Supermarket Price Indicator System
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This is a patentable idea for an electronic system that displays the current price of articles for sale on the shelves of a large market. The price is obtained through computer tapes or diskettes provided by a central MIS facility, keyed to the UPC codes of the articles.

I. *Problem Statement*

Supermarkets and discount chains have almost entirely converted to UPC bar code markings for all products. The price of the product is carried in the store's computer database system and is made available to the customer at the checkout counter, where a laser scanner or other device reads the code, and the current price is looked up through the store's computer system.

Unfortunately, prices cannot be attached to articles on the shelves so that customers can do comparison shopping or establish their purchases in advance, unless some store clerk makes up price labels and attaches them to the shelves. Any price change or movement of the articles forces this manual labor to be repeated.

Stores failing to provide this pricing information risk alienating a class of customers that want this information in advance. But providing the information is a labor-intensive operation that hurts profits.

2. Proposal

I propose an electronic system based on an inexpensive chip with an LCD display. The chip would be mounted in plastic and attached to a power/signal bus running along a store shelf. A three-wire bus is sufficient to supply +5 volt power to the chip, a ground and a signal line through which information can be sent and received from the chip.

The LCD display on the chip shows a price, and (optionally) a unit designation (ea, lb, oz, etc. as appropriate).

Each chip contains a ROM with a unique identification code. A photosensor permits selecting the chip by a person with a special light pen wand.

A typical store will contain several thousand of these chips placed near its products, one chip per product.

The chips are designed to communicate with the store's central computer through a special communications box.

The chips need to have some means of being locked into place on its bus so that they can't easily be pulled off by vandals. They should be easily moved by store people. A typical shelf should support any number of them. They need to be cheap and interchangeable, except for a unique ROM code built into each one.

3. Operations

When a new chip is placed on a shelf, it shows no price. The clerk uses a special wand to 1) read the UPC code on one of the products, then 2) send the UPC code to the chip through its photocell sensor. 3) The chip sends a message to the store computer with its id code and the UPC code. 4) The store computer stores the chip's id code and UPC code in its database, then 5) sends a message to the chip with pricing information for it to display.

The chip can be moved anywhere in the store and used again with some other product or the same product, provided that this entry procedure be followed.

When a price change occurs for some product, that information will be carried in the store computer's database -- the same database used for the checkout counters. The database will know the chip id codes associated with the UPC code and the store computer can then send a message to update the price on the chip display. No human action is required for this.

Price leaders, sale prices, etc. all become an MIS function that occur along with the daily updates to the master store files in which prices are assigned to UPC codes.

4. Technology

The technology exists for all these operations. Communication along a single channel among any number of independent modules is done now through the Ethernet technology. Portable handheld devices that can recognize a barcode and retain the code number in memory exist -- this only needs to be extended to transmit data to a photosensor through a suitable binary code.

However, for this idea to be feasible, it's necessary to embed all the required communications and display electronics on a single chip that can be mass-produced at low cost.

5. Variation

A row of display chips might be managed by a control box at the end of the row. The display chip might communicate with the control box through a simplified communications protocol that (for example) assumes no collisions between competing devices on that row, or that uses more than one signal wire, for example, a synchronizing control line and a signal line. The control box could be more expensive and manage communications to the store computer through a more sophisticated collision system such as Ethernet provides.

Whether this variation is required depends on how much functionality can be packed into a single display chip and at what cost.

6. Power Failure

A power failure would result in blank display chips throughout the store. However, the store computer will have a database on disk of chip IDs vs. UPC codes, which can be used to send messages to all the store's display chips of current pricing. This operation might take a few minutes, but is automatic and brings all the price indicators up to date. The chips do not need a battery backup - - its unique ROM code number can be used to catch price information that pertains to it.

7. Advantage to the Retailer

1. The system would be accurate. Price changes would be reflected on the shelves associated with the goods in a timely fashion.

2. The system is flexible. Display units can be mounted anywhere, and are easily programmed by a clerk to correspond to the article on its shelf.

3. Only one clerical operation is required to associate a display chip with its article. Thereafter, no manual intervention is required, except to replace a defective or broken display chip, or to add, move or remove articles and their associated chips.

8. Cost/Benefit Analysis

Here are some typical costs of such a system to a market:

Each display chip: $2.00.

Wiring: $0.25 per foot. This would have a sticky backing and easily-attached connectors to central bus wiring. It might also come in lengths of preformed plastic carrier into which the display chips can be snapped.

Store computer hardware box and software: $1000.00. Note that this does not assume replacing the store computer, but rather changing or augmenting its software and attaching a special communications box to access the display chips.

Then a store with (say) 2000 items on 1000 feet of shelf space would incur a one-time cost of $5250.00 for the system hardware.

Installing the wiring is mostly a matter of attaching the wiring tracks to the store shelves. At the ends of shelves, a connector provides connections to store-wide wiring that may require some electrical contracting services -- say $1000 for installation.

Installing the display chips is a labor cost comparable to making up price tags --a clerical operation requiring about 1/2 minute per item. At $10/hour, the cost per chip is only about 9 cents, or about $200 for the two days required for the job. This is a matter of walking

down an aisle and snapping display chips into the receiver track for each item on the shelf.

The total one-time installation cost is therefore about $6500. On a 5-year amortization basis, the system therefore costs about $1300 per year.

The benefit obtained is the labor cost saved in otherwise changing price tags. $1300/year would otherwise buy 130 hours of labor per year, or only 2.5 hours per week that would be spent on manual labor expended on changing tags. A store with 2000 items can expect a price change on each item at least twice in the year, particularly for highly competitive high-volume articles stocked by a supermarket. This is 4000 changes per year, or 77 per week. A clerk would have to change about 30 shelf tags per hour, or one every two minutes, to keep pace with the automated system in cost. Note that these will be scattered around the store, requiring the clerk to first locate each item and walk to it. Clerks typically work with thick printouts of prices and UPC codes that need to be matched up against the store items on the shelves.

Such manual changes are prone to error, and customers are quick to exploit or complain about the errors. An overpricing error will result in lower sales of the item, while an underpricing error will be exploited by sharp-eyed customers to demand that the product be sold at the lower price. There is therefore a hidden cost in manual system errors.

9. The Market

The potential market is extremely large, considering the number of supermarkets that exist worldwide and the number of chips required by each one. This would more than justify the capital cost of designing special simplified communications protocol, special ICs and software to implement the system.

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