A price verification method and apparatus for retail stores using shelf labels (19) that have an extended bar code (18) containing the item price or price expiration indicia and the item number. A remote unit (10) scans the item number and price or price expiration indicia, uses the item number to look up the item in a database, then compares the shelf price or price expiration indicia to the database. If the price is no longer valid, a new shelf label (11) is printed immediately. The UPC or other bar code on the product itself is scanned and compared to the shelf price label to confirm product placement. Another embodiment provides for a portable scanner with which a shopper can total purchases as they are selected in order to verify checkout prices.
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SHELF PRICE LABEL AND PRODUCT PLACEMENT
VERIFICATION METHOD AND APPARATUS

FIELD OF THE INVENTION

The invention pertains to the field of methods and devices for retail price tag generation and maintenance. More particularly, the invention pertains to an improved shelf price label, methods and apparatus for confirming the accuracy of shelf pricing and product placement in a retail environment, and for printing replacement shelf price tags for those with incorrect prices.

BACKGROUND OF THE INVENTION

The adoption of the Universal Product Code (UPC) in April 1973 transformed bar codes from a technological curiosity into a business necessity. Before the UPC, every company had its own way of identifying its products. Some used letters, some numbers, some both, and some had no codes at all. Moreover, before the UPC, various bar code systems were in use, all incompatible. After the UPC, any bar code on any product could be scanned and interpreted in every suitably equipped store in the company.

The UPC comprises a twelve-digit bar code which is split into two halves. The first digit is always 0, except for products like meat and produce that have a variable price dependent upon weight, and a few other special types of items. The first five digits after the "0" are the manufacturer's code, the next five are the product code, and the last is a "check digit" used to verify that the preceding digits have been scanned properly. Hidden cues in the structure of the code tell the scanner which end is which, so it can be scanned in either direction.

In certain products such as meat, etc., the first part of the code identifies the type of item (chuck steak, chicken wings, etc.), and the second half gives the price. Books, too, are given the price coding in the second code group, and a part of the ISBN code is appended in another, smaller, code group.

Manufacturers register their codes with the Uniform Code Council (UCC) to get an identifier code for their companies, then register each of their products. Thus, each package that passes over a checkout stand has its own unique identification number.
Standardization made it worth the expense for manufacturers to put the symbol on their packages and for printers to develop the new types of ink, plates and other technology to reproduce the codes with the exact tolerance required. Despite the estimated $200,000 per store cost of scanning equipment, and the potential $200 million annual cost to manufacturers, tests showed the UPC system would pay for itself in a few years.

Once the level of 85% identification of products was reached in the late 1970's, sales of scanner systems took off rapidly. In 1978, less than 1% of all grocery stores had scanners. By mid-1981 the figure was 10%, three years later it was 33%, and today over 60% of all grocery stores in the nation are using checkout scanners. Other types of stores have begun to follow, led by discount chains such as K-mart and Walmart. (The preceding discussion is adapted from "Bar Codes Sweep the World", Invention and Technology, Spring 1993, pp57-63).

Although originally sold as a way of reducing time and errors at the checkout without adding register employees, stores soon discovered that one of the primary sources of savings in the use of the UPC system is that it is no longer necessary for a store to pay an employee to individually tag each and every item in the store. Instead, a single price label is placed on the shelf next to (or under) the items to be sold. This also allows price changes to be made without having to re-tag hundreds of items, and eliminates the possibility of mis-tagged items.

While ideal for the retailer, shelf pricing has its disadvantages from the consumer's point of view. Since there is no price on the item, the checkout scanner (which is working from a central store database of prices) will charge the customer based on the database price, without reference to the shelf price. Unless he or she notes the price from the shelf on each and every item, a consumer has no way of knowing if the shelf price is the price he or she is actually charged at the register.

There may be some reason for consumers to mistrust shelf pricing. According to an article in the Ithaca (NY) Journal, recent studies by Information Week claimed that American consumers were overcharged some $2.5 Billion in 1992 ("NYPIRG: Scanner bill doesn't add up", Ithaca Journal, April 19, 1993, page 3A), and a study in Money Magazine estimated that scanner errors account for more than half of supermarket profits, giving consumers a 1-in-10 chance of
being overcharged on each visit to one of the 30% of stores that routinely
overcharge. ("Don't Get Cheated by Supermarket Scanners", Money Magazine,
April, 1993, pp. 132-138)

The Money Magazine article (p. 138) indicates that Connecticut exempts
stores from a coding law if the store uses computerized shelf pricing. To this
inventor's knowledge, the "electronic unit price shelf tags" are, in fact, small
electronic readouts under each item in the store which directly display the scanner
database price for each item. This is obviously a huge investment for a store, not
to mention the time and trouble to reprogram a system when moving items from
one shelf to another.

Legislation requiring stores to guarantee the accuracy of shelf prices
against scanner prices may be expected in the future. Tompkins County (NY) is
currently holding hearings on such a law requiring a 98% accuracy rate, and New
York, among other states, is considering it. Stores approve of a scanner accuracy
law, since it allows them to continue shelf pricing in the absence of item pricing,
but they will need some way of checking the shelf prices to avoid penalties under
the law. Having an employee manually check every shelf label against a price list
will eliminate some of the gains made by going to shelf pricing in the first place.
Also, counties or states will need some way of checking shelf prices against
scanner prices to enforce any law which eventually goes into effect.

Watson, et.al., U.S. Patent No. 4,654,514, recognizes the problem of
incorrect shelf prices and the difficulty of keeping them up to date. He solves the
problem by eliminating the shelf price and giving the consumer a shelf mounted
scanner to scan the UPC on the item, displaying the correct price from a database
downloaded from the store host. This system just makes the problem worse, from
the point of view of the consumer, since this means no prices are displayed at all,
neither on the shelf nor on the item, and the customer must scan every item on the
shelf to get price comparisons. The confusion on a busy shopping night can be
easily imagined.

Tashiro, et.al., U.S. Patent No. 5,065,002, provides a portable unit having
a bar code reader and printer, which reads bar codes and then prints them. No
particular application is disclosed, nor are any characteristics or uses of the bar
codes scanned. There is no processing of the data read, no database of prices and
no price lookup. Bar codes are scanned by a hand-held scanner wand, stored in the
wand, and dumped to the printer for duplication.

SUMMARY OF THE INVENTION

Under the teachings of the invention, each shelf label will be printed with
the UPC or other barcoded identification for the product, extended with a price-
related additional code group giving the price, or an obsolescence indicia
indicative of the age or version of the price, for the item. A portable verification
unit having a scanner is used to scan the label, including the price or obsolescence
indicia. The identification is used to look up the correct price, or the obsolescence
indicia indicative of the latest price update, in the store database which is the same
as that used by the store's checkout scanners (or a full or partial copy of the
database in the portable unit), and the two prices or indicia are compared. In the
case of an error (or a mismatch in obsolescence indicia which would indicate that
the price on the label is not the latest), a new label bearing the correct price and
the latest obsolescence indicia may be printed immediately. Also, the UPC or
other barcode on the product itself may be scanned and compared to the shelf
price label. Another embodiment of the invention provides for a portable totalizer
with which a shopper can total purchases as they are selected, enabling the shopper
to check the scanner at the checkout register.

BRIEF DESCRIPTION OF THE DRAWING

Fig. 1 shows the apparatus of the invention in use, scanning a shelf label.

Fig. 2 shows a detail of a shelf label adapted for use with the method of the
invention.

Fig. 3 shows a block diagram of the apparatus of the invention.

Fig. 4 shows a flowchart of the method of the invention.

Fig. 5 shows a detail of the top of the apparatus of the invention.

Fig. 6 shows a flowchart of a method of verification of shelf pricing by an
inspector.
Fig. 7 shows a side view of a hand-held totalizer.

Fig. 8 shows a block diagram of the totalizer shown in Fig. 7.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Overview of the Invention

Figure 1 shows the preferred embodiment of the invention as it might be used in a store.

Two products are shown in the figure, bottles of soda (24) and milk cartons (28), on a representative shelf (27). In front of the products are shelf labels: (19a) for the soda, and (19b) for the milk. Each label gives the price (20) of the item, in large numbers for the consumer to read. Each label also has a bar code (18a)(18b), which will be discussed in greater detail below. Each item has the standard UPC barcode - (17a) on the soda (24), and (17b) on the milk (28). It will be noted that the shelf label (19b) for the milk (28) does not match the product, in that the label (19b) recites "½ Gallon Milk" and the actual container is "1 Gallon".

The invention is implemented using a portable verification unit (10), which incorporates the various elements necessary to practice the invention. The verification unit may be mounted on or placed in a roll-around cart or shopping cart, or the entire unit could be made small enough to hang over the shoulder of the unit operator on a strap.

The verification unit (10) has a top panel (16) shown in detail on Fig. 5. The panel (16) has a readout device (55) or indicator which would preferably be of the alphanumeric LCD type which is commonly available from many sources, and requires low power drain and simple, standardized interfacing. However, other display devices such as LED's, gas or plasma discharge, or incandescent, could be used within the teachings of the invention. Since the number of messages to be conveyed would be limited, the readout could be replaced with a number of LED's or indicator lights next to appropriate labels ("Price OK", "Item Mismatch", "Price Error", "Item Not Found", etc.), if desired.

A number of switches, in the form of pushbuttons, will preferably be mounted on the top panel. Shown are buttons for "Load Database" (56), "Print"
(57), and "Done" (58), as well as ON/OFF switches (or a single rocker or toggle switch) for system power (54). The use of these switches will become evident later. Switches of many kinds are available, and the choice of type will be obvious to one skilled in the art.

The verification unit will have a printer (11) with paper supply, to allow replacement shelf price labels to be printed if an error is detected. The printer will preferably be built into the verification unit, but it will be understood by one skilled in the art that the printer might be in a separate box and attached to the verification unit by any convenient means such as cables, IR remote, etc. Many kinds of small, low-power printers are available, including thermal, inkjet or inked-ribbon, any of which can be used within the teachings of the invention. The printer must be capable of printing shelf labels or paper slips, including the printing of a bar code which can be read by a scanner. This would not pose a problem with most dot-matrix type printers known today. The printers designed for portable calculators or label makers would be usable within the teachings of the invention. The exact choice of printer for a specific application would be determined by factors of price, power requirements, and the type of label to be printed, all of which would be within the capability of any person skilled in the art.

The verification unit is equipped with two connectors (12) and (13). Connector (12) is for communications with the store’s computer, to download the UPC/price database into the verification unit’s internal storage. This connector would preferably be one of the industry-standard connectors, such as the 25-pin DB-25, nine-pin DB-9, or one of the five- or nine-pin DIN connectors.

The second connector (13) is for the scanning device, here shown as a wand (15), connected to the main verification unit by a cord (14). In an alternate embodiment, the cord (14) could be replaced by a remote means such as IR or RF, which would allow a larger and heavier verification unit to be mounted on a roll-around cart, with full freedom to the employee doing the sensing, so long as he remained in range of the cart. The scanning device is shown as a wand, which is available from many sources, however one of the scanning guns available on the market could be used instead. The wand is easier to use in this application, as it can simply be run down the shelf in contact with the shelf edge and scanning each label as it passes. The gun would require the employee to aim accurately and
"shoot" each label. In some applications, the gun might be preferable, and the exact form of the scanning device can vary within the teachings of the invention.

The wand (15) or gun is preferably provided with a switch (16) or trigger to signal the verification unit that scanning of a label has begun, and thus to start the laser beam for scanning. This switch may be omitted, if desired. The trade-off between use of this switch (16) and continuous scanning would be obvious to one skilled in the art, including such factors as power drain, laser life, dangers from visible laser beams, etc.

Figure 2 shows a shelf label (19) modified for use with the invention. The label will include pricing information (20) for the customer to read, possibly including a unit price as shown. It will also include a product description (21), so the customer can determine what product the price label refers to. An extended UPC for the product is printed on the label. The standard UPC, identifying the product as described above (22), is followed by an additional code group (23). In the embodiment taught in the parent case to this application, this barcode gives the price of the item. Preferably, this additional price barcode follows the same format as the price portion of the standard UPC price code used for priced items such as meat or the like, which eliminates the need to define an additional code and uses standard UPC coding and decoding methods. This disclosure teaches that this added code group can be in the form of an obsolescence indicia - that is, an indication of when the price was last updated, perhaps in the form of a date or date/time code, or as a simple "release number" which is changed when the price is changed. The intention of the obsolescence indicia is the same as that of the price code in the parent case - to allow the detection of a change in price from the label on the shelf.

It should be noted that the exact coding shown in the drawing and described herein is given for example only, and that any scanner-readable coding which gives both the item identification and an indicia of price or price obsolescence will work within the teachings of the invention. The "UPC" bars in Figures 1 and 2 of the drawing do not actually relate to the products shown, nor do they form a valid UPC barcode, but are provided for drawing purposes only.

Internal Details of the Apparatus
Referring now to Figure 3, the block diagram of the portable verification unit itself is enclosed in dotted lines (30). Not shown is the power supply for the verification unit, which will preferably comprise a rechargeable battery pack of sufficient voltage and amp/hour rating to power the verification unit for several hours. Gelled-electrolyte lead-acid ("Gel Cell") or Nickel-Cadmium (NiCd) batteries would be preferable for this application. The choice of specific power supply will depend on the electronics chosen for the various components in a manner familiar to one skilled in the art.

The verification unit is seen to comprise a CPU (33), which can be any of the many (preferably low power) general-purpose VLSI microprocessor "chips" available, such as the 80C386 or the like. These devices are currently widely used in portable "laptop" computers, and the same advantages which make them well adapted for that application are also important here.

The basic microprogram for the verification unit can be "burned" into Read Only Memory (ROM) in the chip itself, or external ROM (68) can be provided as shown. The ROM (68) contains the programming necessary to allow the CPU to perform the functions required. If desired, the ROM need contain no more code than that necessary to instruct the verification unit to download additional code into the Random Access Memory (RAM) (37) from the store's computer, when the price and identification data is loaded into the disk (35).

The RAM (37) contains the short-term storage needed for the operation of the verification unit, and possibly elements of the CPU programming which are not ROM-resident. Any RAM which will interface with the CPU chosen is usable, and the specific chips chosen will vary based on the processor, the state of the art at the time, power drain, required memory capacity, etc. At the present time, 1 Megabyte CMOS low-drain memory would be the most likely choice.

The "disk" (35) is used to contain the price and product identification information downloaded from the store's main computer. Although called a "disk" in this specification, it will be understood by one skilled in the art that the exact form of this mass storage medium will vary within the teachings of the invention as the technology of portable mass storage evolves. At present, large capacity rotating magnetic disks (on the order of hundreds of megabytes) are relatively inexpensive and easily available. In the future, this may be replaced by solid state
memory, optical disks, bubble memory, or some other technology yet to be developed. If desired, large chains might distribute the price database on Compact Disk Read-Only Memory (CDROM), which could either be physically used in the verification unit, or downloaded onto a conventional magnetic or other "disk" in the verification unit.

The information stored in the disk will contain, at a minimum, the UPC key and price for every item to be verified. In addition, if the shelf label additional code group comprises an obsolescence indicia instead of the actual price, the information on the disk will also have, for each item, an obsolescence indicia indicative of the latest price change. This obsolescence indicia could be the date or date and time the price was last changed, or a number which is changed each time the price is changed.

Preferably, the database will also contain such information as a description of the item, quantity of sale (14-ounce box, ½ gallon bottle, 50-count package, etc.), and standard unit for unit pricing ("each", "ounce", "10-count", etc.), so that all of the information necessary to produce the price label will be immediately available in mass storage. Preferably the data will be stored in some compressed format to save on disk space and transfer/access time.

If the "disk" storage is limited, it will be understood that the database need not contain all of the UPC information for the entire store. By planning how the store is to be checked, the database could be downloaded in sections (i.e., all canned goods, all cereals, dairy/produce, etc.) and the price checking would then be done by section of the store. As a practical matter, this would have little or no effect upon the operation of the system, since stores tend to be arranged in related aisles, and it is most likely that an entire section would be scanned at a time, before moving on to unrelated merchandise. If the store's computer contains such information, the data could specifically be downloaded by aisle or group of aisles.

It is not necessary for the data base to reside in the verification unit, though this is preferred. If desired, the "disk" in the verification unit can be eliminated, and the "I/O" link (34) in Fig. 3 between the verification unit (30) and the store computer (60) would become a remote link, using whatever radio (RF) or infrared (IR) technology is current at the time. For example, the "wireless LAN modem" technology could be used to establish the link, or a duplex simultaneous
transmission/reception path on one or more frequencies could be used with conventional 4-wire modems. The operation of the invention would not change, except that the "download database" step (42) of Fig. 4 would not be needed, and the lookup would actually be performed in the store's computer database via the remote link.

The display (36), switches (64), (65) and (66), wand (38), cord (67), and printer (32) were discussed above.

The three switches shown would be used to initiate a database download (56), control the printer (57) and signal that the scanning process is completed (58). Since these switches will merely provide contact-closure signals to the CPU, the exact functions of the switches will be under software control. For example, the "print" switch could be programmed to cycle through a series of print modes, signaled by appropriate messages on the display (i.e., "No Print", "Print Always", "Print on Price Error"). The CPU could be programmed to print a summary on detecting a press of the "done" key, etc. Other uses for the switches will be evident to one skilled in the art.

The wand (38) or other scanning means will have a light source (62), preferably an IR laser diode for the wand application (a gun would use a higher-power visible laser) which illuminates the bar code (39), and a photodetector (63) to detect the reflected light and thus "read" the code.

Preferably, the verification unit will include an audible alarm (69). This could be simply a speaker driven from a port on the CPU, as is used in the common PC speaker system, or it could be a piezoelectric alarm or "Sonalert" module which are commonly available.

The store computer (60) would most likely be the same computer as now exists to drive the checkout scanners. It maintains the database (61) of information on the products. The I/O interface (34) adapts the verification unit to the store computer in any way convenient to the designer and the computer system. Preferably, this will be an industry-standard serial RS-232 or RS-422 interface running at the maximum available baud rate, or a standard bi-directional Centronics parallel interface might provide a higher data rate. The volume of information to be loaded into the verification unit will dictate that the highest
possible data transfer rate, perhaps including some compression, be used to minimize the transfer time. If desired, while the data is being downloaded, the internal batteries can be charging.

The preferred embodiment of the invention has been described herein in the form of a specialized apparatus, specially built for the application. However, it will be understood that one skilled in the art could adapt a conventional general-purpose portable computer, such as one of the many "laptop" or "notebook" PCs on the market today, to practice the invention.

Operation of the Invention

Figure 4 shows a flowchart of the basic operation of the method of the invention. This flowchart is intended to illustrate the basic operation of the invention. Additional variations in the flowchart will be evident to one skilled in the art, and some will be discussed below.

If the system is designed for the correct store price database to reside in the portable verification unit, the operation starts (41) with the download of the database from the store computer (42). This will probably be initiated by plugging the verification unit into the store computer (60), running an appropriate program on the store computer, and pressing the "Load DB" button (56) on the verification unit. When step (42) is complete, the verification unit can display an appropriate message such as "DOWNLOAD COMPLETE" on the display (36).

If a remote data link to the store computer used to control the checkout scanners replaces the internally stored database, then the "download database" step (42) would be replaced by "establish remote link", with the rest of the method proceeding as described below.

The basic scanning routine of the invention is enclosed in dotted lines (43). The operations before and after this routine are shown in summary fashion only, as the exact details of database loading, etc, will vary by the hardware and software being used by the store, within the ability of one skilled in the art.

The basic scanning routine of the invention is enclosed in dotted lines (43). The operations before and after this routine are shown in summary fashion only,
as the exact details of database loading, etc., will vary by the hardware and software being used by the store, within the ability of one skilled in the art.

The scan routine (43) is started when the employee takes the verification unit out into the store to begin scanning. The employee scans a shelf-price label (44) pressing the trigger switch (16) on the wand (15) or gun. This causes the scanning means to read the label, and the UPC (22) and price-related additional code group (23) from the label are decoded by the CPU and loaded into the RAM (37). The CPU then uses the UPC as a key to look up (retrieve) an item record (45) in the database on the disk (35). If the item record is not found (46), the CPU will cause the display to show an appropriate message ("ITEM NOT FOUND") and preferably to emit an audible warning. The routine then falls through to the point where the item label is scanned (71). Alternatively, if the decision is made that label items which cannot be found need not be verified for match with the actual item, the routine could ignore the item scan part and instead check for the "done" switch (52).

If the item record was found (46), the CPU then (48) compares the price-related additional code group scanned from the label (23) to the price-related additional code group from the item record retrieved from the database stored on disk (35). If the comparison of price-related additional code groups indicates that the price is correct (or, if the obsolescence indicia method is used, if the obsolescence indicia in the database and on the label match), the CPU displays a message to that effect (49) ("PRICE OK"), optionally gives an audible indication, and falls through to the item scan (71), as described above.

If the comparison was not successful (48), the CPU displays (50) an appropriate message ("PRICE ERROR") with optional audible warning, and prints (51) a new label, using the information from the database for the description, units, etc. The printer can be set up to produce the entire label "from scratch", using blank labels or paper. If desired, the printer could also be loaded with pre-printed forms bearing the store's logo, possibly with color accents or advertising material, which would also have the added advantage of making it difficult to forge the price labels.

The employee can then replace the erroneous shelf price label with the newly printed one, and move on to the next label.
In one embodiment of the method of the invention, the next step is for the employee to use the wand (15) to scan the UPC on the item (71) which is, in theory, related to the label. When the UPC is scanned, the identification is compared (72) with the identification which was previously scanned from the shelf label. If the comparison is passed (i.e. the ID's match) the CPU generates some appropriate message (74) such as "Item OK", possibly with an associated audio tone, and the routine proceeds to check the "done" switch (52).

If, as is shown for the milk (28) in the example of Figure 1, the shelf label identification does not match the actual product UPC, then the CPU displays an appropriate error message (73) ("Item Mismatch"), with an optional audio alarm. The employee is thus prompted to check the relative placement of the product and/or label and move one or the other so that they correspond. The routine then proceeds to check the "done" switch (52).

If it is not desired to check the product placement, then the routine would simply fall through to checking the "done" switch (52) after the label check.

If the "done" indication (52) is true (i.e. the "done" button was pushed) the routine can simply end, return to the "start" condition ("READY FOR DOWNLOAD"), or print a summary listing of scans and errors (70), or some combination of these.

As discussed above, several print modes could be programmed into the verification unit within the teachings of the invention. The modifications to the flowchart of figure 4 for the various modes discussed are simple. The basic flowchart of Fig. 4 shows the "Print on Price Error" mode of operation. To implement the "Print Always" mode, check after the "Price OK" display (49) for the "Print Always" indicator. If true, go to block (51) (Print new label). To implement a "No Print" mode, check for a "no print" indication. If true, then block (51) is bypassed.

If the system designer desires, the order of the individual steps in the method could be varied within the teachings of the invention. For example, the scan item step (71) could be done right after or before the scan label step (44). The comparison of the identifications could then be done before the price lookup. This would double-check that the product placement is correct before checking for
the accuracy of the price on the label. In fact, the CPU could be programmed to recognize the difference between the two (the item UPC does not have the price code), and the two scans could be done in either order. The comparison to the price database would then be held pending the completion of both scans. Other variations are possible.

**Additional Embodiment: Consumer Price Scanner and Totalizer**

The encoding of the item price into the shelf label allows for a shopper to carry a calculator-like device which can scan the shelf pricing to store and total the shopper's purchases, as an individual check of the checkout scanner. Figure 7 shows such a device, and Figure 8 shows a block diagram of the internal details. Identical reference numbers in the two figures refer to identical features.

This embodiment of the invention is similar to one embodiment of the shopping cart scanner in the present inventor's co-pending application, no. 07/747,727, filed August 20, 1991, which application formed a part of PCT application PCT/US92/06992, filed August 20, 1992, published as PCT publication WO 93/04449 on March 4, 1993, which publication is incorporated by reference. Unlike the scanner in that application, and unlike the Watson patent cited above, the present invention eliminates the need for an internal database of items and prices, and allows for a simple, calculator-like device which could be easily used by the consumer. The simplicity of the device will lend itself to inexpensive construction, and thus each consumer could purchase one for his or her own use. This would eliminate the concerns about theft and security which were a factor in the more complicated and expensive devices which stored the database of prices internally. Because there is no database, there is no need to worry about updating the data in the database, which itself eliminates an obstacle to the use of the earlier devices.

The totalizer (130) will preferably be built into a small, hand carryable case similar to a pocket calculator. Although described herein as a single-purpose unit, if desired the totalizer could be combined with a calculator, to give the consumer even more capability in the unit.

The front surface of the totalizer (130) will have a display (142) for the customer to view. The display could be of the common LCD or LED sorts used in pocket calculators, or possibly of an incandescent or gas discharge type.
Preferably, this display will have separate zones for an item count (139), item price (140) and running total (141), as shown in figure 7. The use of these zones will be explained in more detail below.

The totalizer will have built-in or associated with it a device capable of reading the barcodes (154) on the shelf labels. As shown, the totalizer will preferably have a built-in barcode reader (131), which would comprise a light source (152) such as an IR laser diode, and a light detector (153). This will allow the entire device to be self-contained, and will allow the shopper to scan a shelf label by simply passing the corner of the totalizer over the bar code while pressing the "scan" button (131). In the alternative, a simple wand-type barcode reader could be used within the teachings of the invention, such as that described earlier in the shelf-price verifier embodiment of the invention and in the present inventor's copending application cited above, connected to the totalizer by wire or IR.

A number of other buttons would be needed on the totalizer. The exact choice and arrangement of controls would be an obvious design choice by one skilled in the art, depending on the functions desired and the programming developed. If the totalizer is combined with a calculator, then more buttons would be required than if it is just to scan shelf prices and display and total them. The buttons shown in figures 7 and 8 are those which would be included on the preferred embodiment of the totalizer. The operations of the "add" (137), "-" (138), "C/CE" (135), "Total" (134) and up/down (133) buttons will become clear in the explanation below.

Internally, the operation of the totalizer will be controlled by a CPU (154), which can be any of the preferably low-drain VLSI microcomputers available. The programming for the totalizer will reside in Read Only Memory (ROM) (151), which might be incorporated into the same chip as the CPU, or could be a separate chip of any appropriate type. The totalizer will also require a quantity of Random Access Memory (RAM) (150) for storing the scanned information, totals and program variables. This can be any size and type of RAM available, so long as it has enough capacity to store the price and UPC for a reasonable quantity of items (several hundred would suffice), and whatever program elements are required. An ordinary designer skilled in the art would have no trouble determining the memory
required from these constraints, the power available, the type of CPU chosen, and other factors.

Not shown is the power source for the totalizer, which could be batteries or solar cells or a combination of the two.

In operation, the shopper will begin by clearing the unit memory by pressing the C/CE key (135). Preferably, a key press of a second or longer would be required in order to reset the totalizer, to minimize the chances of clearing the memory in error.

Then, as the shopper finds an item of interest, he or she will press the scan button (138) and swipe the scan element (131) over the appropriate shelf label. The light source (152) will illuminate the barcode (154), and the reflected light will be detected by photodetector (153). The CPU (154) will translate the scanned barcode into its UPC and price components, and store the information into a temporary storage location in the RAM (150).

The CPU will then display "01" in the "number of items" ("#") zone (139) on the display, and will display the item price in the price zone (140). If the customer wishes to buy more than one of the item, then he or she can increment the item count and price by repeatedly pressing the "+" (137) (or decrement the item count and price with the "-" key (136)).

When the customer decides he or she wants to buy the item, then pressing the "total" key (134) will add the items to the list stored in RAM, and will add the item total (140) to the running total (141).

If the customer changes his or her mind, the CE key (135) will clear the item off the list, and will subtract it from the total, if it has been totalled already.

Once the customer is done shopping, he or she can then use the total displayed on the totalizer to check the total generated by the checkout scanner at the register. If the scanner total does not agree with the totalizer, the up/down arrow key (133) can be used to review the various items on the list in the RAM to compare them with the register tape.
As an additional feature, the totalizer can be programmed to automatically look up an item in the list in RAM and display the item shelf price when a UPC is scanned which does not have the extended price. With this feature, the shelf price of each item can be verified at the checkout register by simply running the totalizer scanner over the UPC on the product itself.

The totalizer can also be adapted to download the list of items and prices in the list in RAM to the checkout register for automatic comparison in accordance with the teachings in the present inventor's co-pending application, cited above. Since the barcode reader (131) in the totalizer has a light source (152), which is preferably an IR laser diode or LED, this same light source could be pulsed or modulated to become a data transmitter, as disclosed in the Tashiro patent cited above. This download could be triggered by an added key, or by a combination of the keys shown in the drawing (perhaps "Scan" and "Total"), or by a specific input on the light receiving element(153). Under this last system, the totalizer would be inserted into a communications slot in the register, and a specific IR signal would be emitted by an IR LED in the slot. This would signal the CPU to begin the download of the list, using the IR light element (152) as a transmitter.

Use of the Invention in the Enforcement Process

Another user group for the invention will be the state or county inspectors charged with enforcing a scanner accuracy law. Of course, the inspector could simply download the store's UPC database and proceed exactly like a store employee, as explained above. That would, however, leave the process open to manipulation by a dishonest store, who could arrange to download a database with the (incorrect) shelf prices instead of the scanner prices. An independent check would be preferable. There are several ways this could be done.

The inspector arrives at the store unannounced. Since the UPC is, after all, Universal and not store-dependent, he can have a stack of 3x5 cards ready, each bearing a randomly selected UPC for a product. These cards are run through a checkout scanner at the store, as if the items themselves had been presented for purchase. The register produces a tape giving the scanned price for all of these items.

At this point, the inspector notes the prices on the cards, or works from the register tape to enter the prices and UPC's into a computer to form a database
which resembles the one in the store's computer. This is downloaded into a
verification unit. The inspector then uses the verification unit to scan the shelf
labels, either looking specifically for the items scanned the previous day, or
simply for representative aisles in the store. The verification unit will do the shelf
scan and lookup as described above. This does allow the store time to change the
shelf labels, if they were so inclined and if the there is too long a time delay
between the checkout register scan and data entry into the verification unit and the
shelf scan to check the prices.

Alternatively, with appropriate modifications to the software in the portable
verification unit, the above procedure can be reversed and the entire inspection
done on one visit (see Figure 6 for a flowchart of this procedure).

In this method, the inspector would print a quantity of 3x5 cards (125/126)
before he arrives at the store. Bringing the cards and the verification unit to the
store, he would then (101) build a database of "correct" prices in the unit by
scanning a number of shelf price labels (102)-(104) (either randomly chosen, or
looking for the items preselected on the 3x5 cards). The 3x5 cards are scanned on
the checkout register scanner and a register tape is produced (105)-(108), and the
cards, register tape and verification unit with its database created from the shelf
labels can then be taken back to the office. Preferably, the computer at the office
which printed the cards will be programmed to display the UPC's from the cards
(110), for an operator to enter the prices (111) from the register tape. The
computer will then print new cards (112) with the extended UPC (item ID and
price), simulating shelf labels of the form of the invention. Then (114)-(122), by
scanning the "shelf labels" printed in the inspector's office (115), the verification
unit will automatically flag all cases where the register differed from the database
created by scanning the real shelf labels in the store (119) & (121). If a card had
not been scanned into the database, the inspector is instructed to proceed to the
next card (117)-(118). Finally, a report on the process (123) can be printed.

Of course, not every store sells every item, so it is possible that some of
the pre-printed test items will not be in the store database. By the same token,
unless the inspector takes the time to find each item represented in the pre-printed
list, not every item on the list (card) will be scanned. However, if the previously
scanned items were sufficiently numerous and truly random, any aisle should have
a large enough number to make up a reasonable sample for enforcement purposes.
Statistical analysis can be done to determine the minimum number of test items and scanned items to form a sufficiently accurate test for enforcement purposes.

By setting the print mode to "no print", the inspector can just get an indication of errors and a summary printout, or he can set to "print on price error" and specifically print out corrected labels to use as evidence, along with the erroneous shelf labels. Or, he can set the printer to "print always" to get a permanent record of the items checked, good and bad.

This method has been described above in terms of the portable verification unit hardware. It will be understood that the totalizer unit may also be used in the enforcement method. The inspector could use the totalizer to store the UPC numbers and prices for selected items, then use the 3x5 cards with bar codes as described above to generate a register tape at the checkout scanner for comparison purposes. The inspector will then manually compare the items and prices from the totalizer with the items and prices on the register tape by recalling the list in the totalizer one item at a time using the up/down control, or by scanning the cards with the totalizer for lookup.

To make the checking and enforcement process easier, the store's checkout registers could easily be programmed to print the UPC number on the register tape, in addition to or replacing the verbal item description.
I claim:

1. A method of shelf price verification for a store of the type utilizing checkout scanners and shelf pricing, comprising the steps of:

   a) placing shelf price labels for each of a plurality of items in the store, each label having at least an item identification printed in barcoded form, a price presented in human-readable form, and a price-related additional code group in machine-readable form;

   b) scanning the shelf label, reading at least the item identification and price-related additional code group;

   c) looking up an item record from a store checkout scanner price database using the item identification, the item record containing at least the price for the item which would be used by the store checkout scanner and a price-related additional code group representative of the last update of the price;

   d) comparing the price-related additional code group from the scanned label to the price-related additional code group from the store checkout scanner price database;

   e) if the price-related additional code group from the scanned label is not equal to the price-related additional code group from the store checkout scanner price database, presenting an indication of a price error to an operator.

2. The method of claim 1, further comprising, in step "e" thereof, printing a new shelf price label containing at least the item identification printed in barcoded form, and the correct price from the store price database presented in human-readable form and the price-related additional code group from the store price database in machine-readable form.

3. The method of claim 1 in which the item identification in barcoded form printed on the shelf price label is the UPC barcode for the item.
4. The method of claim 3 in which the UPC barcode for the item is extended to also barcode a price-related additional code group for the item.

5. The method of claim 1 in which the price-related additional code group is the actual price of the item.

6. The method of claim 1 in which the price-related additional code group is an obsolescence indicia indicative of the age of the price.

7. The method of claim 1 in which the obsolescence indicia is a time code indicating the time when the price is changed.

8. The method of claim 1 in which the obsolescence indicia is a number which is incremented when the price is changed.

9. The method of claim 1, further comprising the steps of:

   f) scanning the item, reading at least the item identification;

   g) comparing the item identification from the scanned label and the item identification from the scanned item; and

   h) if the item identification from the scanned label and the item identification from the scanned item do not match, presenting an indication of an item mismatch to the operator.

10. The method of claim 9, in which steps b) and f) are executed one after the other in either order, and further comprising the step, after completion of both scans, such that the scan of step b) is defined as the scan in which the price code is detected in the scanned data.

11. A portable shelf price verification unit, for use in a system wherein a plurality of items in a store are identified with shelf price labels, each label having at least an item identification printed in barcoded form, and a price presented in human-readable form, and a price-related additional code group in machine-readable form, comprising:
a) scanner means for reading at least the item identification and price-related additional code group from the barcode on the shelf price label;

b) memory means for storing at least the scanned item identification and the scanned price-related additional code group from the barcode on the shelf price label;

c) database means for storing a plurality of item records, each item record representing an item and containing at least the price for the item which would be used by the store checkout scanner and a price-related additional code group representative of the last update of the price;

d) indicator means for communicating with the operator of the verification unit,

e) processor means for controlling the scanner means, memory means, indicator means and database means, such that when the scanner means has scanned a shelf price label, the processor means loads the item identification into the memory means, looks up the item identification in the memory means in the database means, retrieves the associated item record for the item identified by the item identification, and compares the scanned price-related additional code group and the price-related additional code group from the item record, and, if the scanned price-related additional code group and item record price-related additional code group are not equal, provides a price error indication to the operator of the verification unit using the indicator means.

12. The method of claim 11 in which the price-related additional code group is the actual price of the item.

13. The method of claim 11 in which the price-related additional code group is an obsolescence indicia indicative of the age of the price.
14. The method of claim 13 in which the obsolescence indicia is a time code indicating the time when the price is changed.

15. The method of claim 13 in which the obsolescence indicia is a number which is incremented when the price is changed.

16. The verification unit of claim 11, in which each of the plurality of items has at least an item identification printed in barcoded form, and the processor means for controlling the scanner means further operates such that when the scanner means has scanned both the shelf price label and an item identification from an item, the processor means loads the item identification from the item into the memory means, compares it to the item identification from the shelf price label, and, if the item identification from the shelf price label and the item identification from the item do not match, provides an item mismatch indication to the operator of the verification unit using the indicator means.

17. The verification unit of claim 16 in which the item identification in barcoded form printed on the item is the UPC barcode for the item.

18. The verification unit of claim 11, further comprising a printer, capable of printing the barcode and human-readable information on a shelf price label, operatively connected to the processor means such that when the shelf price and item record prices are not equal the processor means commands the printer to print a new shelf price label having at least the item identification printed in barcoded form, and the item record price presented in both barcoded and human-readable form.

19. The verification unit of claim 11 in which the item identification in barcoded form printed on the shelf price label is the UPC barcode for the item.

20. The verification unit of claim 11 in which the UPC barcode for the item is extended to also include a barcode for the price of the item.

21. The verification unit of claim 11 in which the database means is a mass storage device located in the portable verification unit.
22. The verification unit of claim 21 in which the portable verification unit further comprises input/output means for communicating with a store computer, whereby the database of item records can be downloaded from the store computer to the database means of the portable verification unit.

23. The verification unit of claim 11 in which the store has a store computer controlling a plurality of checkout registers for scanning purchases by consumers, the database means is the database associated with the store computer which controls the checkout registers, and the portable verification unit further comprises a remote data link between the portable verification unit and the store computer.

24. The verification unit of claim 11 in which the indicator means also indicates when the shelf price and item record price are equal.

25. The verification unit of claim 11 in which the indicator means also indicates when the item identification from the shelf price label and the item identification from the item match.

26. A method of inspection to verify the accuracy of shelf pricing in a store by an inspector, in a store in which the shelf prices for each of a plurality of items in the store have been printed on shelf price labels, each label having at least an item identification and price printed in barcoded form, and in which the checkout registers are provided with scanners adapted to read the item identification codes printed on the items, comprising the steps of:

a) printing the item identification barcodes for a plurality of items;

b) scanning the item identification barcodes of step (a) on the scanner of a checkout register, creating a register tape giving the prices of each item;

c) for each of a plurality of items chosen by the inspector, scanning the shelf label, reading at least the item identification and shelf price, building an item record using the item identification number as a key, the item record containing the item identification and the scanned shelf price for the item;
d) comparing the shelf price from the scanned labels to the checkout
scanner prices from the register tape;

e) if the shelf price from the scanned label is not equal to the price
from the register tape, presenting an indication of a price error to
the inspector.

27. A portable totalizer for use with shelf price labels having an extended
scannable code containing at least an item identification and a shelf price
which is identical to a human-readable shelf price on the label, comprising:

a) scanner means for reading a scannable code, comprising light-
emitting means for illuminating a code and light-receiving means
for detecting reflected light such that the light-emitting means
illuminates the code the reflected light is detected by the light-
receiving means;

b) memory means for storing data;

c) display means for displaying numeric data;

d) programmable processor unit means operatively connected to the
scanner means, memory means and display means, such that the
barcode read by the scanner means is interpreted by the processor
unit means, the item number and price are extracted from the
interpreted data and are stored in a list in the memory means, and at
least a running total of items and prices is calculated by the
processor means and stored in the memory means and displayed on
the display means.

28. The portable totalizer of claim 27 further comprising pushbutton means for
indicating the quantity of an item to be purchased, operatively connected to
the processor means, such that the quantity of each item is stored in the
memory means and the quantity and price are used to calculate and display
the total.
29. The portable totalizer of claim 28 in which the pushbutton means comprises a calculator type keypad such that the quantity of an item can be directly entered.

30. The portable totalizer of claim 28 in which the pushbutton means comprises a pair of switches to increase and decrease the quantity of an item.

31. The portable totalizer of claim 27 in which the display means also displays an item price and quantity in addition to the total.

32. The portable totalizer of claim 27 further comprising means for selecting and displaying the items in the list in memory and displaying at least the item quantity and price in the display means.

33. The portable totalizer of claim 32 in which the means for selecting an item on the list in memory comprises scanning the code for the item without the extended code for price.

34. The portable totalizer of claim 27 further comprising means for transferring the list in memory to an external device.

35. The portable totalizer of claim 34 in which the means for transferring the list in memory is modulation of the light-emitting means of the scanner means.
Fig. 4

3/5

Start 41

Get DB 42

Scanning Routine 43

Scan Label 44

Lookup 45

Error Msg N 47

Found ? Y

Price OK Y 49

Price OK? Y 48

Price Error N 50

New Label 51

Scan Item 71

ID Match ? Y 72

Item OK 74

Item Mismatch N 73

Done ? N 52

Sum 70

End 53
INTERNATIONAL SEARCH REPORT
PCT/US94/14753

A. CLASSIFICATION OF SUBJECT MATTER
IPC(5) : G06K 7/10
US CL : 235/383
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)

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 practicable, search terms used)
APS
search terms: extended bar code shelf price

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<tr>
<td>A</td>
<td>US, A, 5,311,000 (Brooks) 10 May 1994, entire document</td>
<td>1-35</td>
</tr>
<tr>
<td>A</td>
<td>US, A, 5,250,789 (Johnsen) 05 October 1993, entire document</td>
<td>1-35</td>
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Further documents are listed in the continuation of Box C. ❌  See patent family annex.

Date of the actual completion of the international search
16 MARCH 1995

Date of mailing of the international search report
03 APR 1995

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<tr>
<td>A</td>
<td>US, A, 5,227,617 (Christopher et al.) 13 July 1993, entire document</td>
<td>1-35</td>
</tr>
<tr>
<td>Y</td>
<td>US, A, 5,111,196 (Hunt) 05 May 1992, entire document</td>
<td>1-35</td>
</tr>
<tr>
<td>A</td>
<td>US, A, 4,857,716 (Gombrich et al.) 15 August 1989, figures 2 and 3</td>
<td>1-25</td>
</tr>
<tr>
<td>A</td>
<td>US, A, 4,720,785 (Shapiro) 19 January 1988, entire document</td>
<td>1-35</td>
</tr>
<tr>
<td>Y</td>
<td>US, A, 4,500,880 (Gomersall et al.) 19 February 1985, entire document</td>
<td>1-35</td>
</tr>
<tr>
<td>A</td>
<td>US, A, 4,373,133 (Clyne et al.) 08 February 1983, entire document</td>
<td>26-35</td>
</tr>
<tr>
<td>Y</td>
<td>EP, A, 0,199,252 (Sato) 29 October 1986, entire document</td>
<td>1-35</td>
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