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[54] **AUTOMATED STORE SYSTEM**

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[52] **U.S. Cl.** ..... **186/1 B,** 214/11

[51] **Int. Cl.**..... **E04h 3/04**

[58] **Field of Search** 186/1, 1.2; 214/44, 214/16.1, 11

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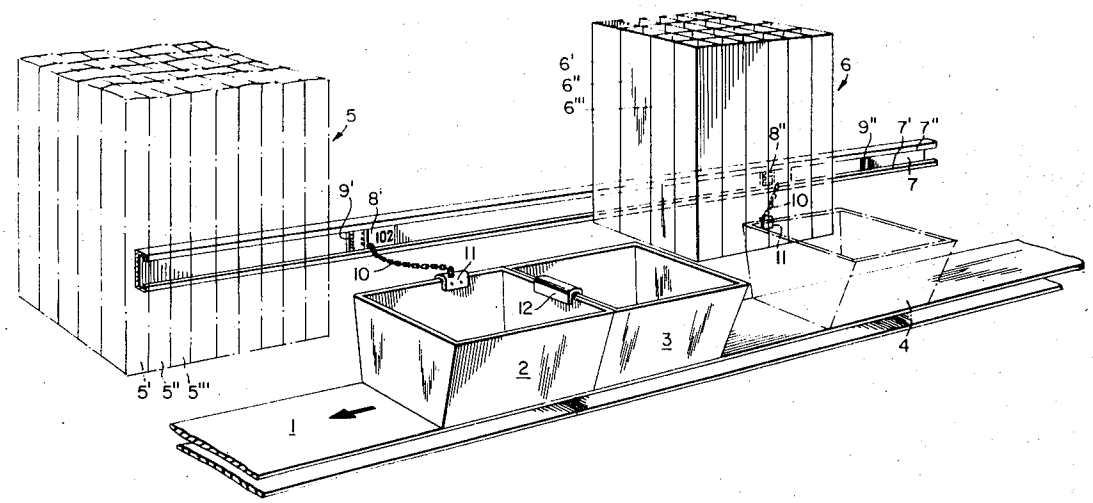
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[57] **ABSTRACT**

An automated store system utilizing a computer control for the dispensing of articles from dispensors into specific containers which are identified with specific purchase orders. The containers carried on a conveyor identify themselves to the computor at each dispensing station and on a return impulse from the computer ordered items are released into the container.

10 Claims, 5 Drawing Figures



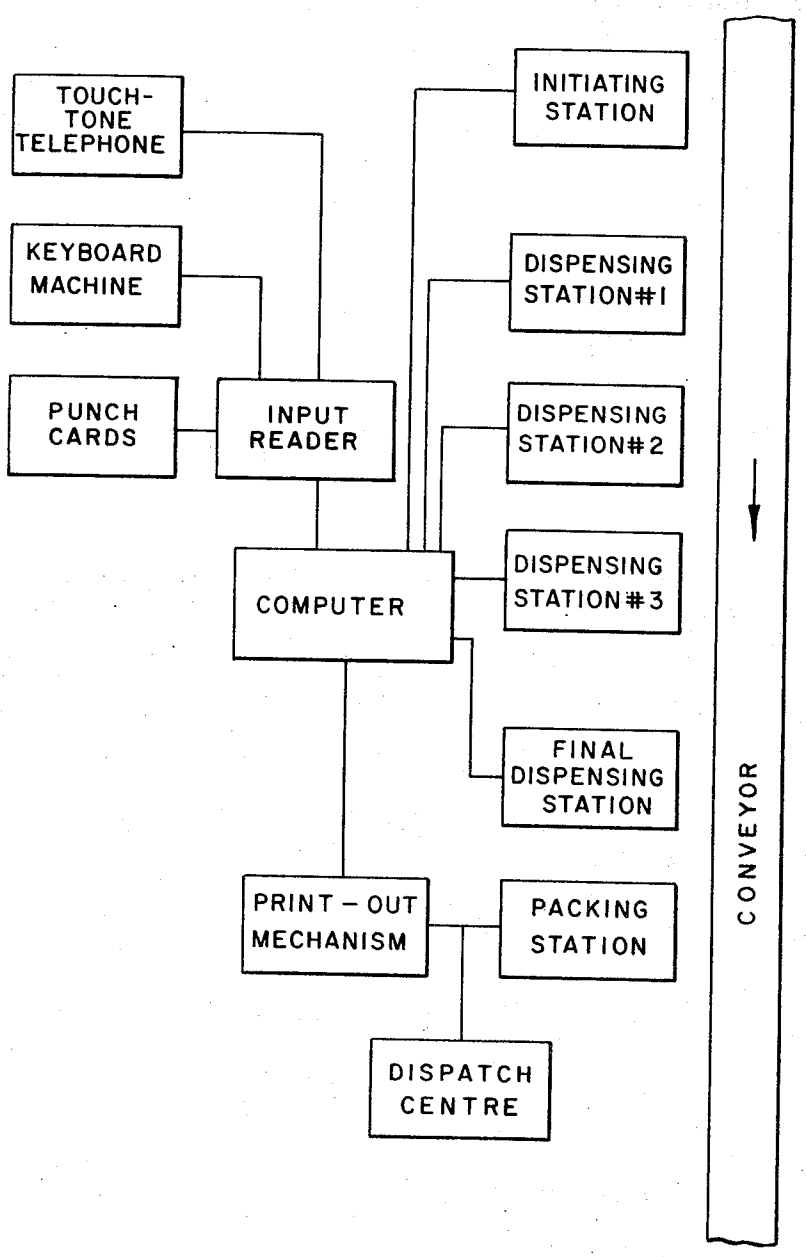


Fig.1.

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4 Sheets-Sheet 2

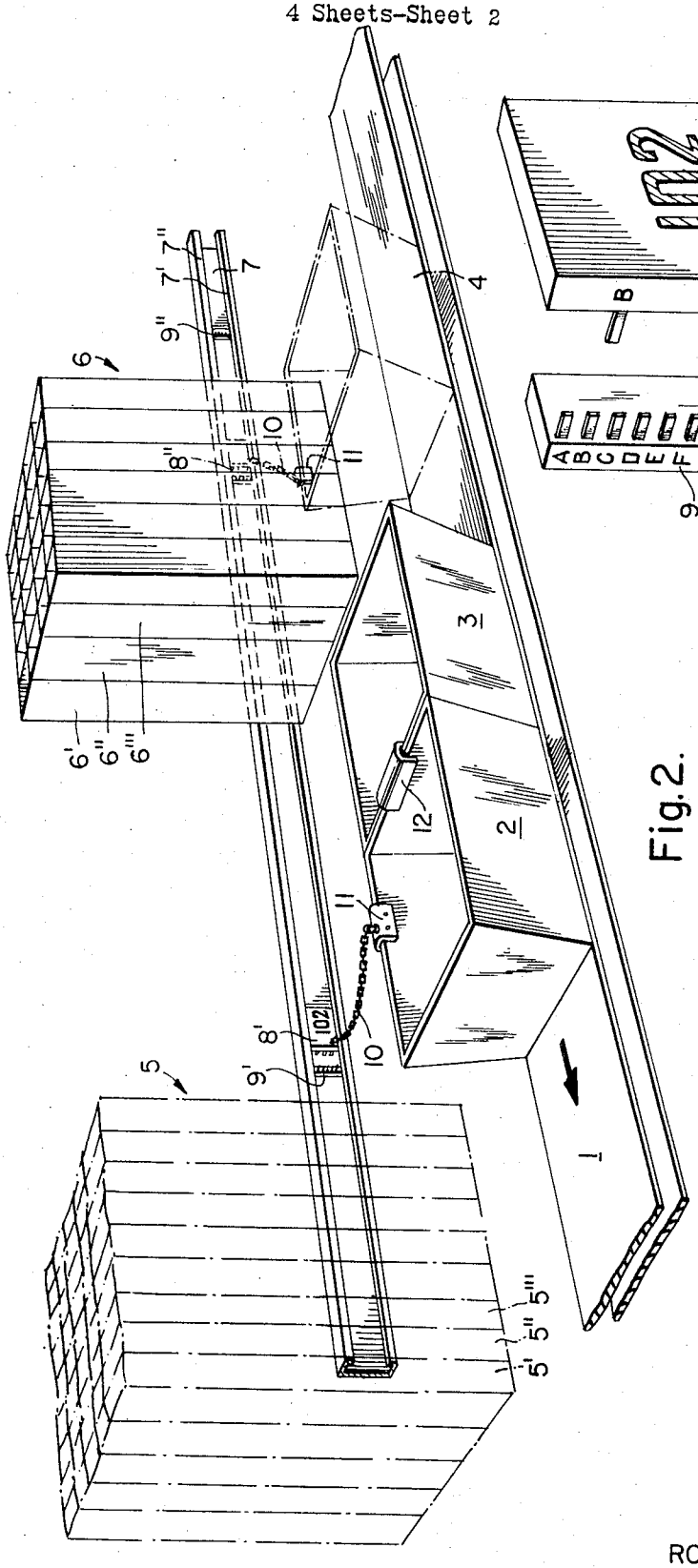


Fig.2.

Fig.3.

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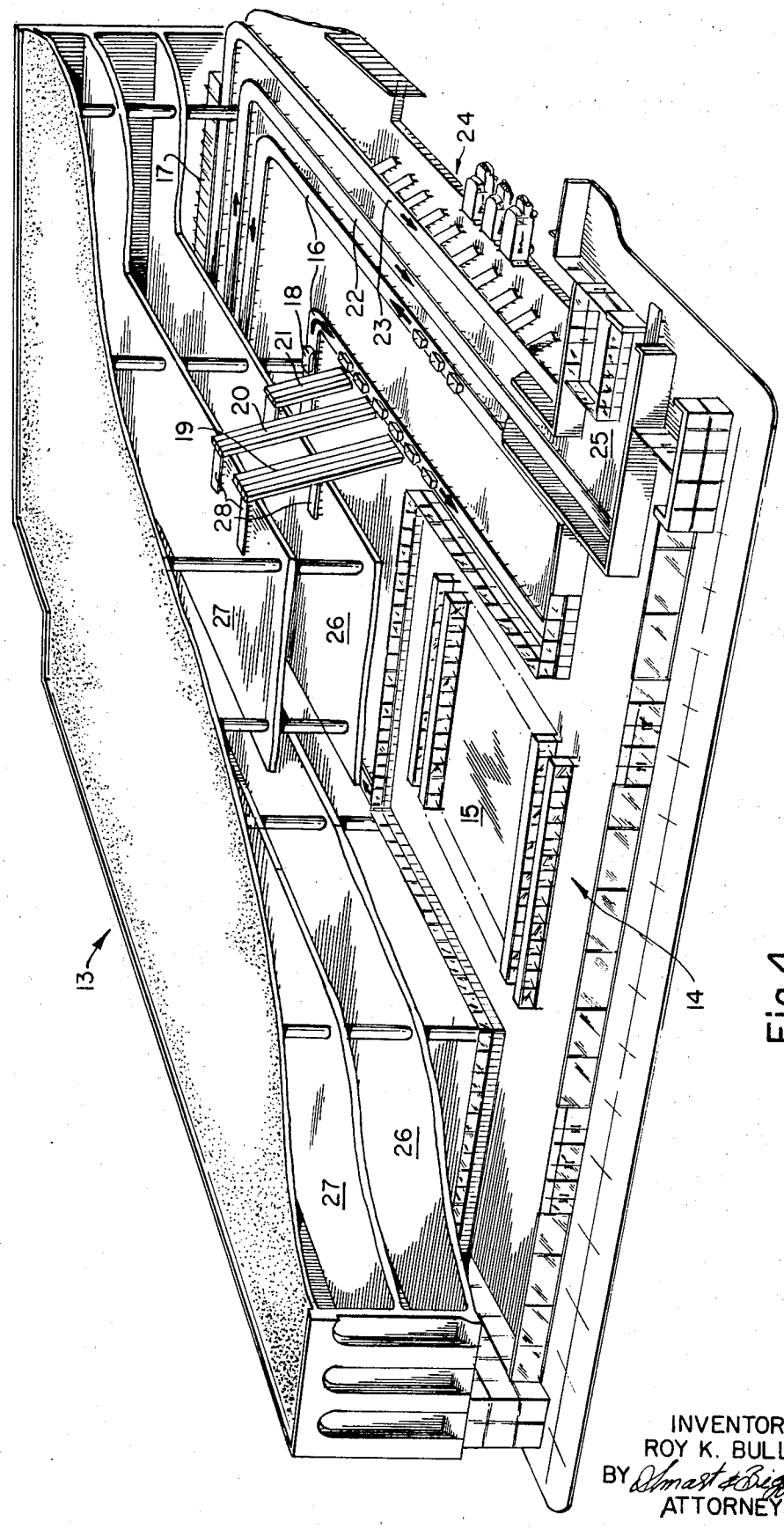
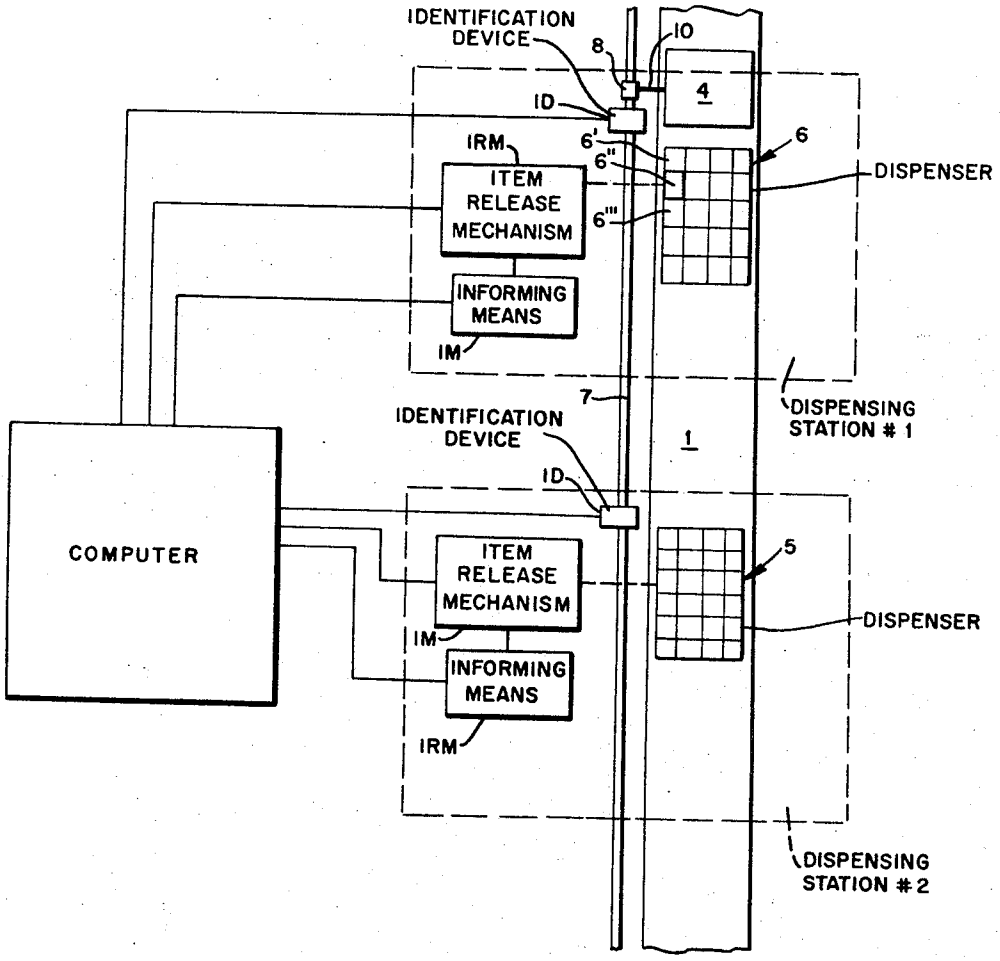


Fig. 4.

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Fig.5


IDENTIFICATION DEVICE
8
10
4
ID
IRM
6'
6''
6'''
6
DISPENSER
ITEM RELEASE MECHANISM
INFORMING MEANS
IM
7
DISPENSING STATION # 1
IDENTIFICATION DEVICE
1
ID
COMPUTER
ITEM RELEASE MECHANISM
5
DISPENSER
IM
INFORMING MEANS
IRM
DISPENSING STATION # 2

AUTOMATED STORE SYSTEM

BACKGROUND OF THE INVENTION

This invention relates to an automated store system which is adapted to supply numerous different articles from a plurality of sources to a container.

The novel system of this invention is intended primarily for use in the grocery business, but also may be applied to related merchandizing fields such as automotive parts suppliers, pharmaceutical houses, warehouses and department stores. The system is designed to assist materially both the purchaser and the store proprietor. By having only one or a very few central order receiving and dispatch centers or stores, the need for costly chain stores in a given area, normally necessary to accommodate customers, is dispensed with. This of course will assist the consumer in that the supplier's construction or rental costs and overall labor costs are greatly reduced and a resultant reduction in consumer prices can therefore be expected. The novel system also has the great advantage of reducing merchandizing losses through theft. Moreover, by the advent of satellite stations in direct line communication with the supply store, the consumer need never leave his house or place of business when he places an order. The order, once placed, is almost immediately filled, and needless delays are done away with. The purchaser's order, while filled automatically, is treated on an individual basis and hence there is no confusion as to which orders were placed by whom, a problem which is a serious shortcoming of the present day conveyor dispensing systems.

SUMMARY OF THE INVENTION

The automated store system according to the invention comprises: a computer; means for supplying coded purchase orders to the input of said computer, said computer being adapted to store said orders; a plurality of item dispensing stations having item release mechanisms and being arranged along a conveyor; the conveyor being arranged to carry a plurality of containers to sequentially pass each one of said dispensing stations, said computer being adapted to correlate specific ones of said containers with specific ones of said purchase orders and identification means adapted to identify a container as it arrives at a dispensing station and to transmit such identification to the computer, said computer being adapted, in response to receipt of such identification, to actuate an item release mechanism in said dispensing station as said container passes thereby if the memory shows that the order associated with that container contains an item or items stored at that dispensing station.

The information fed to the computer would generally comprise the following:

- Customer name or number, if a cash sale, an order number;
- in any event, some means of identifying a particular order.
- Customer's address, if a charge sale or if to be delivered.
- Method of delivery.
- Quantity and item number for each item ordered.
- Amount of any cash payment made at time of placing order.
- Method of settling any balance (charge or COD).

The input to the computer may be supplied by one of a punch tape, punch cards, magnetic tape or other suitable means which is read through an input reading device.

The paper tape or other input medium may be prepared in one of several ways. For example, direct keying from a keyboard is suitable where very small orders are concerned. The keying can be done by an attendant at a satellite store or at the central store. A form of punch-card-to-paper-tape may also be employed, whereby all the prospective purchaser would have to do is to pick up from display racks punch cards which are pre-punched and which relate to the desired specific items in question, and hand them to an attendant on duty. Again, these cards may be located at either the satellite store or central store, or if desired, may be sent to the customer on request for his future use. The touch-tone telephone can also be considered to act as a satellite station. With respect to orders originating by phone, it will be necessary for the subscribing customer to have installed on his premises, suitable signal equipment which is in line connection with the central store computer. The telephone assists the customer in that he need never leave his home or place of business, and he is assured that his order will be placed almost instantaneously. For the subscribing grocery shopper, daily or weekly food prices would be listed in the local newspaper with the appropriate code for each item being listed.

Dispensing stations are arranged over or along a conveyor housed in the central store. Each station may comprise a large number of dispensers grouped together or may be composed of only one or a very few dispensers. Each dispenser has an associated item release mechanism responsive to a signal from the computer. The number of dispensers located at any given station is dependent upon the physical size of the items stored in the dispensers and upon the type of dispensing equipment required for each item.

As a collection container proceeds along the conveyor, such container being identified with a particular order in the computer memory more fully described below, those dispensing stations having dispensers containing articles corresponding to those on the purchase order will be sequentially actuated to dispense the desired articles to the container. Should a given dispenser at a dispensing station be temporarily out of stock, the customer will not be billed for this exhausted item as the cost is only entered against the order upon the release of the article in question from the dispenser. If more than one order is placed for a given item, the dispenser at the dispensing station containing these items will be actuated more than once so as to dispense the number of specific items of that article requested in the order.

The identification means transmits signals uniquely identifying each container to the computer, and the computer then co-relates the container with a given purchase order. Thus, every time a container approaches a dispensing station, it identifies itself to the computer. As the computer is also informed of the particular station from which the container identification was received, it compares the purchase order associated with the container with the articles contained in the dispensers located at that station. The articles adapted to be dispensed at each station are preprogrammed in the computer memory together with

the cost of each item. Hence, the computer effectively compares the purchase order with the items contained in the dispensers at the dispensing station which is being approached by the container.

Should a dispensing station contain articles on the purchase order, a signal is sent from the computer to the appropriate dispenser or dispensers at that station, actuating item release mechanisms which will permit one or more of the items to fall into the container passing thereby. Of course, if a dispensing station does not contain an ordered article, no return signal is forthcoming, and no dispenser at that station is actuated.

Once the order has been completed, and the container has passed the last dispensing station, the computer, which is in line connection with a print out mechanism, tallies the total bill, and the bill, together with all the relevant particulars of the order, is printed out in invoice form. Attendants located at a packing station at the end of the conveyor, pack the contents of each container for shipping and physically attach the invoice to the delivery carton or bag. Because the invoices are printed out in numerical sequence while the orders are being packaged at the packing station in the order received, there is no difficulty encountered in correlating an invoice with a packaged carton. However, as a double check, and in order to assist the packing attendants or personnel in identifying a packaged carton with an invoice, an identification sheet may be placed in each container at the initiating station or immediately before it reaches the first dispensing station. This identification sheet, which is the last thing removed from the container at the packing station, is then attached to the packaged carton and thus becomes visually identifiable with the correct invoice number.

The packaged order is next directed to an appropriate area in conformity with the shipping instructions contained on the invoice, such as a pick-up station, delivery station, or "hold for future pick-up" station. Payment by the customer is made in accordance the mode of purchase. For instance, an accounting station will be located at the pick-up center in the central store. If the order has been pre-paid or if it is to be treated on a charge or COD basis, this will also appear on the invoice and dealt with in a standard form where computer controls are utilized.

Depending upon the physical nature of the articles dispensed, it is also possible to substitute automatic sorting and packing equipment at the packing station in place of the packing attendants.

Should a customer desire an indication of the full purchase price of his order before the order is filled, the computer may be programmed to tally a preliminary price figure. Of course, if items ordered are not in stock the customer will not be billed for them due to the fact that the finalized bill is only tallied after completion of the dispensing run and only after each item has been dispensed. In cases where the order is placed at a satellite store, a customer may be given a preliminary idea of the amount of the purchase order by using an automatic adder capable of reading the punch cards or paper tape punch. If the preliminary estimate does not correspond to the final tally, and if the customer has paid the preliminary amount at the time of placing the order, the customer will be reimbursed either by cash or voucher.

It will be seen that the computer effectively observes, supervises and controls the progress of each of the collection containers as they pass along the conveyor. The dispensing stations may be so arranged that the heavy or durable goods are dispensed early in the conveyor run and the perishable or delicate goods dispensed only near the end of the conveyor run. This dispensing arrangement reduce breakage and spoilage of the vended articles during the assembly of the order.

The computer may also be programmed to determine a volumetric estimate of the goods ordered, which of necessity would include an allowance for random placement of the dispensed articles in the conveyor container. Should the estimate be greater than the cubic capacity of the conveyor container, an additional container may be attached thereto or a larger container substituted. This control may be achieved by a computer signal to the attendant on duty at the initiating station, informing him to take appropriate action. If the computer is not programmed to estimate the volumetric capacity of each purchase order, containers which are expandable in a direction normal to the conveyor run may be used. In this case, attendants positioned along the conveyor need only expand those containers which appear to be approaching capacity filling.

As the containers move along the conveyor at a uniform rate of speed, it is possible that if an order were placed for a large number of identical items, some of these items would be dispensed on the conveyor surface after the container has passed the appropriate dispensing station. To overcome this difficulty, the computer may be so programmed as to be informed of the maximum number of articles capable of being dispensed from each dispenser in a given length of time. The maximum number of identical items dispensed in a given length of time of course depends upon the size of the item and the type of dispenser used. Upon being informed of the number of identical items ordered, and assuming the container is at the dispensing station containing these items, the computer will send an impulse to the motor driving the conveyor, thereby momentarily stopping or slowing down the speed of the conveyor until all the identical items have been dispensed into the stationary container.

Should the system be operating at maximum capacity, it is possible that several containers might well identify themselves to the computer at the same time. The computer, which must sequentially correlate these identification signals with given purchase orders before a return signal actuating an item release mechanism is sent, may be unable to so deal with the identification signals received within the time in which the containers moving along the conveyor are at the appropriate dispensing stations. To overcome this difficulty the computer may be programmed in the manner described above, but in this instance cause the motor driving the conveyor to slow down as the system approaches its maximum operating capacity. This procedure would allow the computer sufficient time to analyze and deal with the identification signals received in good time before the containers in question have passed the dispensing stations from which the identification signals were received.

In addition to programming the computer to estimate the approximately bulk volume of the order, it may also maintain a continuous inventory, sales analysis, customer credit rating, and predict future trends in the

business on the basis of current experience, together with any other information processing that may be required.

BRIEF DESCRIPTION OF DRAWINGS

The following is a description by way of example of certain embodiments of the invention; reference being had to the accompanying drawings wherein:

FIG. 1 is a flow diagram of a typical automated store system contemplated.

FIG. 2 is a schematic view of a portion of the conveyor, dispensing and identification arrangement.

FIG. 3 shows in more detail the identification system employed,

FIG. 4 is a cut-away of an automated store utilizing the system, and

FIG. 5 is a schematic block diagram of signalling system utilized in the embodiments of FIGS. 1 and 2.

DESCRIPTION OF SPECIFIC EMBODIMENTS

Referring to FIG. 1, it will be seen that a purchase order, which may originate by touch-tone telephone, punch-cards or keyboard punch, is ultimately fed to a computer in code form. In cases where magnetic tape is used, the input reader would be replaced by a magnetic tape reader. Once the order, together with the various delivery information is in the computer memory, a container is permitted to proceed along the conveyor commencing at the initiation station. The container, as it proceeds along the conveyor, is identified with one order in the computer memory at the first dispensing station and thereafter with the same purchase order at the remaining dispensing stations. The initial identification between the container and the purchase order in the computer memory may also take place before the container is at the first dispensing station. If one or more dispensers at each dispensing station contains articles which are itemized on the purchase order, the appropriate item release mechanism for each dispenser is actuated by return signal from the computer and the ordered items then dispensed into the container. This is due to the fact that the computer has in its memory store a record of the items contained in each dispenser located at each station and is in line communication with the item release mechanisms of each dispenser. If no items at a station are on the purchase order, no signal pulse is sent to actuate the item release mechanisms and the container passes that station without having any items dispensed. As each item is dispensed, this fact is relayed to the computer by informing means so that a record of it may appear in the final invoice which is prepared after the container has passed the final dispensing station. Once the container has passed the final station, the invoice for that order is printed out on a line printer and physically attached to a delivery carton or shopping bag which has been packed by attendants located at a packing station at the end of the conveyor run. The carton or bag is then routed to the appropriate dispatch center in accordance with the delivery instructions contained on the invoice.

The identification means illustrated in FIGS. 2 and 3 serves to provide output signals to the computer which identifies each container. The computer then correlates each container with a particular purchase order and maintains such correlation until the final dispensing station is passed. The identification means additionally informs the computer which of the many dispensing stations that specific container is approaching.

Referring to FIGS. 2 and 5, an endless conveyor 1 is provided and arranged to carry therealong containers, such as containers 2, 3 (FIG. 2) and 4 (FIG. 5), in the direction indicated. Dispensing arrangements, such as overhead dispensing arrangements 5 and 6, are arranged along the conveyor 1 at the corresponding dispensing station. Each arrangement may include one or more dispensers such as 5', 5'', 5''' at dispensing arrangement 2 and 6', 6'', 6''' at dispensing station 1. Each dispenser includes an item release mechanism IRM shown schematically in FIG. 5 and means for informing the computer of the dispensing of one or more identical items therefrom denoted IM and also shown schematically in FIG. 5. Thus, referring to FIG. 5, an item release mechanism IRM and an informing means IM for dispenser 6'' are shown. The item release mechanism IRM may, for example, comprise a solenoid-actuated latch for a hinged cover plate located at the lower or output end of dispenser 6'', the solenoid being energized responsive to a signal from the computer to release the latch and to thus permit the cover plate to pivot open due to the force of gravity and cause discharge of an item from dispenser 6''. The cover plate can be arranged to be automatically returned to the closed position thereof upon discharge of an item from dispenser 6''. Informing means IM may suitably comprise a micro-switch which is actuated responsive to movement of the cover plate to the "discharge" position thereof, informing means IM supplying a characteristic pulse to the computer under these circumstances. It will be understood that the particular construction of the item release mechanism IRM and the informing means IM forms no part of the present invention and that a number of other, different arrangements can be used. The item release mechanism IRM is, as stated, actuated on impulse from the computer, thereby permitting the dispensing of the ordered item or items from the dispenser into the container. Also, as discussed, each informing means IM transmits a return signal to the computer, and thus informs the computer of the number of identical items that have in fact been dispensed. This information ultimately appears in the invoice which is printed up after the container has passed the final dispensing station. Regardless of whether the dispenser is of the overhead, inclined or horizontal dispensing type, it will be associated with an item release mechanism and an informing means which operate in the general manner described above although the particulars thereof may vary.

Arranged adjacent and parallel to the conveyor 1 is a signal track 7. The signal track 7 preferably has flanges 7' and 7'' adapted to permit non-identical number carriers, such as 8' and 8'' shown in FIGS. 2 and 8 shown in FIG. 3, to freely slide therealong. Immediately preceeding each dispensing station and extending from signal track 7, are identical multi-contacts or comb contacts such as 9' and 9'' shown in FIG. 2 and in greater detail as 9 in FIG. 3. These comb contacts are the basic elements of identification devices ID shown schematically in FIG. 5.

Referring to FIG. 3, it will be seen that comb contact 9 has twelve teeth, A to L. The number of teeth may be varied as will be seen later. As evidenced in FIG. 3, number carrier 8 has three protuberances, for example B, F, H, which are adapted to contact corresponding

teeth B, F, H, of comb contact 9. Because each number carrier used in the system has a uniquely different combination of protuberances, it will be seen that the twelve teeth per comb and the three protuberances per carrier give rise to a mathematical combination of 218 contacts wherein all the integers are completely different, which means in effect, that a maximum of 218 containers may be on the conveyor at any one time.

Each tooth of each comb 9 is connected to the computer so that when three teeth thereof are connected with the three protuberances of a carrier, a signal will be sent to the computer informing it of (a) the station from which the signal was sent and (b) the identity of the number carrier, which effectively identifies the container to which the number carrier is attached.

During normal operation of the system, a container similar to container 4 shown in FIGS. 2 and 5 is placed on conveyor 1 at the initiating station. At the initiating station the container 4 is also attached to a number carrier (8'' shown in FIG. 2) by means of a chain 10 and a clamp 11. Clamp 11 is preferably secured to the leading side edge adjacent the signal track 7 as shown, but may, for reasons which will become apparent hereinafter, be secured the side edge of the container. As container 4 proceeds along the conveyor towards the first dispensing station, it will effectively "tow" number carrier 8'' in signal track 7 with it. The three protuberances on number carrier 8'', which, when in contact with the three corresponding teeth of the identical combs arranged along track 7, will uniquely identify this number carrier from 217 other number carriers. As container 4 approaches the first dispensing station and number carrier 8'' contacts the first comb positioned in track 7; number carrier 8'' will be identified to the computer, and effectively so will its associated container 4, and the computer will then associate the signal received from this carrier with a particular order in the computer memory. Return signals will be sent to the dispensers located in the first dispensing station from the computer, should this station contain articles on the purchase order. As each successive dispensing station is approached and passed, the identification, association, and signalling between the item release mechanisms IRM and the informing means IM with the computer will take place in the manner described above.

If the attendant on duty at the initiating station has been informed by the computer that the estimated volumetric capacity of the purchase order is greater than that a container can hold, a second container such as container 3 of FIG. 2 may be hooked behind a first container 2 by a clamp 12. In this situation, the number carrier 8' on container 2 is then positioned midway along the side edge of lead container 2, so that articles dispensed from each dispensing station will effectively dispense equally in containers 2 and 3. If the computer is not programmed to give a volumetric estimate of the size of a purchase order, attendants stationed along the conveyor may, if it becomes visually apparent that a container is approaching capacity filling, attach a second container similar to container 3 to the first or lead container 2, and move clamp 11 to a point midway of the side of lead container 2.

FIG. 4 is illustrative of a typical store layout utilizing the novel system according to this invention.

On ground floor 14 of central store 13, a display and ordering center, generally indicated at 15, is provided for those people who wish to place their orders personally at the central store. The computer and its associated input and print-out equipment, not shown, may also be located on this floor. The remainder of the ground floor is principally taken up by container conveyor 16, which proceeds from an initiating station (not shown) to a packing station 17. Containers, such as container 18, pass numerous dispensing stations during the conveyor run, overhead dispensers 19, 20 and 21 being illustrated. Arranged alongside and parallel to conveyor 16 is a signal track, the signal track not being shown in FIG. 4 for the sake of clarity. However, this signal track functions in the manner previously described in connection with FIG. 2.

At packing station 17, packaged cartons or bags are transported by conveyor 22 or 23 to either delivery station 24 or pick-up station 25.

The second and third floors of the store 13, indicated by reference numerals 26 and 27 respectively, house bulk merchandise which will be ultimately loaded into the appropriate dispensing stations. Dispensing station conveyors 28 are provided on floors 26 and 27 in order to facilitate transport of bulk merchandise to the general area of the appropriate dispensing stations for loading. Bulk merchandise and dispensing station conveyors are also located on ground floor 14, but not shown. The bulk merchandise on this floor is supplied via the dispensing station conveyors to those horizontal, inclined or vertical dispensing stations which can only be loaded from the ground floor 14.

While the identification means disclosed is electromechanical, it must be appreciated that this is only a preferred embodiment of the invention, and that it would be obvious to one skilled in the art to use an alternative form of identification means, e.g. a photoelectric, radiation or magnetically sensitive identification means.

What I claim as my invention is:

1. An automatic store system comprising a computer; means for supplying coded purchase orders to the input of said computer, said computer including means for storing coded purchase orders supplied thereto; a conveyor; a plurality of item dispensing stations located along said conveyor, each said station including at least one item release mechanism and the conveyor, in operation, carrying a plurality of containers sequentially past each one of said dispensing stations; and said computer including means for correlating specific ones of said containers with specific ones of said coded purchase orders; identification means at each dispensing station for identifying each said container as the container arrives at that dispensing station and for transmitting an identification signal corresponding to that container to the computer, and item release mechanisms located at each of the dispensing stations for controlling release of items stored at said stations, said computer further including means for receiving said identification signals and for producing, in response to receipt of a said identification signal from a said station, a signal for causing actuation of at least one said item release mechanism at said dispensing station as said container passes thereby in accordance with whether the stored coded purchase order stored in said computer and associated with that container contains an item or items stored at that dispensing station.

2. An automated store system as claimed in claim 1 wherein the coded purchase order originates from a keyboard punch.

3. An automated store system as claimed in claim 1 wherein the coded purchase order originates from a telephone source.

5. An automated store system as claimed in claim 1, wherein said identification means comprises a plurality of identical combs, one associated with each one of said dispensing stations and a carrier associated with each one of said containers; said carrier, in operation, contacting selected teeth in said combs to thereby produce coded signals uniquely identifying a said container as the container arrives at a said dispensing station.

5. An automated store system as claimed in claim 1 wherein said identification means comprises a signal track adjacent and parallel to said conveyor, a plurality of multicontact means on said signal track, each one of said dispensing stations having one of said multicontact means associated therewith, a plurality of carriers movable along said track, each one of said carriers being associated with specific ones of said containers and, in operation, actuating predetermined combinations of contacts on each of said multicontact means to thereby identify a said container as the container arrives at a said dispensing station.

6. An automated store system as claimed in claim 1, wherein each one of said dispensing stations includes at least one informing device for transmitting a signal to the computer upon discharge of an item or items therefrom.

7. An automated store system as claimed in claim 1, wherein the coded purchase order originates from a pre-prepared punch-card.

8. An automated store system as claimed in claim 1, which includes a print out mechanism, in line communication with said computer, for printing out particulars of the purchase order in invoice form after each one of said containers has passed the last of said dispensing stations.

9. An automated store system as claimed in claim 1, wherein said dispensing stations are so arranged and stocked that perishable or delicate articles will be dispensed near the end of the conveyor.

10. An automated store system as claimed in claim 1, wherein each one of said dispensing stations includes at least one dispenser, each said dispenser being associated with an item release mechanism and an informing device for transmitting signals to the computer upon discharge of an item or items therefrom.

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