

[54] **AUTOMATIC CHECKOUT AND INVENTORY CONTROL**

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Related U.S. Application Data

[63] Continuation of Ser. No. 832,629, June 12, 1969, abandoned.

[52] U.S. Cl. **235/61.6 R**, 40/2 G, 235/61 M, 235/61 PS, 235/91 L

[51] Int. Cl. **G06k 7/00**, G06m 7/02, G09f 3/02

[58] Field of Search 235/61.6, 61.12, 235/61.9, 91.13, 61.11, 61 M, 61 PS, 91 L; 271/26; 250/223; 186/1; 40/2 R, 2 A, 2 G, 27.5; 214/310

[56] **References Cited**

UNITED STATES PATENTS

3,059,112 10/1962 Rogal 235/61.6 R UX

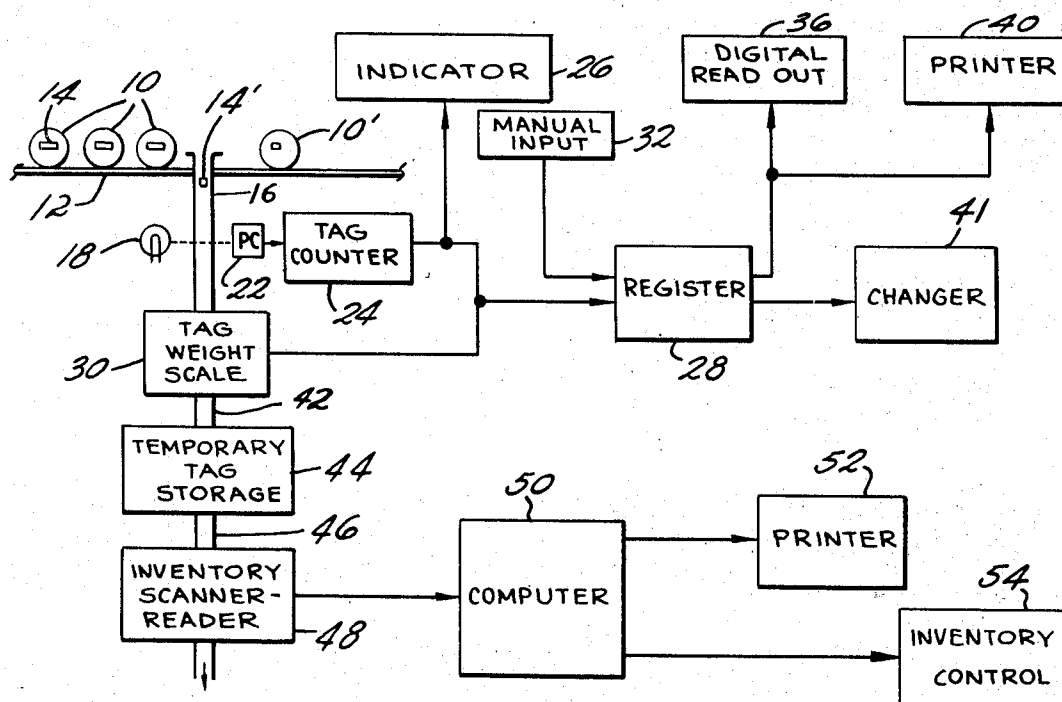
2,746,679 5/1956 Stratton et al. 235/61.6 R
2,774,060 12/1956 Thompson 235/61.12 C X
3,246,126 4/1966 Schlieben et al. 235/61.11 E
2,919,851 1/1960 Otis 235/61.9 UX

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[57] **ABSTRACT**

Individual tags attached to shelf merchandise in a self-service supermarket have a detachable portion whose weight represents the price of the merchandise to which the tag is attached. The detachable tag portion also contains an inventory control number. At a checkout station, the detachable tag portions are removed from all merchandise selected by a customer and the detached tag portions are counted and weighed. The collective weight of the tags is used to give a real time indication of the total price of the customer's purchases. Subsequent to checkout, the detached tag portions are scanned individually to identify merchandise sold through the checkout station. This information is thereafter processed and used for inventory control.

48 Claims, 9 Drawing Figures



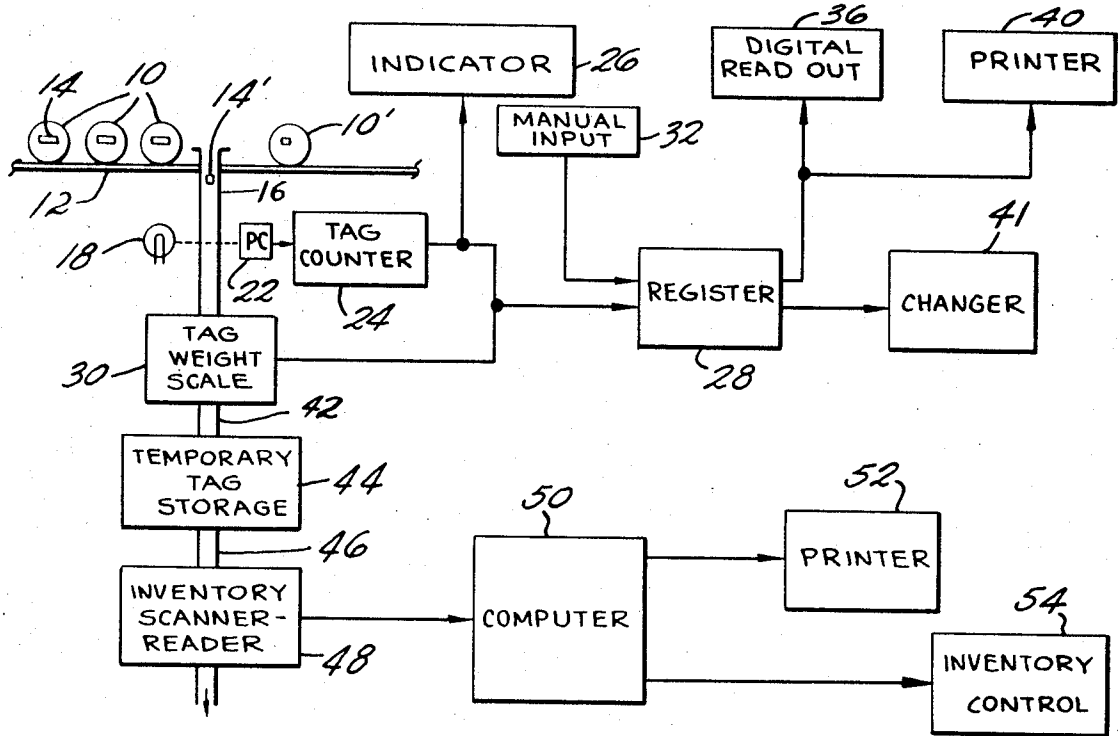


FIG. 1

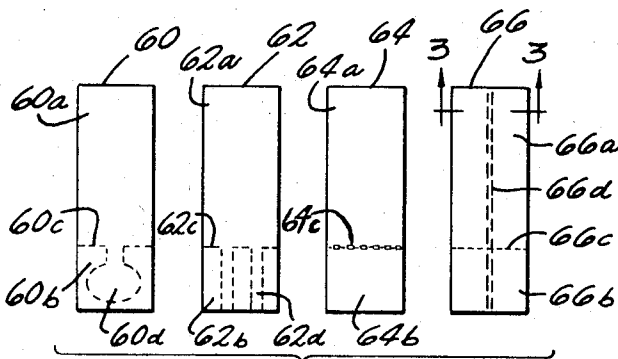


FIG. 2

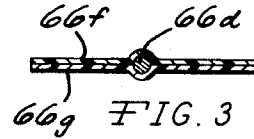


FIG. 3

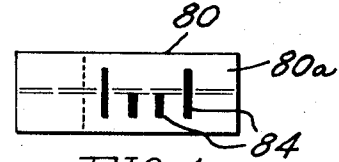


FIG. 4a

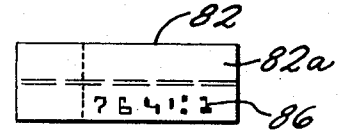


FIG. 4b

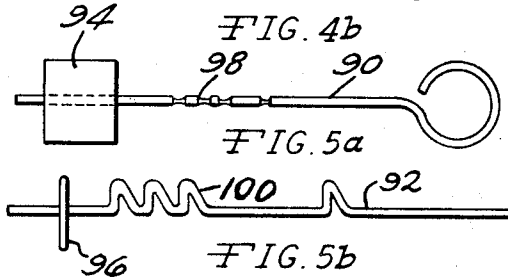


FIG. 5a

FIG. 5b

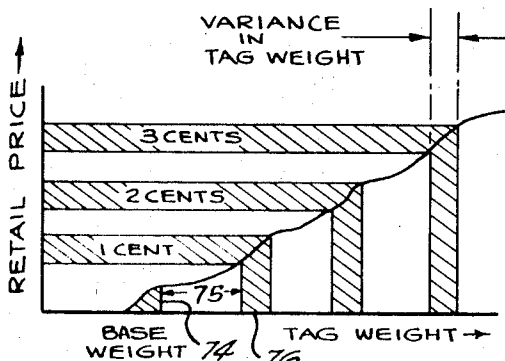


FIG. 6

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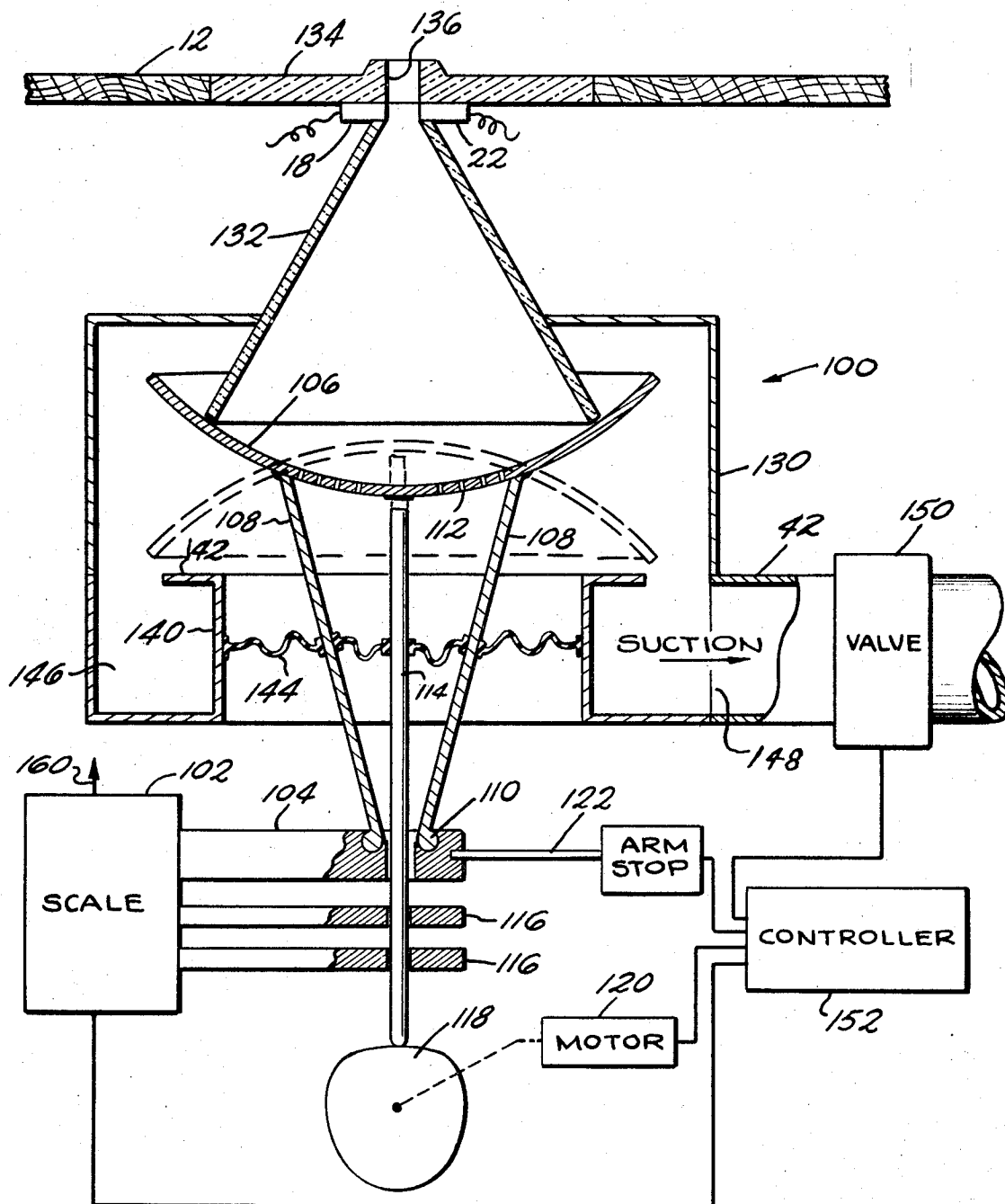
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FIG. 7



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AUTOMATIC CHECKOUT AND INVENTORY CONTROL

This application is a continuation of my prior co-pending application Ser. No. 832,629, filed June 12, 1969 and entitled "Automatic Checkout And Inventory Control" (now abandoned).

In self-service merchandising, for example, in department stores and food markets, the usual procedure is for a customer to select merchandise marked with the price, either upon a separate label or stamped directly on the goods. The checkout cashier looks for the label or the price imprinted on the goods and then enters each individual price into a cash register to obtain a total selling price. A significant problem with high-volume merchandising of goods such as food is the bottle neck at the checkout station. Rapid and smooth flow of customers through checkout is not realized because of the time required for the cashier to locate the price and manually enter the price into the cash register. Conventional checkout using a cashier also introduces human error, for example, errors in reading prices and in entering prices into the register. A very significant cost factor is also incurred by the conventional checkout cashier when salary, overtime and fringe benefits are taken into consideration. Slow checkout also gives rise to indirect losses; for example, prospective customers may not shop at crowded stores with slow checkout.

Although existing data processing technology is capable of computerized automatic inventory control, prior attempts to commercialize such systems have emphasized the value of inventory control as contrasted to satisfying the need to improved checkout. Data processing has received limited commercial acceptance with certain types of merchandising where the benefit for inventory control purposes justifies the cost, even though checkout is not improved and, in some applications, checkout is even impaired. However, data processing checkout and inventory control systems have not received commercial acceptance for high-volume food merchandising even though the inventory control problem with respect to food is a major concern.

One type of data processing system that has been suggested for checkout and inventory control uses indicia or perforations on a label which is scanned by special equipment to derive pricing and inventory control data. The scanning equipment is, in general, expensive, cumbersome and not suited to high-volume merchandising. For example, one typical automatic inventory control system that has been suggested uses an optical scanner. The present state of the optical scanner art is such that such systems have not been adopted commercially for high-volume merchandising because they are expensive, they lack the accuracy and reliability required and they fail to accomplish any real speed-up in checkout due to the time required to sort and handle individual labels during scanning.

Other types of checkout and inventory control systems using processed data have also been suggested where the customer is not permitted to freely inspect and select the specific goods to be purchased. It is desirable in almost all automatic checkout systems that the customer should be free to inspect and accept or reject any item for purchase. The customer should actively participate in the selection of his purchases and in the checkout process without losing visual contact of his purchases.

Objects of the present invention include providing improved automatic checkout and/or inventory control that is particularly suited to high-volume merchandising; that overcomes the aforementioned disadvantages of prior systems; and that achieves fast, accurate, reliable and effective checkout and/or inventory control at low cost and without depriving a customer of freedom of individual selection.

Further objects of the present invention are to provide automated checkout that is simple to operate and minimizes the transfer of pricing data into a register by a cashier but yet allows for manual price transfer into the register when required.

A further and equally important object of this invention is to provide automated automatic checkout that minimizes manpower requirements and losses due to cashier error and to avoidance of shopping by customers by comparison to present commercial checkouts and/or that provides an inventory control capability to thereby further effect a substantial saving to high-volume merchandising.

In accordance with one embodiment of the present invention, a small tag is affixed to each item in the store. The tag is coded with an inventory control number, and the weight of the tag is related to the price of its associated item. The customer selects items from shelf stock and takes them to the checkout counter in a cart or the like. The items are removed from the customer's cart by a semi-skilled checkout cashier and/or the customer, detagged, and the tags are dropped through a slot in the checkout counter top past a counting device and onto a scale. The total price of the items purchased is determined by the collective weight of the tags. The tags are then collected for subsequent processing to identify the inventory control numbers for inventory control purposes.

Other objects, features and advantages of the present invention will become apparent in connection with the following description, the appended claims and the accompanying drawings in which:

FIG. 1 is a block diagram of an automated checkout and inventory control system of the present invention;

FIG. 2 illustrates four different types of tags having detachable portions whose weight represents the price of goods;

FIG. 3 is a transverse cross section taken on line 3—3 of one of the tags of FIG. 2;

FIGS. 4a and 4b illustrate two techniques for printing inventory control numbers on a tag;

FIGS. 5a and 5b illustrate further embodiments of tags formed from wire strips;

FIG. 6 is a plot illustrating a principle of incremental tag weight variation applicable to the present invention; and

FIG. 7 is a fragmentary view of a checkout counter incorporating a scale and a pneumatic tag transfer mechanism according to one embodiment of the present invention.

Referring more particularly to FIG. 1, a plurality of items 10 selected by a customer are placed on a checkout counter 12. Each of the items 10 has affixed thereon a small tag 14 having a detachable portion 14' which is removed during checkout and inserted in a chute 16. The tag portions 14' are conveyed by chute 16 past a photocell counter which includes a light source 18, a photocell pickup 22 and a counter 24. Counter 24 receives an input pulse from photocell 22

in response to each removed tag portion 14' passing down chute 16. The output of counter 24 is fed, respectively, to a visual indicator 26 and a totalizing register 28. Indicator 26 is a light which flashes on in response to the passage of a tag portion 14' to verify that the tag has been counted.

Chute 16 empties into a tag weight scale 30 that accumulates all of the tags removed from the items 10 purchased by the customer. Scale 30 provides an output signal to register 28 representing the total weight of the accumulated tag portions 14' for a complete purchase by the customer of the items 10. Register 28 is also connected to a manual input 32, such as a keyboard or the like, under the control of the checkout cashier. Data that can be transferred into register 28 via the manual input 32 includes instructions to register 28 to totalize the amount of the purchases; prices of goods without tags, if any; sales tax; and the amount given the cashier by the customer for which change must be given.

Register 28 calculates the total price of the merchandise or goods 10 purchased by the customer as a function of the two inputs received from the tag counter 24 and the tag weight scale 30, i.e., the total number and the collective weight of tag portions 14' accumulated in scale 30. In response to the data from manual input 32, tag counter 24 and scale 30, register 28 calculates the total price of the purchase, including sales tax, and the change required, and feeds this information, together with the number of items purchased, to a digital readout 36 and a printer 40. The readout 36 provides a visual display of the information received from register 28 and printer 40 provides a printed receipt for the customer and a printed record for the store. Register 28 also actuates a changer 41 which delivers change to the customer. The checkout apparatus and procedure described generally hereinabove is simple, accurate and reliable and operates rapidly without skilled operators. The total purchase price will, in general, be determined automatically by the information from either scale 30 alone or scale 30 together with the count from counter 24, as will later be explained in greater detail. Rapid checkout is achieved because the tag portions 14' are not examined individually, as by scanning; and hence elaborate sorting and handling of individual tags is not required during checkout.

After a sale is completed, the tags 14' accumulated in scale 30 are transferred via a conduit 42 to a temporary tag storage unit 44. Tags are removed from the temporary storage 44 periodically via a conduit 46 and transferred to an inventory scanner-reader 48 for processing of inventory control numbers. After processing in the scanner-reader 48, the used tag portions 14' are collected for destruction or other disposition. Scanner-reader 48 reads the inventory control number upon each of the tag portions 14' and supplies that information to a central inventory control computer 50. Computer 50 performs functions conventionally associated with inventory control as, for example, providing a printed tabulation of inventory changes via the printer 52 and/or periodically initiating orders for a store as illustrated by the inventory control function 54.

The present invention contemplates using conventional equipment for the scanner-reader 48, computer 50, printer 52 and inventory control 54. However, a significant feature of the present invention is that the tag portions 14' are not scanned and read on a real time

basis during checkout; and hence tag portions 14' can be scanned and read for inventory purposes by commercially available scanning and reading equipment. For example, although the input for scanner-reader 48 has been described as directly from temporary storage 44, the scanner-reader 48 could be centrally located to service several stores. The tag portions 14' from one store can be transported periodically, for example, once a day, to the location of the scanner-reader 48 for processing. This avoids duplication of expensive scanner-reader equipment at each checkout station or at each individual store. Whether a scanner-reader 48 is provided at each checkout station, at each store for a plurality of checkout stations, or at a central location for a plurality of stores, the scanner-reader can process tag portions 14' at a rate determined by the capabilities of the scanner-reader independent of the rate of the checkout operation, per se.

FIG. 2 shows four of the different possible types of planar tags 60, 62, 64, 66, any one of which could be used in a set of tags 14 for a given merchandising application. Each of the tags 60, 62, 64, 66 generally comprises a body portion designated by the letter "a" and a tab portion designated by the letter "b." The body portions 60a, 62a, 64a, 66a are detachable from their respective tab portions 60b, 62b, 64b, 66b along lines of separation designated by the letter "c." Each of the body portions 60a, 62a, 64a, 66a has a weight corresponding to a given price for an item to which the tag is to be attached. A set of tags will have body portions incrementally graduated in weight to accommodate retail price variations within the merchandising price variations for a given merchandising application. The tabs 60b, 62b, 64b, 66b are adhered to the merchandise as by adhesive. For articles to which the tabs will not adhere, the tabs can be stapled, wired or otherwise affixed to the articles. Tag 66 also includes a length of wire 66d laminated between top and bottom layers 66f, 66g (FIG. 3). With tag 66, the weight of the body portion 66a includes the weight of the wire 66d. When the body portion 66a is removed from the tab portion 66b along the separation line 66c, wire 66d is retained in the body portion and the lower end of the wire as viewed in FIG. 2 pulls out or tears through the tab portion 66b.

For a given merchandising application, the tag configuration will be selected to provide the best compromise between at least the following factors: (a) production cost and control; (b) cost and design of a suitable tagging device for applying the tags to the article; (c) minimizing fraud by deterring customers from removing body portions from one tag and inserting them into tab portions of tags on higher priced items; (d) minimizing accidental separation of the body portion from the tab portion; and (e) facilitating removal of the body portion from the tab with accurate repeatability, i.e., minimum weight variation between detached body portions representing a given price. For example, with tag 60, the interface formed by the separation line 60c between the body portion 60a and the tab 60b, forms a key 60d on the body portion 60a. This configuration minimizes accidental separation and undetectable interchange of body portions by the customer. The size of the key 60d can be varied for different price ranges to provide a weight variation for that price range. Different sized keys 60d for different price ranges also further deters removal and reinsertion of a body portion

60a from one price range tag to another price range tag.

With the tag 62, the line of separation 62c forms legs 62d. This configuration also minimizes accidental separation of the body portion 62a from the tab portion 62b and the size or number of the legs 62d can be varied from price range to price range to minimize exchange of body portions from one price range tag to another price range tag and provide a weight variation between tags in different price ranges. Tag 64 has the simplest interface configuration along the line of separation 64c and hence is most susceptible to accidental separation. On the other hand, this configuration provides for easy separation without variation in the weight of the body portions as they are removed from the tab portions. The wire 66d in tag 66 minimizes accidental separation and provides a convenient mechanism for varying the weight of tags representing different prices. Wires 66d of different diameters provide a convenient means to provide different weight ranges for different price ranges.

The tags 60, 62, 64, 66 can be made of paper or plastic and, for example, have dimensions on the order of 2 inches long, 1/2 inch wide and one-thirty-second of an inch thick with each tag weighing about 1/2 gram. The tags can be manufactured to substantially the form shown in FIG. 2 in complete sets to accommodate the required price variations. The tags would then be applied to the articles by a suitable tagging device which would simultaneously mark a visible price on the item and/or the tag and also code the tag with an inventory number. Alternatively, for example, the tags can be partly formed during production by forming rolls of strip material having uniform thickness, width and weight-per-unit length. The tagging device would then form the individual tags 60, 62, 64, 66 (form the separation lines c and cut the tag so that the body portions a have the desired weight for given prices), code the tag with an inventory number, mark the price on the tag or the item, and affix the tag to the item.

In order to accommodate retail price variations over a total price range for a given merchandising operation, the weight of the body portions 60a, 62a, 64a, 66a should be incrementally graduated from a non-zero base weight 74 as illustrated in FIG. 6. Tag weight increments can be obtained by varying the configuration as described hereinabove or by varying the length, width, thickness and/or density of the material of which the tags are made. In the preferred embodiment, the length is varied while the width and thickness are held constant to facilitate sorting and handling in the scanner-reader 48. A typical merchandising operation might, for example, require on the order of 500 to 2,000 steps to obtain the required number of incremental graduations in weight corresponding to pricing variations of the merchandise being handled by the system. An allowable variance 76 in tag weight at each price step should be taken into consideration to compensate for weight variations due to manufacturing tolerances, scale accuracy and variations in detaching the body portions a from the tab portions b.

The allowable weight variation 76 and the optimum separation 75 between adjacent price steps will be selected depending upon the accuracy of the scale 30, the accuracy in producing the tags 14 and the expected weight variation occurring when the body portions are detached from the tab portions b. Although theoretic-

cally it would appear that the separation 75 between weight (price) steps should be at least as great as the maximum permitted variance 76 at each price step multiplied by the total number of allowable purchases, in any given merchandising application, the variance 76 can be substantially less depending on the sales frequency of each price step. Ideally, the variance in the base weight 74 should be significantly smaller than the incremental weight or separation 75 associated with a price step. On the other hand, the total variance (the sum of the variances 76) that one could expect in an allowable set of purchases would statistically not be significant. Cumulative pricing errors arising from the variance of the base weight and from the variance of the incremental weight at each price step should be dependent upon the distribution of tag weights within the allowable variance and could thus be minimized at the tag production level. At most, the expected total variance would not exceed a predetermined price step, for example, 1 cent; and this amount could be deducted from the total purchase price. The present invention also contemplates a complete tag that is removed from the article and whose weight identifies price. This would avoid weight variation incident to detaching the body portions a from the tab portions b with the tags of FIG. 2.

FIGS. 4a and 4b show two tags 80, 82 illustrating different techniques for providing inventory control numbers on the tags. On tag 80, the inventory control number is printed in binary form by the bar markings 84. The lower half of the bars 84 provide clock information whereas the presence or absence of the upper half of the bar represents a one or a zero, respectively. On the tag 82, the inventory control number 86 is imprinted with stylized numerals compatible with available optical scanning equipment. It will be understood that the form of the inventory control number is not an essential feature of the present invention. It is significant, however, that for checkout purposes the tags 80, 82 have body portions 80a, 82a, respectively, whose weight represents the price of the item to which the tags are attached; and the same tags 80, 82 provide an effective media for inventory control numbers associated with the items being merchandised through the checkout system. Although inventory control via the tags 14 is preferred, the improvements in checkout alone provided by the present invention would justify adoption of the system without inventory control for many merchandising operations.

FIGS. 5a and 5b illustrate embodiments of the present invention wherein the tags 14 are in the form of wire tags 90, 92. Wire tags such as the tags 90, 92 are cut from spools of wire having a constant weight-per-unit length, i.e., uniform density and diameter. Incremental weight variations representing different prices are thus obtained by varying the length of the wire tag. As with the embodiment of the tag 66 in FIG. 2, weight variations between price ranges can be obtained by varying the diameter of the wire. The wire tags are fixed to the articles 10 via an adhesive tab 94 or a staple tab 96. The free end of the wire tag may be rolled into a loop to facilitate removal from the item as illustrated by the tag 90; or the loop can be omitted as illustrated by the tag 92. Inventory control numbers, where desired, can be provided on the wire tags by techniques that do not remove material and hence do not vary the weight of the tag as, for example, rolled or struck

notches 98 illustrated on the tag 90 or toothed deformations 100 illustrated on the tag 92. The sequence (presence or absence) of notches 98 or teeth 100 provides a binary number that could be read by either a contacting or a non-contacting scanner. The adhesive tab 94 or the staple tab 96 allows the entire length of wire to be pulled out from underneath or tear through the tab during checkout.

Although semi-rigid wire tags such as the tags 90, 92 have been described and offer a media capable of being coded with inventory control numbers, the present invention also contemplates tags of other materials formed in incremental lengths and hence incremental weights to cover a price range as, for example, a tag made of string, nylon line or plastic-coated wire.

FIG. 7 shows in greater detail an exemplary arrangement of the scale 30, the counting arrangement including photocell 22 and a pneumatic tag handling system 100 for transferring tags from the checkout counter 12 through the scale 30 and to the temporary tag storage 44. The tag weight scale 30 (FIG. 1) generally includes the scale mechanism, per se, 102, a scale beam 104 and a pan 106. Pan 106 is a dish-shaped disc opening upwardly and is made of flexible spring sheet metal. The pan is supported on the outer free end of the scale beam 104 by upright arms 108 mounted on beam 104 at 110. The bottom of pan 106 is apertured at 112. Scale 30 also generally includes a plunger rod 114 vertically slideable in guides 116 and actuated by a cam 118 driven by a motor 120. When rod 114 is raised by cam 118, pan 106 flexes from a concave state (full lines) to a convex state (dashed lines) to dump the tags from the pan. Pan 106 has its upper surface highly polished to facilitate removal of the tags. When rod 114 is lowered, pan 106 returns to its concave state due to the spring action of the pan. Beam 104 is provided with a stop arm mechanism 122 which normally restrains motion of the beam 104 until the arm 122 is withdrawn from the end of the beam. Pan 106 is enclosed in a housing 130.

Chute 16 (FIG. 1) is in the form of an inverted cone 132 that extends from counter 12 through the top of housing 100 and has its lower open end communicating with pan 106. In the preferred embodiment, the chute 132 is made of transparent material such as plastic, and counter 12 has a transparent insert 134 containing a slot 136 that communicates with the upper end of the chute 132. The transparent insert 134 and chute 132 enable a cashier to visually monitor the scale pan 106 and the transfer of portions 14' into and out of the pan. As illustrated in FIG. 7, the lamp 18 and the photocell 22 may be mounted directly on the bottom face of the insert 134 to count the tags as they pass through the slot 136.

Arms 108 and rod 114 project upwardly through a cylindrical wall 140 in the bottom of housing 130. The opening formed by wall 140 is closed by a resilient flexible diaphragm 144 provided with suitable collars permitting arms 108 and rod 114 to pass freely therethrough. The top of wall 140 has a horizontal annular flange 142 that terminates just inward of the lateral edges of pan 106 when it is flexed to its convex position. Flange 142 forms an annular collecting duct 146 in the bottom of housing 130 that communicates with an outlet 148 to the duct 42. The duct 42 is preferably under suction created by a suction fan (not shown) downstream of an air control valve 150. Valve 150,

arm stop 122, motor 120 and scale 102 are all actuated in the desired sequence by a controller 152.

In the operation of the apparatus described in connection with FIG. 7, all of the tag portions 14' inserted in the slot 136 from the items 10 in one order are collected in the scale pan 106. Upon instructions from the cashier via the manual input 32 (FIG. 1), controller 152 disengages arm stop 122. Scale 102 weighs the tags in the scale pan 106; and, upon command from controller 152, scale 102 feeds this information to register 28 via the lead 160. After the signal indicating the weight of the tags in pan 106 is transferred to register 28, controller 152 engages arm stop 122 in the scale beam 104 and actuates motor 120. Motor 120 rotates cam 118 to raise and lower rod 114, dumping the tags in pan 106 into the collecting duct 146. During this dumping operation, the valve 150 is opened so that the suction in duct 42 collects the tags in duct 146 and transfers them to the temporary tag storage 44. Preferably, cam 118 undergoes several revolutions to assure that all of the tags have been removed from the scale pan 106. Depending upon the construction of the tags being used, it may be desirable to open valve 150 slightly while tags are being inserted in slot 136. This provides a very weak air flow through the slot 136 and apertures 112 in the bottom of pan 106 to assure that tags entering slot 136 come to rest in pan 106. Valve 150 is then closed while measurements are taken by scale 102. The apparatus of FIG. 7 minimizes the possibility that tags will hang up on the scale mechanism.

The apparatus described in connection with FIG. 7 is particularly suited to handling planar tags made of paper or plastic such as the tags 60, 62, 64, 66. However, with nonplanar tags such as the wire tags 90, 92, a substantially simpler scale and pan arrangement could be used. For example, the wire tags could be made of magnetic material and the tags can be removed by an electromagnet.

Based on the tag count data from counter 24 and the total tag weight data from tag scale 30, the calculations by register 28 in the exemplary system described in connection with FIG. 1 will be readily apparent. Assuming that the tag base weight 74 (FIG. 6) is other than zero and equal for all tags used in the system, the predetermined base weight of the tag portions 14' is programmed in register 28; and register 28 multiplies the predetermined base weight 74 times the number of tags counted by counter 24. For the system being described where increases in price are indicated by a corresponding increase in weight (FIG. 6), the resulting multiplication product is then subtracted from the total tag weight data received from scale 30 and the result is a direct indication of the price of the items purchased. By way of example, for a tag base weight of $\frac{1}{2}$ gram and weight increments of 20 micrograms for each 1 cent of price, for a purchase of a 1-cent item together with a 2-cent item, the total tag weight would be 1 gram plus 60 micrograms. Hence by subtracting twice the base weight or 1 gram, the result is 60 micrograms or 3 cents.

For the above example, it will be apparent that scale 30 must be accurate over a relatively wide weight range. This disadvantage can be easily overcome by utilizing a scale corresponding to scale 30 which also receives the tag count from counter 24 and adjusts the scale range according to the number of tags being weighed. For example, with the above base weight of

$\frac{1}{2}$ gram, and assuming two purchases, i.e., a total tag base weight of 1 gram, the range of scale 30 would be compensated with a factor of 1 gram (a two-tag count) so that the scale, in effect, measures only the weight increments indicating price, namely, 60 micrograms. In this embodiment, the scale would give a direct indication of the total price of the purchase, that is, 3 cents. Preferably, the scale range would be changed as each tag portion 14' is counted by the counter 24.

Although the apparatus in FIG. 1 has been described for purposes of illustration as utilizing a separate counter 24, the present invention also contemplates a scale that will change scale ranges according to the weight of the tag portions 14' on the scale. This operation can be achieved by assuring that the tag base weight is greater than the total incremental weight associated with any allowable set of purchases. For the example described hereinabove, assuming that the maximum allowable number of price steps is two, i.e., 1 cent and 2 cents, and that the maximum allowable number of purchases is also 2, then the total incremental weight associated with the maximum allowable purchase would be 80 micrograms. Based on these assumptions, if the scale weight was on the order of $\frac{1}{2}$ gram, the scale would know that only one tag was present and could set its own scale range to determine whether the tag weighed 20 micrograms (1 cent) or 40 micrograms (2 cents). Similarly, if the total weight was on the order of 1 gram, the scale would know that two tags were present and it would readjust its scale range accordingly to find out what combination of tags were present, i.e., 40, 60 or 80 micrograms. In this embodiment, the tag counter corresponding to the counter 24 of FIG. 1 would not be required and the modified scale would also provide a count of the number of tags corresponding to the number of items purchased.

The present invention also contemplates automatic checkout using tags wherein a decrease in tag weight corresponds to an increase in price. This embodiment is very similar to that disclosed in connection with FIGS. 1 and 6 except that the base weight corresponding to base weight 74 (FIG. 6) is chosen to correspond to the maximum purchase price to be encountered in the merchandising operation. Also the register corresponding to register 28 is programmed with the base weight and modified so as to multiply the base weight by the tag count from counter 24 and then subtract from the resulting multiplication product the total tag weight from scale 30. Hence, for example, assuming a maximum purchase price of 3 cents and a base weight of $\frac{1}{2}$ gram, 1 cent would be indicated by a tag weighing $\frac{1}{2}$ gram less 20 micrograms; 2 cents would be $\frac{1}{2}$ gram less 40 micrograms; and 3 cents would be $\frac{1}{2}$ gram less 60 micrograms. For a purchase consisting of a 1-cent item and a 2-cent item, the register would yield a result of 60 micrograms which indicates a 3-cent total purchase. In this embodiment, where a decrease in base weight represents an increase in price, the present invention also contemplates direct price readout by a scale that automatically sets its scale range according to the number of tags on the scale to thereby weigh only the incremental tag weight as described hereinabove.

The checkout system described hereinabove in connection with FIG. 1 is such that customer participation could be utilized to even further reduce the operations performed by the checkout cashier. For example, the

customer could detach tags from articles as they are selected and place the tags in a receptacle that is handed to the cashier at checkout. Articles could then be bagged by the customer as they are selected. In the embodiment of FIG. 1, it is not essential that counter 12 be used since an unskilled bagger could remove articles from the customer's cart, remove the price tag and place the articles directly into a bag.

As will be apparent from the foregoing description, the terms "weight" and/or "gravitational weight" in connection with the price-by-tag-weight feature of the present invention are used in the physics sense; namely, that property of matter that is expressed in force units and is related to the mass of a body of matter, including, without limitation, the force of gravitational attraction which the earth exerts on a body, e.g., the tags.

It will be understood that automatic checkout and inventory control have been described hereinabove for purposes of illustration of the present invention, the scope of which is defined by the following claims.

I claim:

1. In the method of merchandising articles wherein a plurality of articles are selected from stock and transferred to a checkout station for totaling the total price of said selected articles by use of gravitational weighing means, the steps of forming a group of individual pricing media having incremental gravitational weight variations therebetween corresponding to respective price variations over a price range of said stock articles, associating with each stock article prior to article selection an individual pricing media having a predetermined gravitational weight representing a price of the corresponding article associated therewith and distinguishing that price from all other prices, disassociating said pricing media from articles after selection, and then simultaneously weighing with said weighing means said disassociated pricing media to obtain a collective gravitational weight thereof whereby said total price can be determined from said collective gravitational weight without identifying either the individual price of a selected article or the gravitational weight of an individual pricing media.

2. The combination of a first article of merchandise having a first predetermined price, first pricing means attached to said article, said first pricing means being separable from said first article itself and having a first gravitational weight that represents said first predetermined price and distinguishes said first predetermined price from all other prices, a second article of merchandise having a second predetermined price different from said first predetermined price and second pricing means attached to said second article, said second pricing means being separable from said second article itself and having a second gravitational weight that is different from said first gravitational weight and represents said second predetermined price and distinguishes said second predetermined price from all other prices whereby said first and second pricing means can be separated from said first and second articles and gravitationally weighed to indicate said prices.

3. The combination set forth in claim 2 wherein each pricing means comprises a tag of sheet material having a first portion attached to its respective article and a second portion detachable from said first portion, and wherein said second portion has a gravitational weight representing price.

4. The combination set forth in claim 2 wherein each pricing means comprises a length of filamentary material detachably fastened to its respective article.

5. The combination set forth in claim 4 wherein said filamentary material has a predetermined weight-per-unit length and the length of said filamentary material in each pricing means is such that its gravitational weight represents its respective price.

6. The combination set forth in claim 4 wherein said filamentary material is semi-rigid wire.

7. The combination set forth in claim 6 wherein each wire has a predetermined configuration identifying its respective article.

8. The combination set forth in claim 2 wherein each pricing means comprises a tag of sheet material and a piece of wire attached thereto.

9. The combination set forth in claim 2 wherein said first price is greater than said second price and said first gravitational weight is greater than said second gravitational weight.

10. The combination set forth in claim 2 wherein said first price is greater than said second price and wherein said first gravitational weight is less than said second gravitational weight.

11. In the method of merchandising articles wherein a plurality of articles are selected from stock and transferred to a checkout station for totaling the total price of said selected plurality of articles by using gravitational weighing means, the steps of providing a group of individual pricing media exclusive of the article itself, attachable thereto and separable therefrom, each of said pricing media having at least a portion thereof having a predetermined gravitational weight representing an individual article price, said group containing incremental individual pricing media portions having incremental gravitational weight variations therebetween over a price range corresponding to a price range of said stock articles, associating with each stock article prior to article selection an individual pricing media selected from said group and representing the price of the corresponding article associated therewith, disassociating from articles after selection at least said pricing portions of said pricing media, collecting said disassociated pricing media portions at said checkout station into an accumulation having a corresponding total gravitational weight representing the sum of the individual gravitational weights of said pricing portions associated with said selected articles, and then measuring said total weight of accumulated pricing media portions with said gravitational weighing means and without separately identifying either the individual price of a selected article or the individual gravitational weight of corresponding selected pricing media portions whereby said total price can be determined from said total weight.

12. The method set forth in claim 11 wherein said pricing media is provided by providing individual tags of sheet material and wherein the weight of said material in respective tags is varied incrementally according to corresponding incremental price variations.

13. The method set forth in claim 11 wherein said pricing media are provided by providing individual lengths of filamentary material.

14. The method set forth in claim 11 wherein said pricing media is provided by providing individual lengths of wire.

15. The method set forth in claim 14 implemented by automatic apparatus including scanning means and further comprising imparting to individual lengths of said wire respective different configurations identifying respective articles with which said lengths are to be associated, separating individual lengths of wire from said accumulation and scanning each wire to determine its configuration and thereby obtain an identification of the articles selected from stock.

16. The method set forth in claim 11 wherein said pricing media are provided by providing individual tags of sheet material reinforced with rigid filamentary material.

17. The method set forth in claim 11 wherein said pricing media are provided from material having a predetermined uniform weight-per-unit length and wherein said incremental weight variations are provided by incrementally varying the length of individual pricing media within said group according to corresponding incremental price variations.

18. The method set forth in claim 11 implemented by automatic apparatus including scanning means and wherein said method further comprises providing each pricing media portion with indicia identifying a respective article to which said pricing media portion is to be attached, separating individual pricing media portions from said accumulation, and scanning each individual pricing media portion with said scanning means to identify the indicia on each pricing media portion and thereby obtain an indication of the articles that have been selected from stock.

19. The method of merchandising articles selected from a stock of articles by using gravitational weighing means to obtain a total price of said selected articles comprising the steps of providing respective pricing means on individual associated stock articles with each pricing means being attached to its associated article and having at least a portion thereof removable from its associated article and whose gravitational weight represents a predetermined price of its associated article, selecting articles from said stock articles, removing individual pricing means portions from said selected articles and then with said gravitational weighing means collectively weighing the removed pricing means portions to determine a total gravitational weight of said removed pricing means portions to thereby obtain an indication of said total price.

20. The method set forth in claim 19 further comprising the step of imparting on each pricing means an inventory control number identifying that particular stock article to which said pricing means is attached.

21. The method set forth in claim 19 wherein each of said pricing means portions is referenced to a substantially identical predetermined gravitational base weight and incremental deviations in actual gravitational weight of said pricing means from said base weight are correlated to different prices, and wherein said indication of total price is obtained by determining a collective total of said incremental weight deviations.

22. The method set forth in claim 19 wherein said weighing means provides a first signal representing said total weight and said method is further implemented by automatic apparatus including counting means and computing means, and wherein said method further comprises counting with said counting means the total number of removed pricing means portions and generating a second signal representing said total number

and then processing said first and said second signals with said computing means to obtain said total price indication.

23. The method set forth in claim 19 wherein merchandising is implemented by automatic apparatus including counting means and automatic visual indicating means, and wherein said method further comprises counting with said counting means the total number of pricing means portions removed from said selected articles and then providing with said visual indicating means a visual indication of said total number to thereby verify that the number of pricing means portions being weighed equals the number of said selected articles.

24. The method set forth in claim 19 wherein merchandising is implemented by automatic apparatus including counting means and computing means, and wherein said method further comprises counting with said counting means the total number of pricing means portions removed from said selected articles and then obtaining said indication of said total price by said computing means as a function of said total number and said total weight.

25. The method set forth in claim 19 implemented by automatic apparatus including scanning means and further comprising providing indicia on each individual pricing means portion identifying the article to which each pricing means portion is attached and scanning with said scanning means each pricing means portion removed from said selected article to identify the indicia thereon and thereby obtain an identification of each article which has been selected from stock.

26. The method set forth in claim 19 wherein said pricing means are formed from material having a predetermined uniform weight-per-unit length and wherein pricing variations are obtained by varying the length of material attached to corresponding stock articles.

27. The method set forth in claim 26 implemented by automatic apparatus including scanning means and by pricing means comprising lengths of semi-rigid wire, and wherein said method further comprises imparting to each length of wire a predetermined configuration identifying that article to which that length of material is attached and scanning with said scanning means each length of wire after removal from said selected articles to identify the configuration of each individual length of wire and thereby identify that article which has been selected from stock.

28. The method set forth in claim 19 wherein said pricing means are provided on said stock articles by means of individual tags of material having at least a portion thereof whose gravitational weight represents the price of that article to which that tag is attached and pricing variations for stock articles having different prices are provided by incrementally varying the gravitational weight of said tag portions.

29. The method set forth in claim 19 wherein said pricing means are provided on articles having different prices by forming individual lengths of semi-rigid wire with incremental gravitational weight variations therebetween corresponding to incremental price variations.

30. The method set forth in claim 19 wherein said pricing means are provided on articles having different prices by forming individual tags of sheet material with incremental gravitational weight variations therebetween corresponding to incremental price variations.

31. The method set forth in claim 19 wherein said pricing means are provided on articles having different prices by forming individual lengths of filamentary material with incremental gravitational weight variations therebetween corresponding to incremental price variations.

32. The method set forth in claim 24 wherein said pricing means are provided on articles having different prices by forming pricing means portions that have equal predetermined base gravitational weights and respective incremental gravitational weight increases over said base weight corresponding to increases in price of corresponding articles to which pricing means portions are attached, and said method further comprises determining said total price with said computing means by multiplying said base weight times said total number and then subtracting the resulting multiplication product from said total weight of said removed pricing means portions.

33. The method set forth in claim 24 wherein said pricing means are provided on articles having different prices by forming pricing means portions that have equal predetermined base gravitational weights with respective decreases in actual gravitational weight of pricing means portions from said base weight corresponding to increases in price of corresponding articles to which the pricing means portions are attached, and wherein said method further comprises determining with said computing means said total price by multiplying said base weight times said total number and then subtracting said total weight of said removed pricing means portions from the resulting multiplication product.

34. The method set forth in claim 29 wherein said incremental weight variations are provided by forming said lengths of wire with length variations therebetween.

35. The method set forth in claim 30 wherein said incremental weight variations are provided by forming said tags with incremental length variations therebetween.

36. In the method of merchandising articles that are to be selected for purchase wherein a total price of selected articles is to be determined by measuring the gravitational weight of pricing means after separation from the articles themselves and wherein a first article has a first predetermined price and a second article has a second predetermined price, the steps of providing on said first article a first pricing means that is attached to and separable from said first article itself and has a first predetermined gravitational weight that represents said first predetermined price and distinguishes said first predetermined price from said second predetermined price and from all other prices, and providing on said second article a second pricing means that is attached to and separable from said second article itself and has a second predetermined gravitational weight that represents said second predetermined price and distinguishes said second predetermined price from said first predetermined price and from all other prices.

37. The method set forth in claim 36 wherein said first and said second pricing means are provided on said first and second articles by first forming said first and second pricing means and then attaching said first pricing means to said first article and said second pricing means to said second article.

38. The method set forth in claim 36 further comprising separating said first pricing means from said first article after said first article has been selected for purchase, separating said second pricing means from said second article after said second article has been selected for purchase, and then determining the sum of said first and second predetermined prices using gravitational weighing means by simultaneously weighing said first pricing means and said second pricing means with said gravitational weighing means.

39. In the method of merchandising articles wherein a plurality of articles are selected from stock and transferred to a checkout station for totaling the total price of said selected articles by use of gravitational weighing means and wherein each stock article has a respective pricing means associated therewith, attached thereto and separable from each article itself, and each pricing means has a predetermined gravitational weight representing a predetermined price of its associated article and distinguishing that predetermined price of its associated article from other prices, the steps of detaching said pricing means from each of said plurality of articles after selection thereof and then simultaneously weighing said detached pricing means with said gravitational weighing means to determine the total gravitational weight of said detached pricing means whereby said total price can be obtained from said total gravitational weight of said detached pricing means.

40. In the method of merchandising articles wherein a first article has a first predetermined price and a second article has a second predetermined price, the steps of providing on said first article a first pricing means that is attached to and separable from said first article itself and has a first predetermined gravitational weight that represents said first predetermined price and distinguishes said first price from other prices, providing on said second article a second pricing means that is attached to and separable from said second article itself and has a second predetermined gravitational weight that represents said second predetermined price and distinguishes said second price from other prices, separating said first pricing means from said first article after said article has been selected and then measuring said first predetermined gravitational weight of said first pricing means after separation from said first article to determine said first predetermined price.

41. Price totaling apparatus for use in selling articles wherein each article has a pricing tag attached thereto and separable from each said article itself and with each tag having a respective gravitational weight representing the selling price of the article to which the tag is attached and distinguishing that price from all other prices comprising a checkout station for processing said articles after selection by a customer, first transfer means at said station for receiving said tags after separation from said selected articles, gravitational weighing scale means at said station for providing a first signal representing a collective gravitational weight of a number of said separated tags greater than one, said gravitational weighing scale means having a tag inlet communicating with said first transfer means to receive said separated tags therefrom, second transfer means at said checkout station for transferring said tags away from said gravitational weighing scale means after said

separated tags have been weighed, and first automatic means operatively coupled to said gravitational weighing scale means and responsive to said first signal to provide an indication of a total selling price represented by said collective gravitational weight.

42. The apparatus set forth in claim 41 further comprising automatic counting means operatively associated with one of said transfer means to count said separated tags and provide a second signal representing said number, and wherein said first automatic means is responsive to both said first and said second signals to provide said indication of total price.

43. The apparatus set forth in claim 41 further comprising automatic scanning means operatively associated with one of said transfer means to identify indicia on each of said pricing means, said indicia identifying the article to which each pricing means was attached so that an identification of each article which has been selected is obtained from said scanning means.

44. The apparatus set forth in claim 41 wherein said first signal provided by said gravitational weighing scale means is a first electrical signal and said first automatic means comprises register means coupled to said gravitational weighing scale means and responsive to said first electrical signal to compute said total selling price.

45. The apparatus set forth in claim 44 wherein said first automatic means further comprises manual entry pricing means operatively coupled to said register means for modifying said total price in response to an instruction entered manually by an operator of said price totaling apparatus.

46. The apparatus set forth in claim 44 further comprising automatic counting means operatively associated with one of said transfer means to count said separated tags and provide a second electrical signal representing said number and wherein said first automatic means is responsive to both said first and second electrical signals to provide said indication of total price.

47. The apparatus set forth in claim 44 wherein said gravitational weighing scale means includes a scale pan enclosed in a housing, said first transfer means has an outlet communicating with the interior of said housing to deliver said separated tags to said pan, said housing having a portion thereof forming a collection chamber, means forming a tag outlet in said housing communicating with said collection chamber, said second transfer means communicating with said tag outlet, means for transferring tags from said pan to said chamber and means for creating a current of air moving through said chamber and exhausting therefrom through said outlet to thereby transfer tags away from said gravitational weighing scale means.

48. The apparatus set forth in claim 47 wherein said collection chamber is located in said housing below said pan, said pan is made of resiliently flexible material and has a normally concave transverse cross section so that said pan opens in an upward direction to receive tags from said first transfer means and wherein said means for transferring tags from said pan to said chamber comprises means for flexing said pan to cause said pan to assume a convex transverse cross section to thereby dump said tags into said collection chamber.

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