisation of
35 active devices such as conveyor belts.

Optionally, the product collector comprises a cushioning device to cushion the fall of products dispensed onto the product collector.

A further inventive aspect may be a product collector comprising a cushioning device to cushion the fall of products dispensed onto the product collector. Optionally, the cushioning device comprises friction-reducing means for facilitating collection under the action of gravity. Optionally, the friction-reducing means comprises rollers. Optionally, the cushioning device comprises a net. Optionally, the net comprises cords about which the rollers are arranged to pivot. Optionally, the product collector is arranged to receive a plurality of products for collecting together from a plurality of product dispensing mechanisms. Optionally, the product provisioning system comprises a plurality of product dispensing mechanisms, each being arranged to dispense a different product type. Generally, each product dispensing mechanism is arranged to dispense a product of a uniform type. This simplifies the operation of each product dispensing mechanism. Furthermore, each product dispensing mechanism generally contains a stack of products. Generally a dispensing mechanism comprises a vertically oriented channel of regular cross-section.

Advantageously, as the products are held in a stack, according to a FIFO (first in, first out) goods that have an expiry date closer in the future are the ones that are dispensed first. In contrast, if users are given a choice as to the products to select from a shelf, they often select the goods that they perceive to be the freshest (i.e. those with a longer shelf life). Additionally, as the product provisioning system may have a means by which to track the expiry date of products, the product provisioning system may be arranged to control all dispensing mechanisms to quickly and simply purge all products that have an expiry date at the end of the day.

Optionally, each product dispensing mechanism is arranged to control the dispensing of a quantity of products in response to and as defined by a dispensing command.

For example, a dispensing command may be issued to dispense exactly one product. Generally, the products are discrete products, each being of a predetermined size and shape, and so each constitute a single product unit. Thus, dispensing of a quantity in this context relates to the number of product units rather than a quantity in terms of weight or volume. Advantageously, by dealing with discrete, usually packaged goods (rather than loose or liquid goods), the operation of the product dispensing mechanisms can be simplified.

Optionally, each product dispensing mechanism comprises a product buffer, such as a stack, and a dispensing outlet, the products being held in the product buffer prior to being dispensed at the dispensing outlet.

Optionally, the dispensing outlet is gravity-fed products from the product buffer.

Optionally, the product dispensing mechanism is arranged to control movement of products within the product buffer so as to facilitate dispensing of an accurate quantity of products.

It will be understood that where products are stored on top of one another within the product buffer, the combined weight of a number of stacked products could interfere with

an outlet of the product dispensing mechanism – potentially dispensing a greater number of products than intended in error. Furthermore, if further products are introduced into the product buffer, and drop freely within the buffer, this may also interfere with the outlet, and may even cause damage to the products or product dispensing mechanism. Therefore, it is advantageous, to control movement through the product buffer, especially if the product buffer is vertically oriented.

Preferably, the product dispensing mechanism comprises a sequential dropping mechanism for lowering products within the product dispensing mechanism gradually.

A further inventive aspect may be a product dispensing mechanism comprising a sequential dropping mechanism.

Optionally, at least one of the plurality of product dispensing mechanisms is a fluidly actuated product dispensing mechanism. It will be understood that the term ‘fluid’ herein may refer to liquid and/or gas. Optionally, the fluidly actuated product dispensing mechanism comprises a plurality of bladders controllably inflatable to control dispensing and/or movement of products through it. A further inventive aspect may be a fluidly actuated product dispensing mechanism comprising a plurality of bladders controllably inflatable to control dispensing and/or movement of products through it. Generally, when a bladder is inflated, it presses against a product, holding it in place and/or blocks passage of a product beyond the inflated bladder. Generally when a bladder is deflated, a product is free to move beyond the bladder. The bladders (or balloons) may be fluidly coupled to electronically controlled valves for inflation and/or deflation. Advantageously, inflatable bladders allow the fluidly actuated product dispensing mechanism to be compatible with a large variety of products. In particular, an inflatable bladder can conform to products of different sizes and shapes. Furthermore, the inflatable bladders can easily handle products of different temperatures. For example, a product dispensing mechanism of the provisioning system may be used to store and dispense products that have to be kept at cold temperatures (e.g. ice-cream). Whilst certain mechanisms may seize as a result of ice build-up, the bladders are particularly suited to operating in such environments. This is because the moving parts are the bladders, which resist the build-up of ice.

Optionally, the fluidly actuated product dispensing mechanism comprises a product buffer in the form of a product chute, each inflatable bladder being inflatable to occupy a volume within the product chute.

Optionally, the plurality of inflatable bladders are disposed along the product chute in an array and are arranged so that progressive deflation of adjacent bladders in the array progressively lowers a product within the chute.

Optionally, the plurality of inflatable bladders are arranged in pairs so that a product item can be gripped between an inflated pair.

Advantageously, this gripping action allows products to be closely stacked on top of one another in the product chute without burdening the product dispensing mechanism with a stacked weight at its lower end. This is because each pair of inflatable bladders bears the majority of the weight of a respective gripped product. As well as increasing the reliability of product dispensing, this arrangement is very space efficient.

Optionally, at least one of the product dispensing mechanisms comprises a hot food dispenser. Optionally, the hot food dispenser comprises a hot food processing conveyor belt arranged to pass chilled food via a heating system for heating food. Optionally, the hot food dispenser comprises a packaging device for packaging heated food. Optionally, each product dispensing mechanisms comprises a product-receiving region for receiving products to be loaded into the product dispensing mechanism.

Optionally, product receiving regions of the plurality of product dispensing mechanisms are disposed adjacent one another.

Optionally, the product provisioning system comprises a filling system for refilling product-dispensing mechanisms. A further inventive aspect may be a filling system for refilling product-dispensing mechanisms. Optionally, the filling system comprises a placement mechanism for placing products into an appropriate product dispensing mechanism. Optionally, the placement mechanism is arranged to place sets of homogenous products into an appropriate product dispensing mechanism. Optionally, the sets of homogenous products are contained within a loading cassette.

Optionally, the filling system transmits product-handling instructions to control the placement mechanism. Optionally, the filling system comprises a scanner for electronically identifying a product, or set of products. It will be understood that the scanner may be arranged to scan a computer-readable image such as a barcode of a product to electronically identify that product. Optionally, the scanner comprises an illumination means. Optionally, the filling system is arranged to receive the electronic identification of a product and in response transmit product-handling instructions to the placement mechanism. Optionally, the filling system comprises a refill buffer for receiving unpacked goods. Optionally, the refill buffer comprises a refill buffer conveyor belt. Optionally, the filling system comprises a transfer mechanism for transferring products between the refill buffer and the placement mechanism.

Optionally, the transfer mechanism comprises a robotic arm. Optionally, the robotic arm comprises a grab head adapted to receive products of different sizes and shapes. Optionally, the robotic arm comprises pressure sensors for use in controlling the handling of products by the robotic arm. Optionally, the robotic arm comprises a/or the scanner. Optionally, the filling system is arranged to receive the electronic identification of a product and in response transmit product-handling instructions to the robotic arm. A further inventive

aspect may be a filling system arranged to receive an electronic identification of a product and in response transmit product-handling instructions.

A further aspect of the present invention may be a product dispensing mechanism for use with the product provisioning system according to the previous aspects of the present invention.

Another aspect of the present invention may be a vehicle service station comprising a product provisioning system according to the previous aspects of the present invention.

A further aspect of the present invention may be a provided a product provisioning method for delivering to a user substantially simultaneously a plurality of heterogeneous discrete products, the method comprising receiving a user-specified product order for multiple heterogeneous products and, in response, controlling a set of a plurality of product dispensing mechanisms in parallel to dispense products of that product order.

It will be appreciated that features of different aspects of the invention may be combined where context allows. Furthermore, features of the aspects of the invention may constitute further independent inventive aspect. Furthermore methods of providing the functions of any one or combination of the features of the different aspects of the invention may be provided. Furthermore, computer controllers may be provided for controlling and/or receiving inputs from the systems relating to aspects of the present invention, and/or for carrying out methods relating to aspects of the present invention.

Brief Description of the Drawings

In order that the invention may be more readily understood, reference will now be made, by way of example, to the accompanying drawings in which:

Figure 1 shows a flowchart depicting a general overview of a product provisioning process and associated product provisioning system incorporating the product ordering system according to various embodiments of the present invention;

Figure 2 shows a perspective view of a product provisioning system in the form of a relatively small-scale vending machine comprising a product ordering system according to a first embodiment of the present invention;

Figure 3 shows a more detailed view of the fascia of the vending machine of Figure 2;

Figures 4 and 5 show perspective views of a product delivery box of the vending machine of Figure 2;

Figure 6 shows a front view of the fascia of such an alternative vending machine to that of Figure 2 comprising a product ordering system according to a second embodiment of the present invention;

Figure 7 shows a schematic front view of a product provisioning system incorporating a product ordering system according to a third embodiment of the present invention;

5 Figure 8 shows a perspective view of a dispenser of the product provisioning system of Figure 7;

Figure 9 shows a perspective view of a touch-screen computing device of the product provisioning system of Figure 7;

Figures 10a to 10q show exemplary screenshots as displayed by the touch-screen device of Figure 9; and

10 Figures 11 and 12 show schematic views of a fourth embodiment of the product ordering system.

Detailed Description of the Preferred Embodiments

Figure 1 shows a flowchart depicting a general overview of a product provisioning process 1a and associated product provisioning system 1 incorporating the product ordering system 2 according to various embodiments of the present invention. Hereinafter, if reference is made to a product provisioning process 1a, then it will be understood that the described features or advantages are also applicable to a product provisioning system 1, and visa versa. Similarly, if reference is made to a product ordering system 2, then it will be understood that the described features or advantages are also applicable to a product ordering process 2a.

20 In general terms, the product provisioning system 1 comprises a product ordering system 2 for receiving a product order from a user and a control system 3 for controlling a plurality of dispensing mechanisms 4 of the product provisioning system 1 such that a set of products of that product order can be dispensed simultaneously. The product provisioning system 1 further comprises a product collector 5 for collecting the simultaneously dispensed products together, and a product router 6 for routing the collected products to a delivery location. Further, the product provisioning system comprises a release authorisation controller 7 for authorising the release of products to the user.

30 Accordingly, the product provisioning process 1a comprises the respective steps of receiving a product order from a user via a product ordering process 2a, controlling dispensing mechanisms 3a to dispense multiple products in parallel 4a, collecting together simultaneously dispensed products 5a, routing those products 6a to a delivery location and authorising the release of products to a user 7a.

35 In more detail, in certain embodiments, the product provisioning system 1 is arranged to receive an order from a user for products stocked by the product provisioning system 1, via the product ordering system 2. The product ordering system 2 comprises a product ordering interface which is arranged to provide product selection options to a product-ordering user in the form of a product menu. The product ordering system 2 is also arranged

to receive user input to select multiple products thereby forming a product order. The product ordering system 2 will typically be arranged to present the product order to a user, allowing the user to quickly understand which items have been selected and also the total cost of those products at a single glance.

5 The product ordering system 2 is then arranged to receive confirmation from the user that a product order is to be fulfilled, and in response send the order to a control system 3 of the product provisioning system 1 so that the product order can be fulfilled. Specifically, product dispensing mechanisms 4 are controlled by the control system 3 such that multiple products are dispensed in parallel. As various dispensing mechanisms 4 of the product
10 provisioning system 1 are typically distributed at different locations about the product provisioning system 1, the simultaneously dispensed products are then collected together 5a. When collected together, the products constituting the product order are then routed to a delivery location for pick-up by the user. Prior to pick-up, the product provisioning system 1, optionally, via the product ordering system 2 is arranged to receive a command authorising
15 the release of the products to the user. Typically, this authorisation takes place in response to the user paying for the ordered products. However, it will be understood that this authorisation may take other forms and may take place at any stage in the product provisioning process 1a.

 This arrangement allows a user to order and receive a batch of products instead
20 of individually ordering and receiving products piecemeal. Accordingly a user only needs to undertake a single transaction with which to obtain multiple products quickly and efficiently rather than, for example, paying for each item individually, as is normally the case with vending machines.

 This general arrangement of the product ordering system 2 and associated
25 product ordering process 2a is applicable to several different embodiments of the present invention as will be described, ranging from a relatively small, self-contained vending machine to a large-scale product ordering and delivery systems. The inventor's motivation for each variant stems from the need to maximise the efficiency - in terms of time, space and other resources - with which products can be ordered and then delivered to a user. The invention
30 has been conceived, and is particularly applicable in the context of the ordering and delivery of discrete products at locations such as service station forecourts where self-service of fuel is already prevalent. However, it will be appreciated that embodiments of the present invention will be applicable in other scenarios also.

 Figure 2 shows a perspective view of a product provisioning system 1 in the
35 form of a relatively small-scale vending machine 1' comprising a product ordering system 2' according to a first embodiment of the present invention. The vending machine is located on-site at a petrol filling station, adjacent to a delivery station incorporating a vehicle bay. As shown, the front fascia of the vending machine 1' which incorporates the product ordering

system 2', faces towards the vehicle bay for visibility and convenient user access. Typically, a user will park their vehicle and walk to the vending machine 1' to place product orders.

The top of the vending machine 1' is provided with an overhang, thereby defining a shelter under which a user may take cover from the rain during use of the product ordering system 2'. It will be appreciated that the overhang also protects the product ordering system 2' of the vending machine 1' from the rain. In alternative configurations, a security housing may be fitted to the front of the vending machine 1'. Such a security housing can further protect the product ordering system 2', and a user from the elements. Furthermore, such a security housing can allow the user to conduct secure transactions within the comfort and protection of the security housing. The security housing may be provided with 'one-way' glass, security cameras and the door of the security housing may be user-lockable.

Figure 3 shows a more detailed view of the fascia of the vending machine 1' which incorporates the product ordering interface of the product ordering system 2'. In particular, the product ordering system 2' comprises a product selection interface 10, a chosen product display 12 and a payment interface 14. These are interfaced with other components of the vending machine such as an ATM 16 (automated teller machine) and a product delivery location 19 defined by the product delivery box 70. The fascia of the vending machine 1' may also have spaces for advertising media 18. The sides, rear and even top of the vending machine can also support advertising media. The sides of the vending machine 1' also allows access to the interior of the vending machine 1' for restocking products. In alternative configurations, the relative positioning of the components of the various components of the vending machine 1' may be different. For example, the ATM may be disposed to the left of the product selection interface, the chosen product display 12 and the payment interface 14. Figure 6 shows a detailed view of the fascia of such an alternative vending machine 1' as will be described in greater detail below.

Referring back to Figure 3, products that are available for a user to order from the vending machine 1' are listed at the product selection interface 10. The product selection interface 10 presents items by categories (e.g. drinks, snacks, cigarettes). A mechanical button is associated with each listed product, and is user-operable to indicate a selection of that product. When an item is selected by a user, it is then listed in the chosen product display 12 under "Your Basket". If a product is out of stock, then this can be indicated by the chosen product display 12.

Contrary to the operation of most vending machines, the user is able to select multiple products using the product selection interface 10, and these chosen products are presented at the chosen product display 12. Accordingly, it is possible for a user to select multiple products before paying for them each individually. Accordingly, this can increase the speed with which multiple items can be ordered and subsequently delivered.

When an item is selected and displayed at the chosen product display 12, the user is provided with further information about the selected product – for example, a product description, its weight, its volume and/or cost. As multiple products are selected, a total cost of all selected products is automatically calculated and presented to the user, indicating to the user the amount that the user needs to pay to purchase all of the chosen products. As well as displaying product details, the chosen product display 12 can also permit the user to deselect one or more previously selected products. In particular, the chosen product display 12 is a touch-screen display, and so the user can interact with it to deselect a product, removing it from the so-called basket of goods to be purchased.

Thus it will be understood that whilst the product selection interface 10 comprises mechanical buttons, the chosen product display 12 comprises a dynamic display capable of receiving a user interaction via touch-screen. Advantageously, by mixing these two different types of technology, the cost of the product ordering system 2' can be minimised, whilst maintaining a dynamic element not present in other vending machines.

However, in other alternatives, the product selection interface 10 and the chosen product display 12 may be replaced with a touch-screen display screen which can perform the function of presenting and displaying the products to be ordered, as well as receiving a user input to indicate multiple product selections.

Figure 6 shows a front view of the fascia of such an alternative vending machine 1'' comprising a product ordering system 2'' according to a second embodiment 2'' of the present invention. In this variant, the product selection interface and the chosen product display are instead both replaced by a touch-screen display screen 30 which performs the function of presenting and displaying the products to be ordered, as well as receiving a user input to indicate multiple product selections. To this end, the display screen 30 may have a portion allocated to displaying available products (as shown by the dashed outline in Figure 6) and a remaining portion allocated to displaying chosen product. It will be appreciated that the portion sizes can be dynamically controlled by the product ordering system 2''.

To enhance the user interaction with the vending machine 1'', the products are presented to a user on a portion of the display screen 30 in a life-size format. Figure 6a shows a schematic view of the items displayed in such a life-size format on the touch-screen display 30.

Product representations 32 are presented on the screen 30 in a three-dimensional life-size format, so that the user can see how big these items are, and associate these representations with real products. Accordingly, this improves the intuitiveness of the user interface, facilitating the correct and confident use by the user of the vending machine 1.

The product representations are arranged on virtual shelves 34, and each shelf is dedicated to a category of product (e.g. snacks, drinks etc). Under each product representation 32 is a description of the product 36 and a virtual button 37 to select that

product. Virtual handles 38 on the shelves allow users to move the virtual shelves 34 horizontally to see other products representations on the same shelf, and vertically to see other virtual shelves, and so other categories of product.

Referring to Figures 6b and 6c, a rectangular outline of an alternative touch-screen display 30' is shown. Displayed on the screen 30' is an image 31 containing the virtual product representations 32 and shelves 34. The size of the image 31 is larger than can be shown on the display 30' and this is presented in Figures 6b and 6c schematically by showing the outline of the display 30' laid over the image 31. Figure 6b shows part of the whole image 31 and Figure 6c shows the extent of the whole image 31. As a user touches the screen at a virtual handle 38 and slides up, down, left or right, the background image 31 slides in a corresponding fashion, as is known in the art of touch-screen user-interfaces.

Referring back to Figure 6, a help-point 22 may be provided to assist the product ordering user and can double as a security feature. The help-point comprises a help-request input, a camera, and a microphone and speaker module. The camera is directed outwardly to capture video footage of the user. The captured video is also transmitted to a remotely located monitoring station to enable monitoring personnel to remotely monitor the users interaction with the product ordering system 1". The camera works in conjunction with the microphone and speaker module. The microphone of the microphone and speaker module permits audio corresponding to the video footage to be transmitted to the remotely located monitoring station. The speaker of the microphone and speaker module enables audio to be transmitted back to the help point 22 from the monitoring station. Thus the camera and microphone and speaker module facilitates communication between the personnel at the remotely located monitoring station and the user, and this can be specifically requested by the user via interaction with the help request input. Once the attention of the monitoring personnel has been requested, the personnel may guide, or even remotely operate the product provisioning system for the user.

With each of the embodiments described, the selected products are listed on the chosen product display 12 (or touch-screen display 30), and once the user has finished selecting products, payment for those products can be received via the payment interface 14. The payment interface 14 may comprise a card reader operable as is known in the art to receive payment for the ordered goods. Alternative payment means may also be supported – for example, cash or contactless or wireless payment means. For example, RFID payment means may be provided. In addition, authentication means may be provided at the payment interface. For example, the authentication means may be an age verification means, such as a passport reader. The verification of a users age may be required by law before certain products such as cigarettes and alcohol can be sold to the user. It will be understood that payment and authentication together fall under the ambit of the release authorisation controller 7 referred to generally above in relation to Figure 1.

When payment and, if necessary, additional authentication has taken place, the list of heterogeneous products in the "basket" can be dispensed for retrieval by the user at the product delivery location 19. The product ordering interface is connected via a control system of the vending machine 1" to a plurality of product dispensing mechanisms located inside the vending machine 1". It will be understood that a similar arrangement applies to the vending machine of Figure 2 and other product provisioning systems described below.

On receiving a product order, the control system is arranged to coordinate the dispensing of multiple products from the plurality of product dispensing mechanisms so as to dispense substantially simultaneously products in parallel. Accordingly a set of products ordered by a user can thus be delivered as part of a single dispensing operation.

Figure 4 shows a perspective front view of a product delivery box 70 of the vending machine 1' of Figure 2. The delivery box 70 is shown in isolation from the vending machine 1' with a product delivery lift 72 of the product delivery box 70 in a raised position. Figure 5 shows a rear perspective cut-away view of the product delivery box 70 of Figure 4 with the product delivery lift 72 in a lowered position. Referring to Figures 4 and 5, products released by the product dispensing mechanisms are routed under the action of gravity by a corner pipe 73 to the lowered lift 72. The lift 72 is programmed to await the arrival of all the ordered products before lifting the products to a height convenient for a user when retrieving products through a delivery hatch 74 of the delivery box 70. The delivery hatch 74 is transparent, allowing the user to see the product that have been ordered and delivered. The product delivery box 70, and dispensing mechanisms of the vending machine 1' may employ product dispensing sensors such as electronic infrared or optical sensors to detect that a product has been successfully dispensed and has successfully arrived at the product delivery box 70. In alternatives, the product delivery box may be recessed into the ground, the lift being raised to a convenient height to allow a user to retrieve products therefrom. Furthermore, the product delivery box may be recessed into the vending machine 1' as a further security feature.

As already discussed with reference to Figure 1, various embodiments of the product ordering system may be used with various different types of product provisioning systems, ranging from a relatively small, self-contained vending machine 1' described in relation to Figure 2 to larger embodiments as will now be described.

Figure 7 shows a schematic front view of one of such product provisioning systems 1B incorporating a product ordering system according to a third embodiment of the present invention. Like the previously discussed vending machines 1', 1", this product provisioning system 1B is sized and arranged to be retrofitted to a standard petrol station without significant modification of that petrol station. Furthermore, it will be noted that this retrofitted product provisioning system 1B do not overly interfere with the operation of, or convenience of access to a standard petrol station. Accordingly the product provisioning

system 1B can be maintained in conjunction with the layout of a standard petrol station. However, as will be described in greater detail below and in keeping with other embodiments, the product provisioning system 1B and associated product ordering system provide a faster way in which users can order and then receive a plurality discrete products.

5 The product provisioning system 1B comprises a storage region 10B in which discrete products are stored. Stilts 2B support the storage region 10B at approximately two metres from the ground above a vehicle bay 3B. As such, the product provisioning system 1B defines a delivery station 4B at which products can be delivered to vehicles and/or users of those vehicles. The stilts 2B space the storage region 10B at a sufficient height from the
10 ground to permit users and vehicles to safely pass underneath the storage region 10B. As shown, a vehicle 6B and a service attendant 7B are easily accommodated within the delivery station 4B.

 The delivery station 4B, comprises a fuel pump 5B as well as a product dispenser 20B. The storage region 10B, which is schematically shown in the form of a cross-
15 sectional view, is connected to the product dispenser 20B via a chute 30B. In use, discrete products are dispensed from the storage region 10B and are delivered via the chute 30B to the product dispenser 20B. In parallel, during ordering and delivery of those products, the service attendant 7B is able to refuel the vehicle 6B. Advantageously, this can significantly improve the speed at which a vehicle 6B can be loaded with fuel and products over a
20 conventional vehicle service station.

 The storage region 10B comprises a plurality of product dispensing mechanisms 11B, each defining at least one product channel 12B in which discrete products can be stored and controllably released under control of a respective product dispensing mechanism 11B.

 The product provisioning system 1B also comprises a product refill module 40B
25 sitting on top of the storage region 10B. The product refill module 40B comprises a product buffer 41B divided into a plurality of buffer sections 42B. The product refill module 40B is aligned with the storage region 10B such that each of the buffer sections 42B align with the product channels 12B of the storage region 10B. This allows the product refill module 40B to refill the appropriate products within the product channels 11B.

30 The storage region 10B comprises other hardware 16B, for example a power supply unit for powering the product dispensing mechanisms and refrigeration modules to chill discrete goods. In particular, the other hardware comprises a control module for receiving a product order and in response control product dispensing mechanisms 12B.

 Some of the product dispensing mechanisms 11B may be arranged to dispense
35 hot food. In particular, products can be dropped from a chilled region into a heating section – for example, a microwave – to cook products for a predetermined period. The cooked product can then be packaged within the product dispensing mechanism 11B for subsequent delivery, as other discrete products would be.

The storage region also comprises a product collector 15B arranged to collect together dispensed products released by the product dispensing mechanisms 11B and guide them under the action of gravity towards the chute 30B.

The product collector 15B comprises a net fitted with rotatable balls and rollers. The net cushions the impact of products being dispensed from the product dispensing mechanisms 11B, and the rollers reduce the friction between the products and the product collector 15B. Dispensed products can therefore flow freely from the product collector 15B, down the chute 30B and into the product dispenser 20B.

Unlike the previously described vending machines 1', the present product provisioning system 1B does not require a user to leave their vehicle 6B to place an order for a product, or even to collect ordered and delivered products. To this end, the product dispenser 20B comprises an arm 21B that is extendible towards an open window of the vehicle 6B. Products can therefore be ordered from and delivered within reach of a product-ordering user – without the user needing to leave the vehicle 6B.

Referring to Figure 8, a perspective view of the dispenser 20B is shown. The dispenser 20B comprises a product-ordering interface 22B. In particular, the product-ordering interface 22B comprises an electronic menu system in the form of a tablet-style touch-screen computing device 22B. The product dispenser 20B further comprises a beverage dispenser 23B, product delivery tray 24B, a window 25B, a plastic bag dispenser 26B and a product rejection bin 27B.

When a vehicle 6B parks alongside the delivery station 20B, the arm 21B automatically extends toward the window of the vehicle 6B, thereby easing a user's reach of the components supported by the arm 21B. Such components include the product-ordering interface 22B, beverage dispenser 23B, product delivery tray 24B, window 25B and plastic bag dispenser 26B.

Referring to Figure 9, a user can take hold of the hand-portable touch-screen computing device 22B from the supporting arm 21B into the vehicle, and use it to make product selections. The touch-screen computing device 22B is tethered to the product dispenser 20B via a power and data cable. As well as providing power and data, the cable also prevents the removal of the touch-screen computing device 22B from the product dispenser 20B.

The touch-screen computing device 22B presents a menu of orderable products to the user and can guide the user through the product selection process.

Referring back to Figure 7, by way of example, a user may be prompted by the touch-screen computing device to select the quantity of fuel with which to refill the vehicle 6B. This can be communicated electronically to the service attendant 7B, who can then refill the vehicle 6B whilst the user is guided through the rest of the ordering process. In particular, once fuel has been ordered, the user may be prompted to order a beverage from the

beverage dispenser 23B and/or continue with ordering discrete products. It will be appreciated that, in alternatives, an automatic refuelling system may be provided instead of a service attendant 7B.

5 Once a user has selected a number of discrete products, the product selections are communicated to the product dispensing mechanisms 11B within the storage region 10B. The appropriate product dispensing mechanisms 11B are operated to release the ordered quantity and brand of products. These are dispensed onto the product collector 15B and slide down the chute 30B and into the product delivery tray 24B.

10 The user is able to view the ordered products via the window 25B before the user is obliged to pay for those ordered products. The touch-screen computing device 22B is arranged to prompt the user to either pay for the goods on display, or reject the products. If the user chooses to reject the products, then the product delivery tray 24B can actuate to tip the products into the rejection bin 27B contained within the product dispenser 20B.

15 If the user would like to buy the products then payment is possible via the touch-screen computing device 22B. In particular, the touch-screen computing device 22B comprises a payment card reader 220B into which a user may insert a payment card – such as a credit card, and undergo a payment authentication process. At the same time, payment can be made for the fuel being dispensed (or having been dispensed) to the vehicle 6B.

20 After the payment authentication process is complete, and the ordered products have been paid for, the product dispenser 20B actuates the window 25B to allow the products on the product delivery tray 24B to be retrieved by the user. If many products have been ordered, a user may choose to make use of a plastic bag, as available via the plastic bag dispenser 26B. Alternatively, a product carrier such as a plastic bag may be dispensed from the product dispensing mechanisms. In such a case, the product carrier would be dispensed
25 automatically once a predetermined quantity and/or weight of other products have been chosen.

After the vehicle 6B has been refuelled, and the user has collected the ordered and paid for products, the vehicle can be driven away to free the delivery station 4B for another vehicle.

30 The portable electronic computing device 22B acts as the product ordering interface of the product ordering system of this third embodiment of the invention.

Unlike previous embodiments, the product ordering interface defined by the computing device 22B can be taken into the comfort of the user's vehicle, and so users do not need get out or lean out of the vehicle to make orders.

35 Although the computer device 22B has been described as being tethered to the product dispenser 20B, it will be appreciated that, in alternatives this may not necessary be required, and the device can instead be a powered by battery, and in wireless communication

with the product provisioning system. This allows the product ordering interface to be mobile, and so independent of the product delivery system of the product provisioning system.

In such alternative arrangements, by way of example, the device 22B may be provided to a user on entry into the service station, and the user may be guided, via the device to drive their vehicle to an appropriate ordering and/or delivery station. This guidance is interactive, and arranged to receive user choices as to desired goods and services. With such a wireless form of touch-screen computing device, the driver may be guided to either a waiting region at which orders can be made, or a service point at which products can be issued. In certain variants, the waiting region and the service point may be separated from one another, and so after placing an order, the driver would be instructed to move the vehicle to an appropriate delivery or service point. To this end, the product ordering interface may track the position of the user and/or vehicle of the user to ensure that they are correctly positioned prior to release of products that the user has paid for and/or is authorised to receive.

Typically, the touch-screen device 22B would be operated when the vehicle 6B is parked. Although hand-portable, to further increase user comfort, the touch-screen device 22B has attachment formations in the form of hooks provided at its rear which enables the driver to hook the device over his steering wheel such that the device does not have to be held continuously held by the driver during product ordering. Advantageously, these attachment formations make it easier for the user to operate the data input device. After receiving the chosen goods and services, before being allowed to leave the service station, the touch-screen device would be returned, assuming it is not tethered.

The tablet-style touch-screen device 22B is a proprietary device dedicated for use with the product ordering system according to embodiments of the present invention - and so is not a general purpose computing device. This improves the speed of operation of the tablet-style touch-screen device, and also reduces the motivation for the theft of the device. It will be appreciated that this device is provided to the user as a loan whilst at the service station.

Figures 10a to 10q show exemplary screenshots as displayed by the touch-screen device 22B of the product ordering interface acting as an electronic menu system. As can be seen, a graphical user interface is provided along with graphical user interface artefacts or prompts arranged to receive a user interaction to select and deselect options presented to the user.

Figure 10a shows a first page of the electronic menu system. The first page provides guidance about the overall ordering process, and presents a prompt to the user or driver to swipe or otherwise provide a credit card to initiate the ordering process. Figures 10b to 10f show a sequence of pages presented to a user to select whether fuel should be ordered

(Figure 10b), select the type of fuel (Figure 10c), select the amount of fuel (Figure 10d), confirm the order for fuel (Figure 10e) and monitor progress of fuelling (Figure 10f).

Notably, in Figure 10d where the amount of fuel is selectable, the user is provided with a graphical user interface in the form of a slider with which the user can interact to select the quantity of fuel. As the slider is shifted, the quantity of fuel, both in terms of volume and cost is displayed in response. This provides a quick and convenient way of getting the user to specific a desired quantity of fuel.

As mentioned the electronic menu system is wirelessly connected to the product provisioning system of the service station, and once a user confirms the quantity and type of fuel desired, this quantity is communicated from the electronic menu system to a petrol pump attendant that can then commence filling of the vehicle, with the appropriate type of fuel to the desired quantity.

The petrol pump attendant is capable of making a visual determination as to the type of fuel compatible with the vehicle as a cross-check against the type of fuel selected by the user. However, in addition, an image recognition system may also assist in this check by determining the type of fuel suited to a determined make and model of the vehicle. If there are any discrepancies, these can be brought to the attention of the ordering user – either via the petrol pump attendant, or if determined automatically, via an appropriate prompt appearing on the electronic menu system.

After ordering fuel, the user is then prompted by the electronic menu system to order further items. In particular, Figures 10g to 10k show a typical sequence of images displayed to a user to determine whether they wish to order hot food (Figure 10g), which specific items of hot food are required (Figure 10h), specific preparation information regarding some types of hot food (Figure 10i), confirmation of the order for hot food (Figure 10j), and a total cost page showing the complete cost of the fuel and hot food order and permitting further hot food items to be selected (Figure 10k).

The next pages presented to the user are shown in Figures 10l to 10o. More specifically, the user is asked whether they wish to purchase anything from the shop (Figure 10l), which items from the shop are required (Figure 10m), the quantity of a selected item (Figure 10n), a total page showing the complete cost of the fuel, hot food order and shop items and also permitting further shop items to be selected (Figure 10o). If the user selects a checkout option on the total page a summary screen is displayed which shows the cost of each of the categories of purchases (fuel, hot food and shop items in a basket) and permits a final chance to purchase popular goods (Figure 10p). If the user selects a popular item his basket is updated and the total page value recalculated. If however, the checkout option is selected once more, indicating that all products have been chosen, the user is taken to the confirm page shown in Figure 10q where the user can have a final total presented and confirm

and pay for the order by simply swiping their credit card or otherwise undertaking a payment card authentication process.

It will be appreciated that whilst the user continues to make menu selections to order further items, the vehicle is simultaneously being filled with fuel. In the same way, after a user has ordered hot food, the preparation of that ordered hot food can take place at the same time as the user is deciding what other products to select. Furthermore, the picking of those products can take place at the same time as the user confirming and paying for the ordered goods and services.

In an alternative set up, in which users desire to fill their own vehicles with fuel, the electronic menu system may prompt the user to select the products they wish to order first before refilling their vehicle. In this way, goods can be picked whilst the user is refuelling.

Thus, ordering and provisioning of goods and services can be maintained in parallel, minimising the total time necessary for the vehicle to remain within the service station. This is another advantage maximising throughput.

It will be understood that the user may also order cash via the electronic menu system. The cash can be issued at a delivery station where other ordered goods are dispensed.

Once the driver has submitted their order, typically with the tablet-style touch-screen device communicating the order wirelessly (WiFi network or Bluetooth® for example) to the provisioning system, the screen of the tablet-style touch-screen device can display an order progress monitor screen to the driver. The screen may typically confirm details of the order. Such details may include an indication as to where the product order is to be dispensed. The order progress monitor screen can also provide an estimated time of arrival of each the completed box. This progress monitoring builds confidence with the driver that the order is being processed and that they will receive their ordered goods shortly.

Thus it has been so far demonstrated that the product ordering system 2 of various embodiments of the present invention can be in various forms. In the first and second embodiments, the product ordering systems comprise product ordering interfaces mounted relative to a vending machine arranged to be operated by a walk-up user. In the third embodiment, the variants of the product ordering interfaces are relatively mobile, being able to be taken into and operated by a vehicle. It will be appreciated, however that the product ordering system and interfaces may take on other forms.

Figures 11 and 12 show schematic views of a fourth embodiment of the product ordering system 2C in which the concepts associated with previous embodiments are combined, at least in part. Here, the product ordering system 2C comprises a virtual shopping area 20C. Users enter into the virtual shopping area with touch-screen devices 22C similar to those described in relation to the third embodiment and select products displayed within the virtual shopping area 20C using a selection tool 23C associated with the touch-screen device

22C. The virtual shopping area 20C is provided as a way of a driver having an experience which is not too removed from the experience of a conventional service station.

Referring to Figure 11, walls 221C of the virtual shopping area 20C display goods for sale, and in particular provide life-size representations of products. Many users
5 may use the common virtual shopping area 20C. Referring to Figure 12, The selection tool 23C is in the form of a stylus or light pen in communication with the table-style touch-screen devices 22C. Users interact with the display screens selecting images of products to be ordered. In particular, the stylus is capable of reading barcodes associated with each product
10 to register that a user wants to buy that product. In alternatives, RFID tags behind the displays may be provided which interact with an RFID reader on the stylus.

As each stylus and/or associated tablet device is unique to each user, goods registered with the tablet device can be communicated for delivery to the correct vehicle of that user using the tablet device within the virtual shop.

At the end of the procedure, the user is provided with a confirmatory list of
15 selected goods, which on final user confirmation are collected together as an order and delivered to the order and delivery station.

The displays comprise large backlit media onto which the life-size representations of the products are printed. Underneath each representation of a product, a numeric liquid crystal display may indicate the price of the shown product. The numeric LCD
20 is linked to a pricing system which can automatically update the price of the products displayed. A large variety of products can be displayed alongside one another, and may be represented more than once so as to promote certain products over others. Advantageously, the virtual shop is a very efficient use of space and energy as none of the goods themselves are stored there either in refrigerated or heated manner for example. Rather, only images of
25 the goods need to be displayed for user selection, via the selection tool.

In further alternatives, a user may order products in other ways. For example, on entering the vicinity of a product provisioning system, the user may be provided with a menu. Ideally, the menu is printed on paper by a menu printer in response to the detection of a user. Advantageously, the menu indicates the products available via the product
30 provisioning system, along with tick boxes next to those products. Pens may also be provided at the same area at which the menu is printed. In use, users can mark the menu to indicate which of the indicated products are desired. The menu printer may be linked to a stock control system (not shown) which controls the product items that are printed in response to availability.

35 A completed menu can then be placed into an electronic scanner that determined the required products on the list and relays this information electronically to the product provisioning system as before. The total cost of the items ordered are presented to

the user, and these are subsequently dispensed. The user is then prompted to provide an authorisation such as payment for those goods before they are released.

Claims

1. A product ordering system for a product provisioning system, the product
5 ordering system comprising a product ordering interface for receiving a user interaction to
order products;
the product ordering interface being arranged to:
display a product menu of orderable products to a user;
receive a user interaction to select a set of products of that menu to thereby
10 generate a user-specified product order; and
receive a user-initiated command to transmit said user-specified product order to
the product provisioning system so that the product provisioning system can dispense to
the user the set of products of the product order in parallel.
- 15 2. A product ordering system according to claim 1, wherein the product ordering
interface is further arranged to display to a user a list of the set of selected products.
3. A product ordering system according to claim 2, wherein the list is dynamic and
is arranged to receive a user input to remove items from the list.
20
4. A product ordering system according to any preceding claim, wherein the
product ordering interface is further arranged to display to a user a sum cost of the set of
selected products.
- 25 5. A product ordering system according to any preceding claim, further comprising
a progress indicator arranged to provide dynamic feedback to a user about an expected
delivery time of the set of products.
6. A product ordering system according to any preceding claim, wherein the
30 product ordering interface further comprises an electronic menu system having a touch-
screen display.
7. A product ordering system according to claim 6, wherein the electronic menu
system comprises a hand-portable device.
35
8. A product ordering system according to any preceding claim, further comprising
an authentication device arranged to determine that the user is authorised to receive products
of the product order.

9. A product ordering system according to claim 8, wherein the authentication device comprises a payment card reader.
- 5 10. A product ordering system according to claim 8 or claim 9, wherein the user initiated command to transmit the user-specified product order is initiated in response to the authentication device determining that the user is authorised to receive products of the product order.
- 10 11. A product ordering system according to any preceding claim, further comprising a communication module arranged to establish a communication channel between the user and a remote monitoring station, the remote monitoring station being configured to remotely monitor and/or control the product ordering system.
- 15 12. A product ordering system according to any preceding claim, wherein the product ordering interface is arranged to display a plurality of product menus to a user in a sequence and receive a user interaction therewith to generate and transmit in a corresponding sequence a plurality of product orders to the product provisioning system so that products having a longer delivery time are ordered before products having a relatively
20 shorter delivery time.
13. A product provisioning system comprising a product ordering system according to any preceding claim and arranged in use, to deliver to a user substantially simultaneously a plurality of heterogeneous discrete products in response to receiving a product order from the
25 product ordering system.
14. A product provisioning system according to claim 13, further comprising:
a plurality of independently-controllable product dispensing mechanisms each configured to dispense different predetermined types of said discrete products from one
30 another;
a product collector arranged to collect together products dispensed by the plurality of product dispensing mechanisms; and
a control system in communication with the product dispensing mechanisms, the control system being arranged to receive a user-specified product order for a set of
35 heterogeneous products and, in response, control a set of the plurality of product dispensing mechanisms in parallel to dispense specified products of that product order.

15. A method of receiving a user interaction to order products to be dispensed by a product provisioning system, the method comprising:

displaying a product menu of orderable products to a user;

receiving a user interaction to select a set of products of that menu to thereby generate

5 a user-specified product order; and

receive a user-initiated command to transmit said user-specified product order to the product provisioning system so that the product provisioning system can dispense to the user the set of products of the product order in parallel.

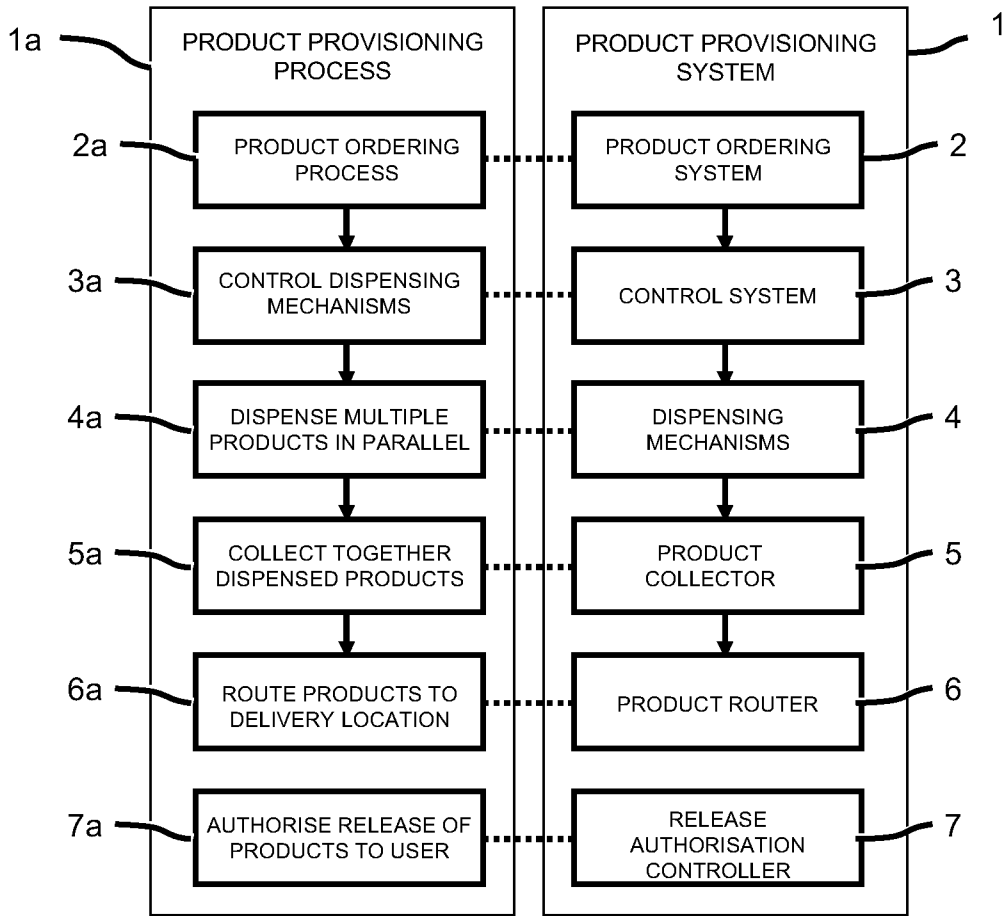


Figure 1

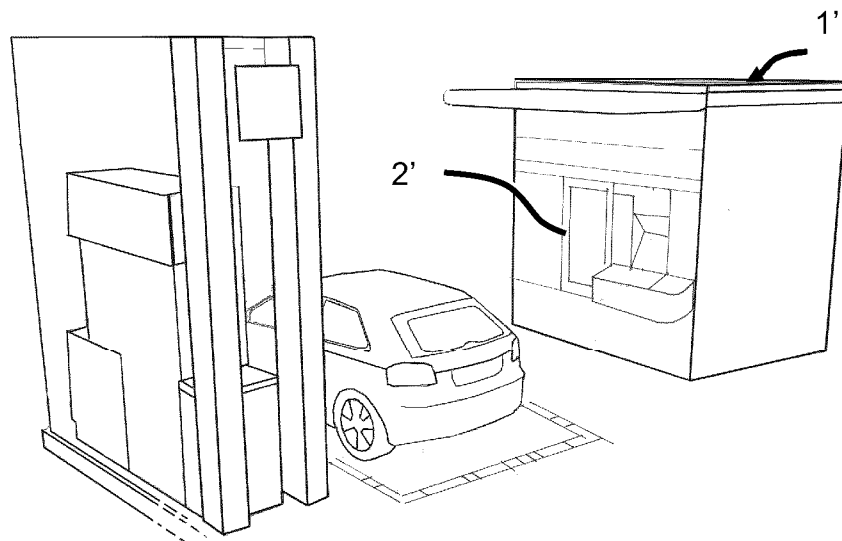
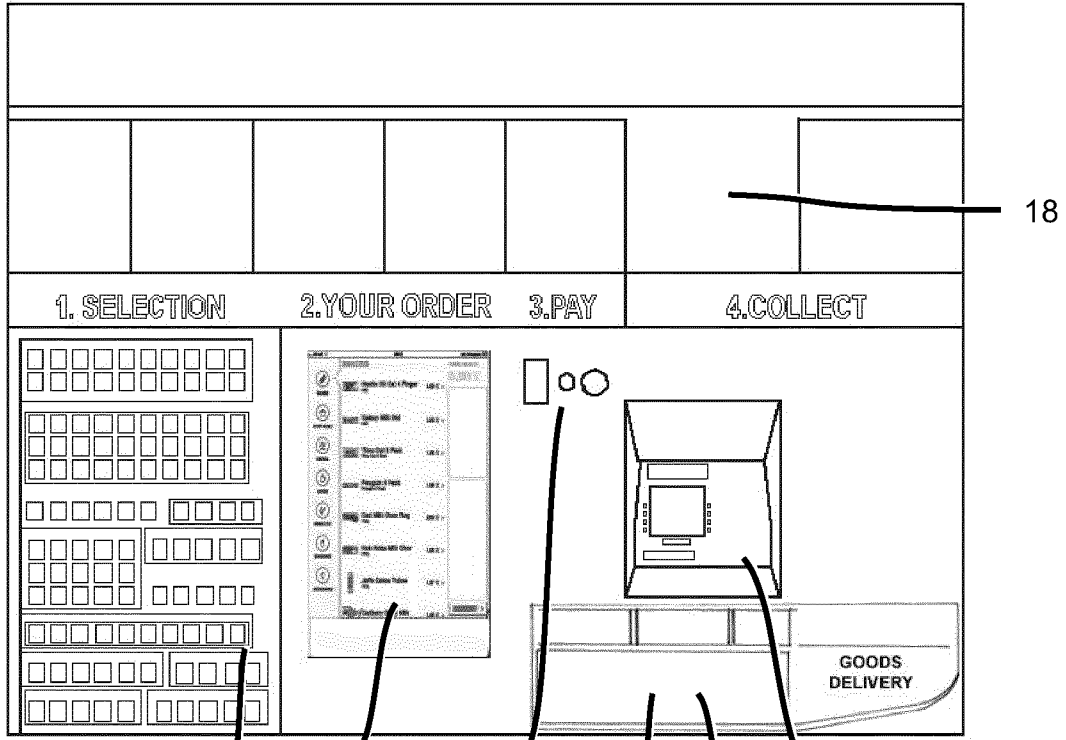


Figure 2



1' 2' 10 12 14 70 19 16
Figure 3

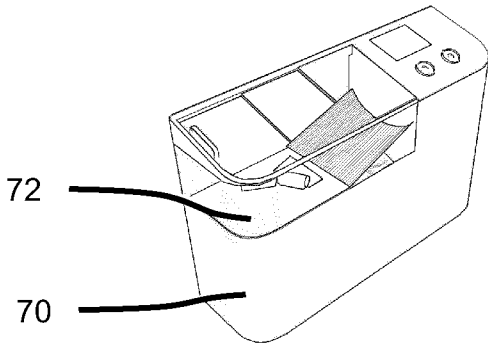


Figure 4

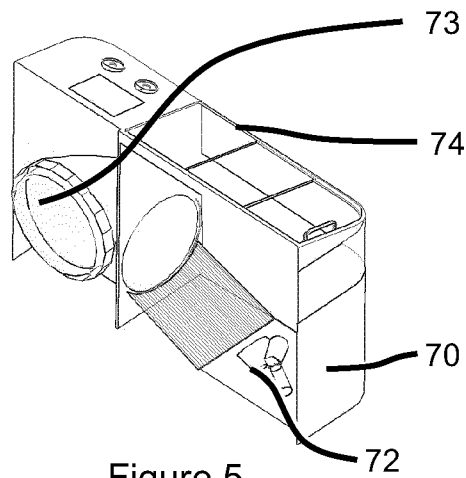


Figure 5

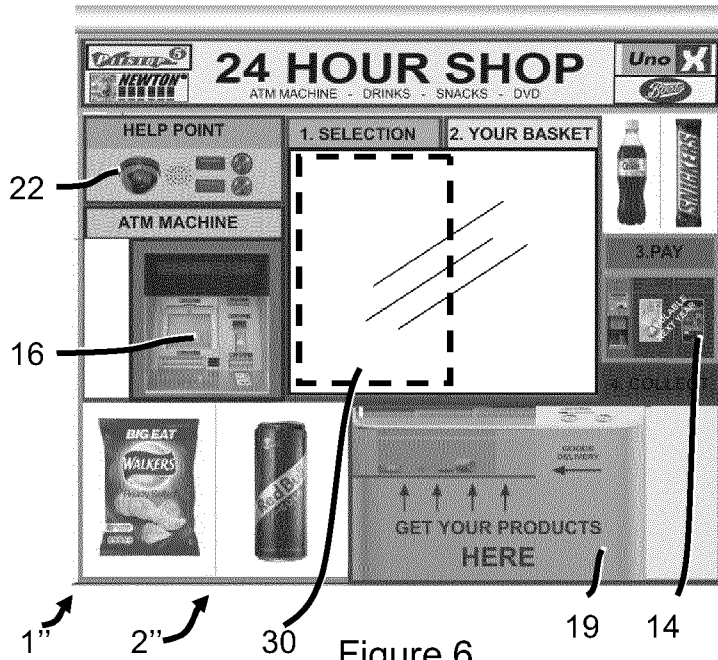


Figure 6

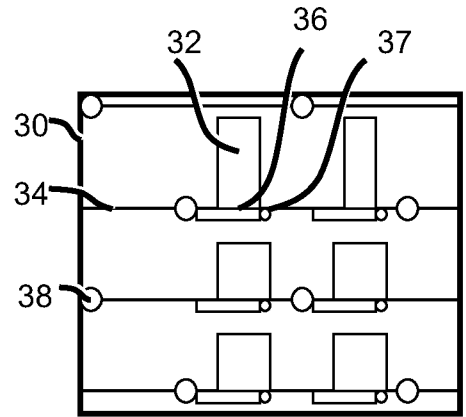


Figure 6a

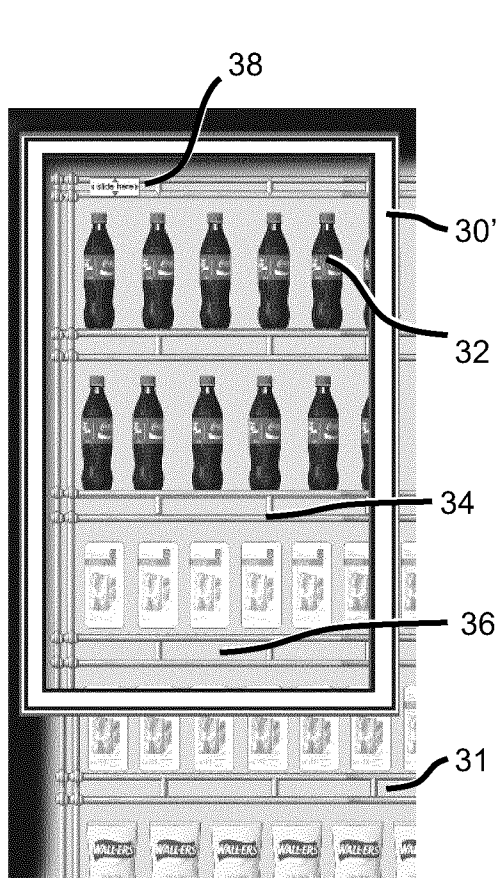


Figure 6b

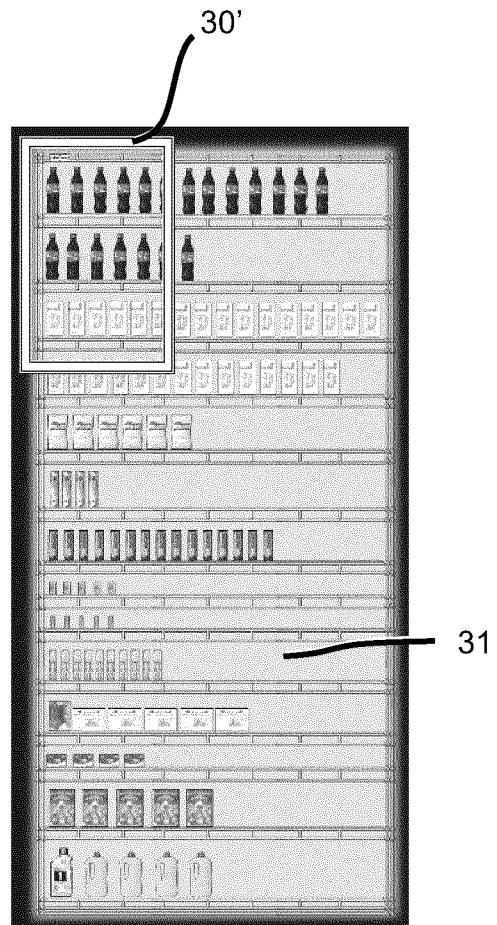


Figure 6c

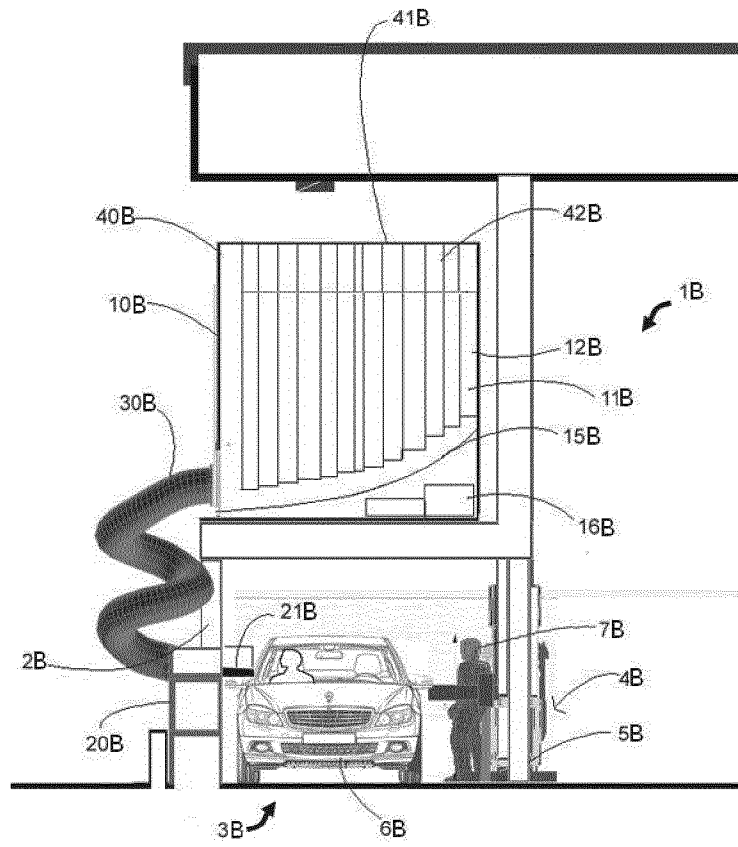


Figure 7

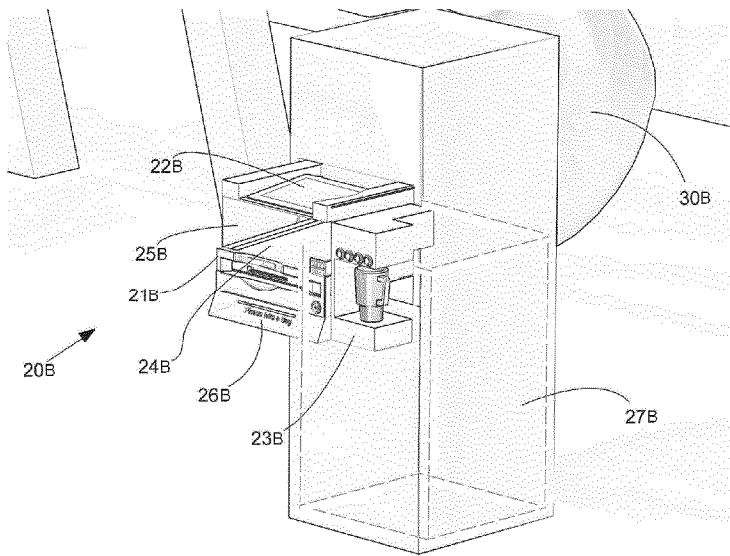


Figure 8

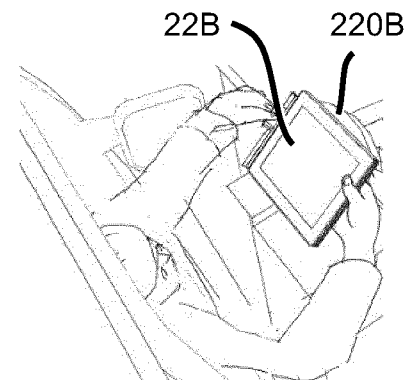
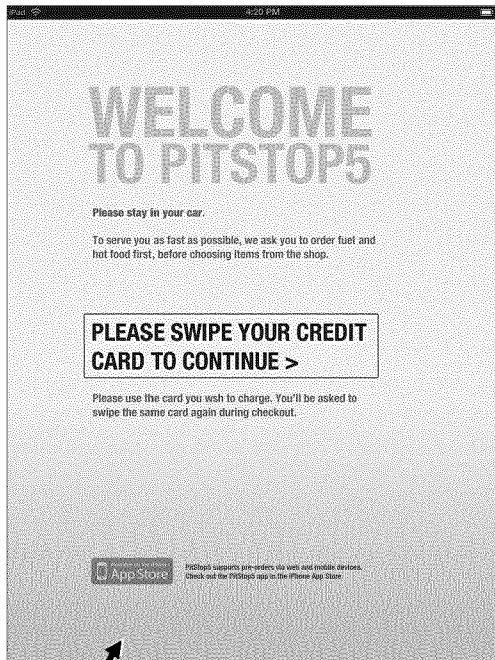
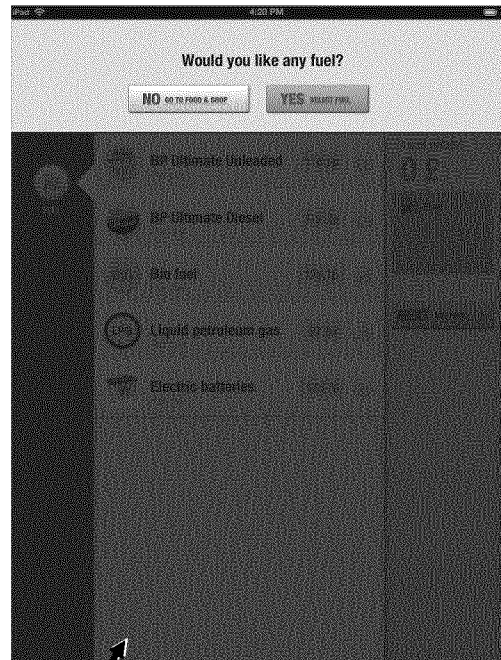


Figure 9



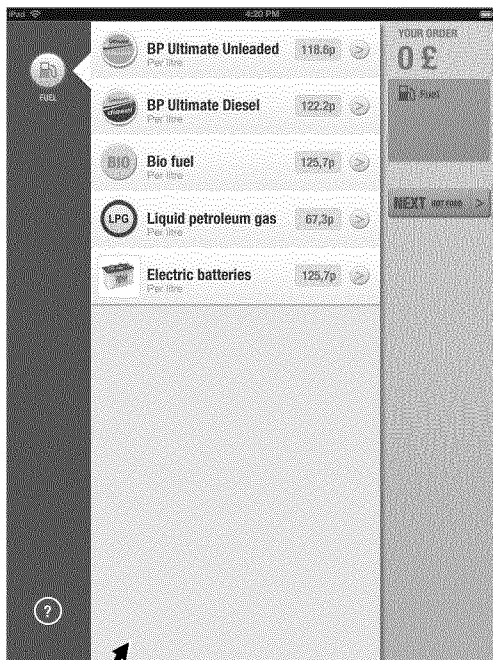
22B

Figure 10a



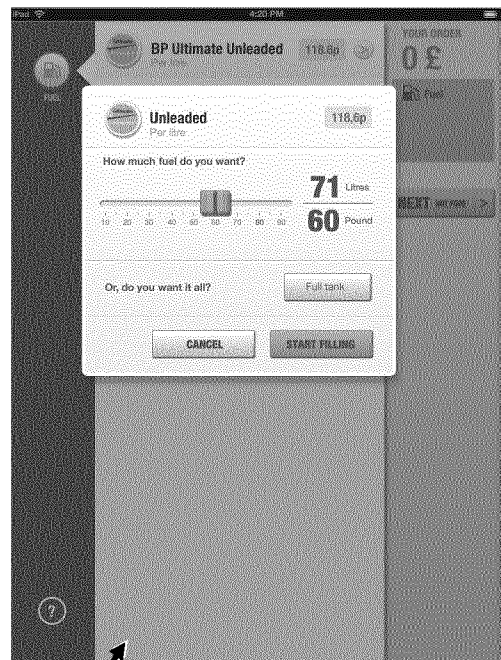
22B

Figure 10b



22B

Figure 10c



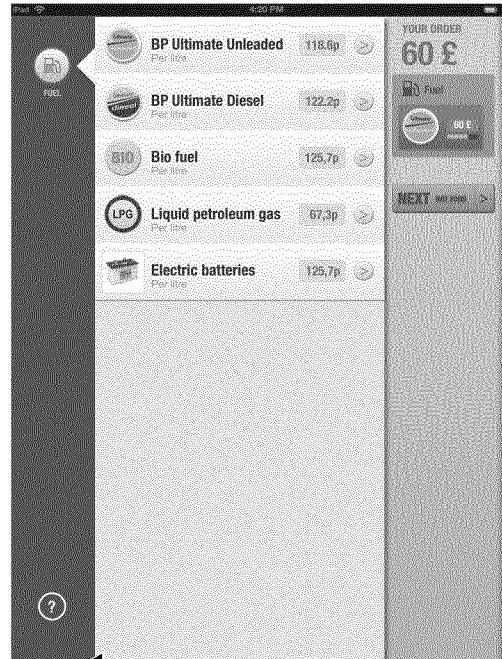
22B

Figure 10d



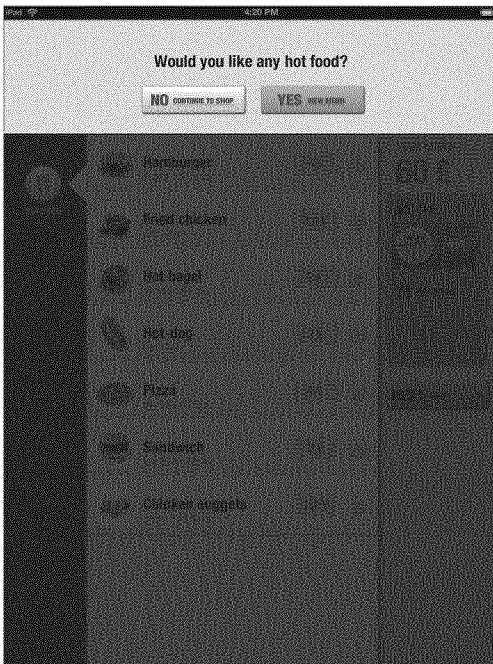
22B

Figure 10e



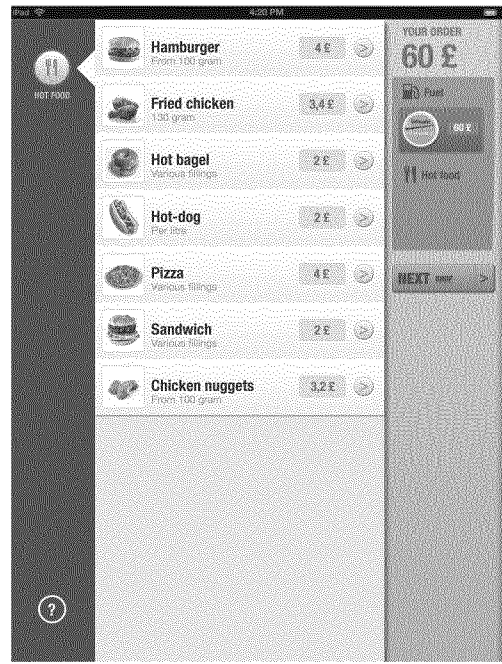
22B

Figure 10f



22B

Figure 10g



22B

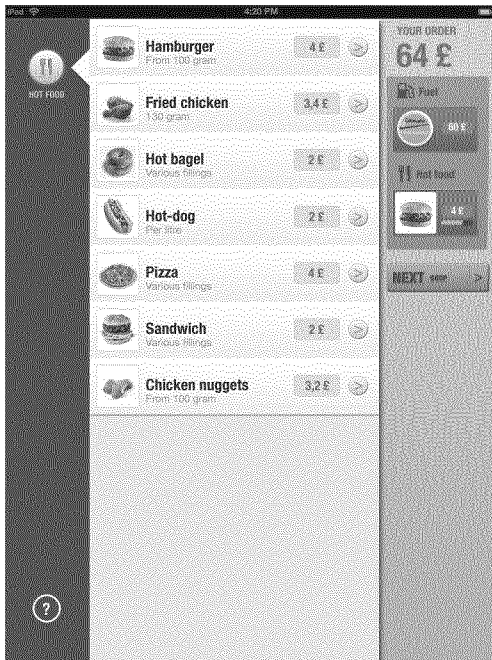
Figure 10h



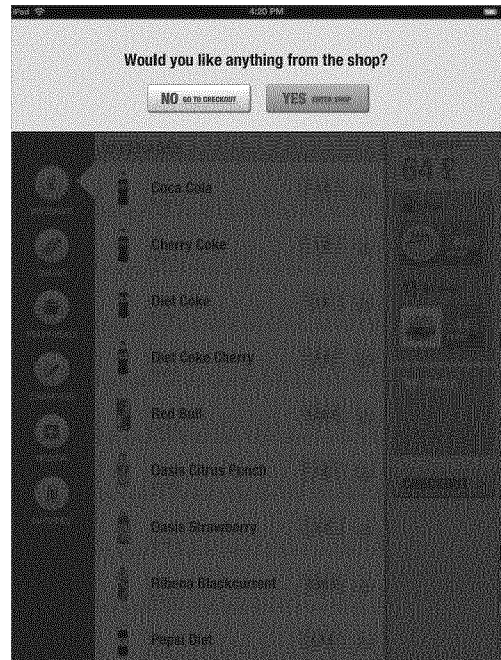
22B Figure 10i



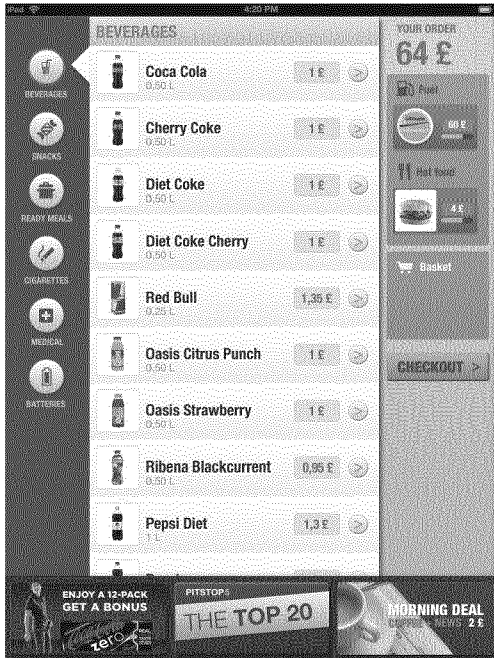
22B Figure 10j



22B Figure 10k



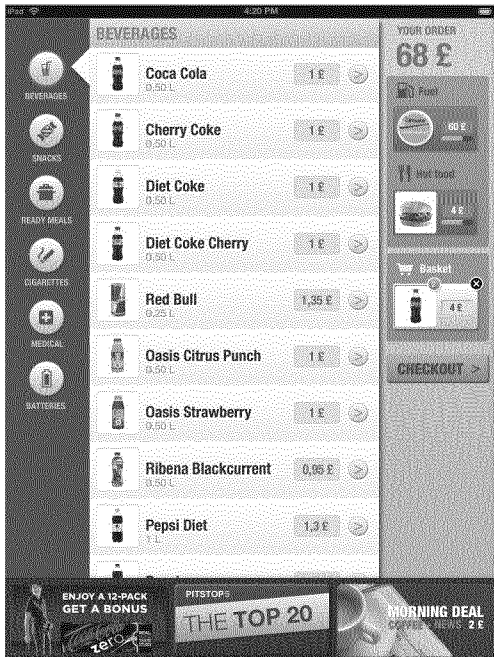
22B Figure 10l



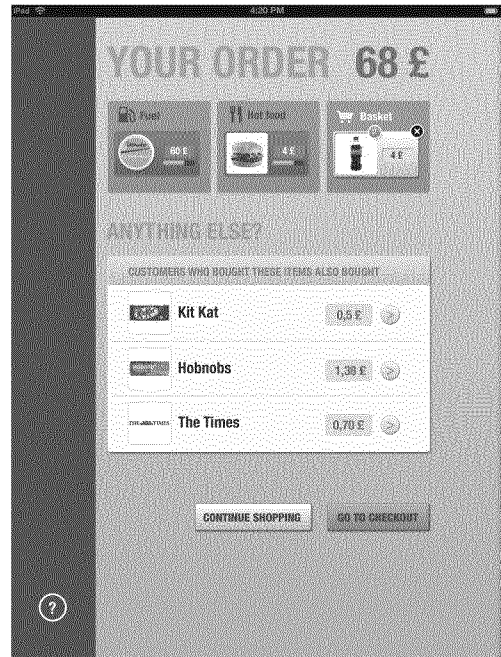
22B ↗ Figure 10m



22B ↗ Figure 10n



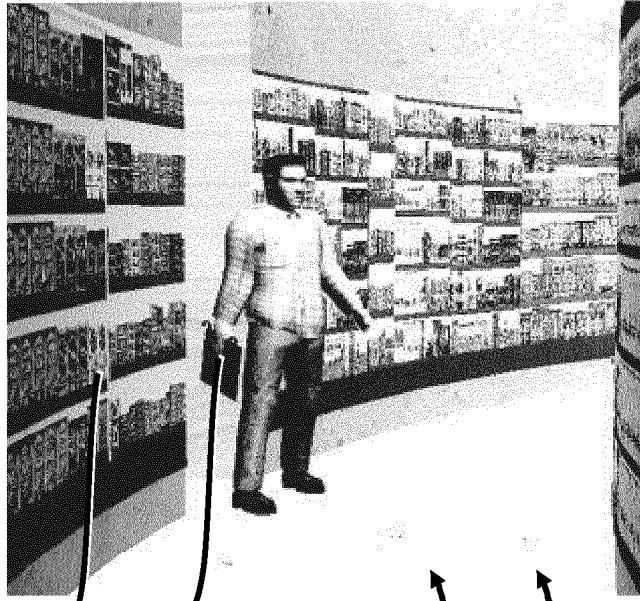
22B ↗ Figure 10o



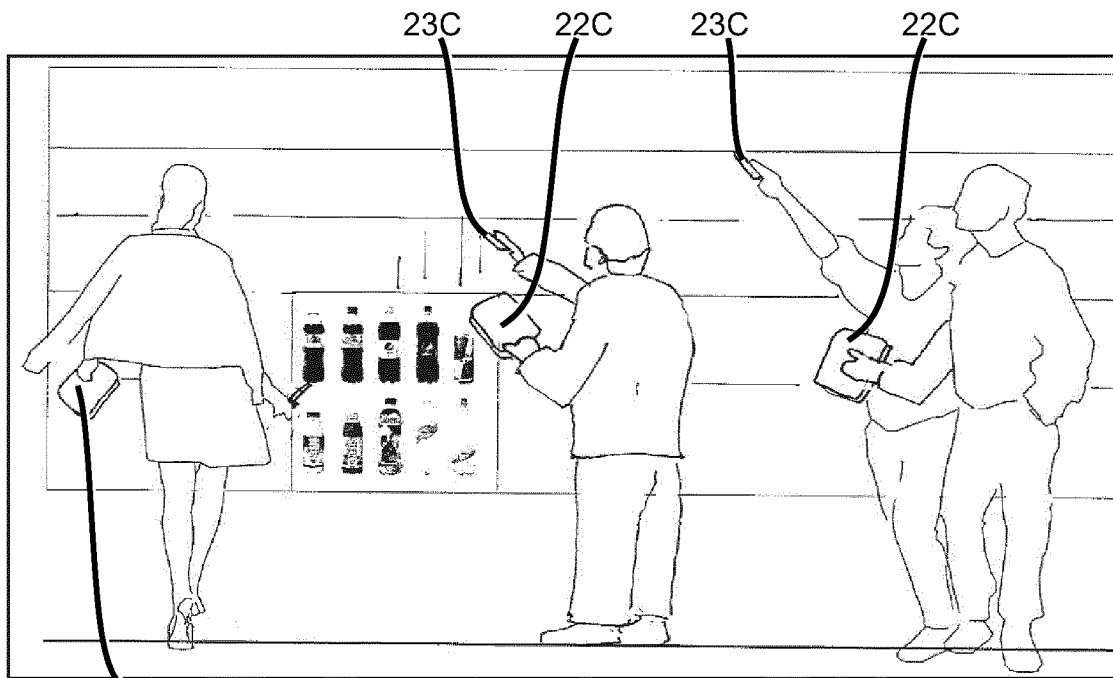
22B ↗ Figure 10p



22B Figure 10q



221C 22C Figure 11 20C 2C



22C

Figure 12

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2011/071442

A. CLASSIFICATION OF SUBJECT MATTER
 INV. G07F7/00 G07F11/62 G06Q50/12
 ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G07F G06Q G07D E04H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 482 139 A (RIVALTO MICHAEL A [US]) 9 January 1996 (1996-01-09) abstract; figure 3 column 4, line 21 column 5, lines 23-57 column 6, lines 10-41	1-6,8-15
X	EP 1 942 469 A1 (G M S DRIVE SAS [FR]) 9 July 2008 (2008-07-09) paragraphs [0022] - [0034]; figure 1	1,2,6-15
X	WO 01/97206 A1 (JOHNDROW SCOTT W [US]; NORD ERIK [US]) 20 December 2001 (2001-12-20) line 30 - page 16, line 13; figure 9	1-4,6, 11,13,15



Further documents are listed in the continuation of Box C.



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Date of the actual completion of the international search

20 March 2012

Date of mailing of the international search report

28/03/2012

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González, Gonzalo

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2011/071442

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