

[54] **APPARATUS FOR WEIGHT-CLASSIFYING ODD-SHAPED ARTICLES**

[72] Inventor: Victor Del Rosso, Ithaca, N.Y.

[73] Assignee: Hi-Speed Checkweigher Co., Inc., Ithaca, N.Y.

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[51] Int. Cl.....B07c 5/28

[58] Field of Search209/74, 73, 121; 177/52, 59, 177/56, 57, 163

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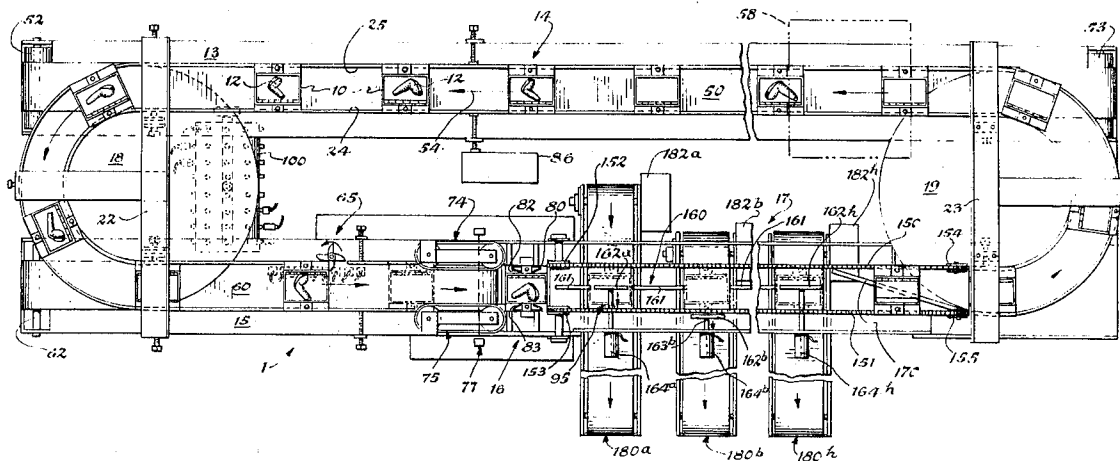
Primary Examiner—Allen N. Knowles

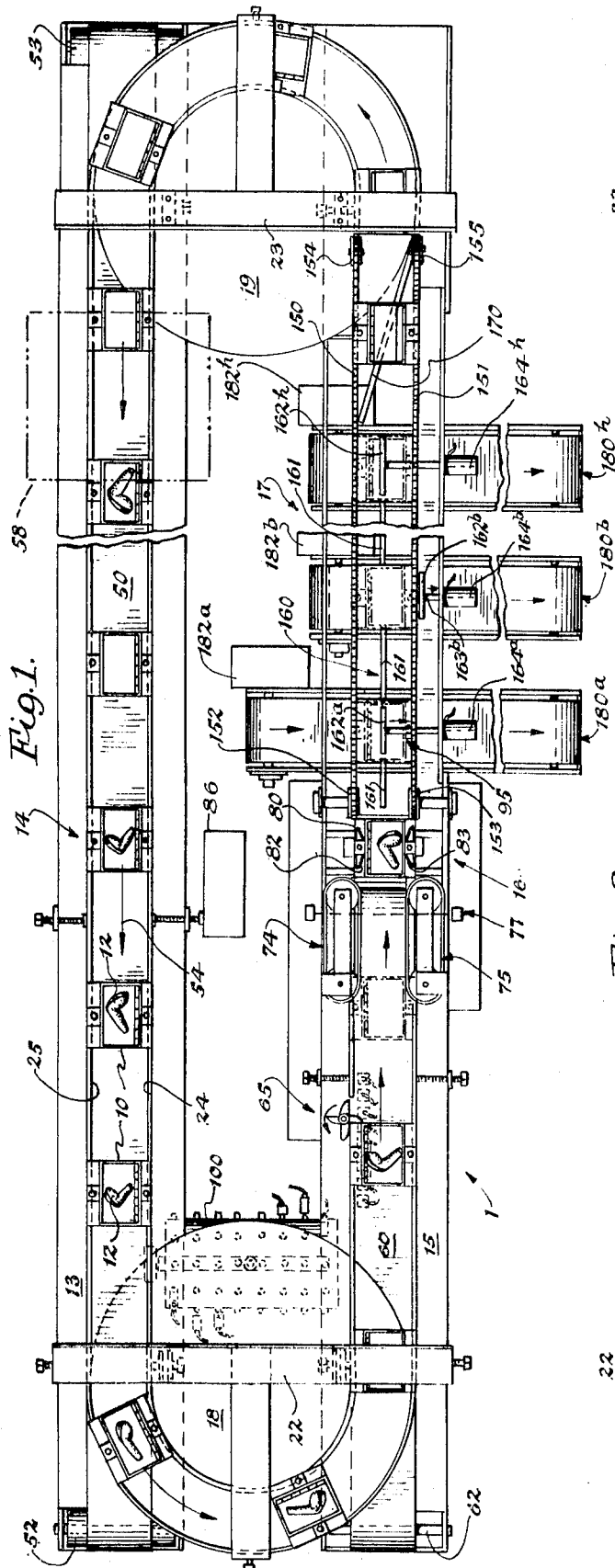
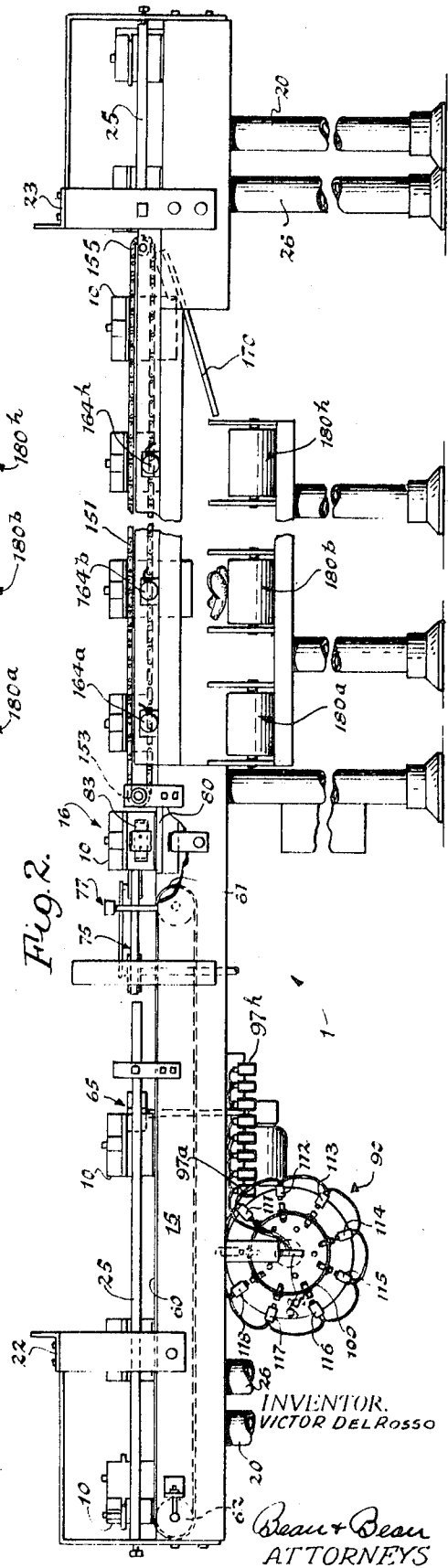
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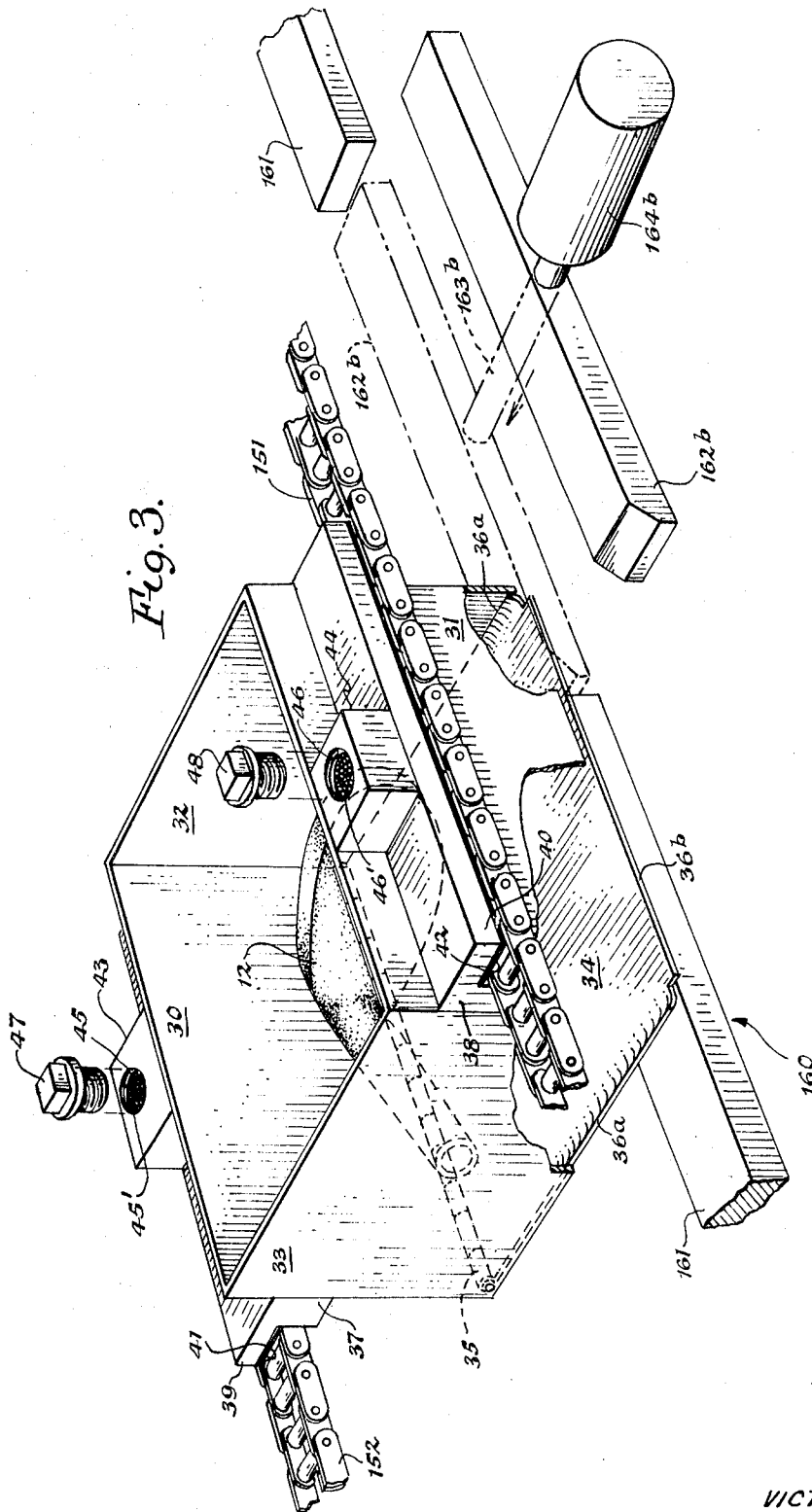
[57] **ABSTRACT**

An apparatus for weight-classifying odd-shaped articles, wherein a plurality of open-topped carrier buckets having hinged bottoms adapted when closed to support articles thereon are continuously passed sequentially through a filling station at which articles are positioned in the buckets, a weighing station at which the articles are weighed, and a discharge classifying station at which the bottom of each bucket is opened to discharge an article into one of a plurality of article takeoff conveyors on the basis of its previously recorded weight.

13 Claims, 8 Drawing Figures



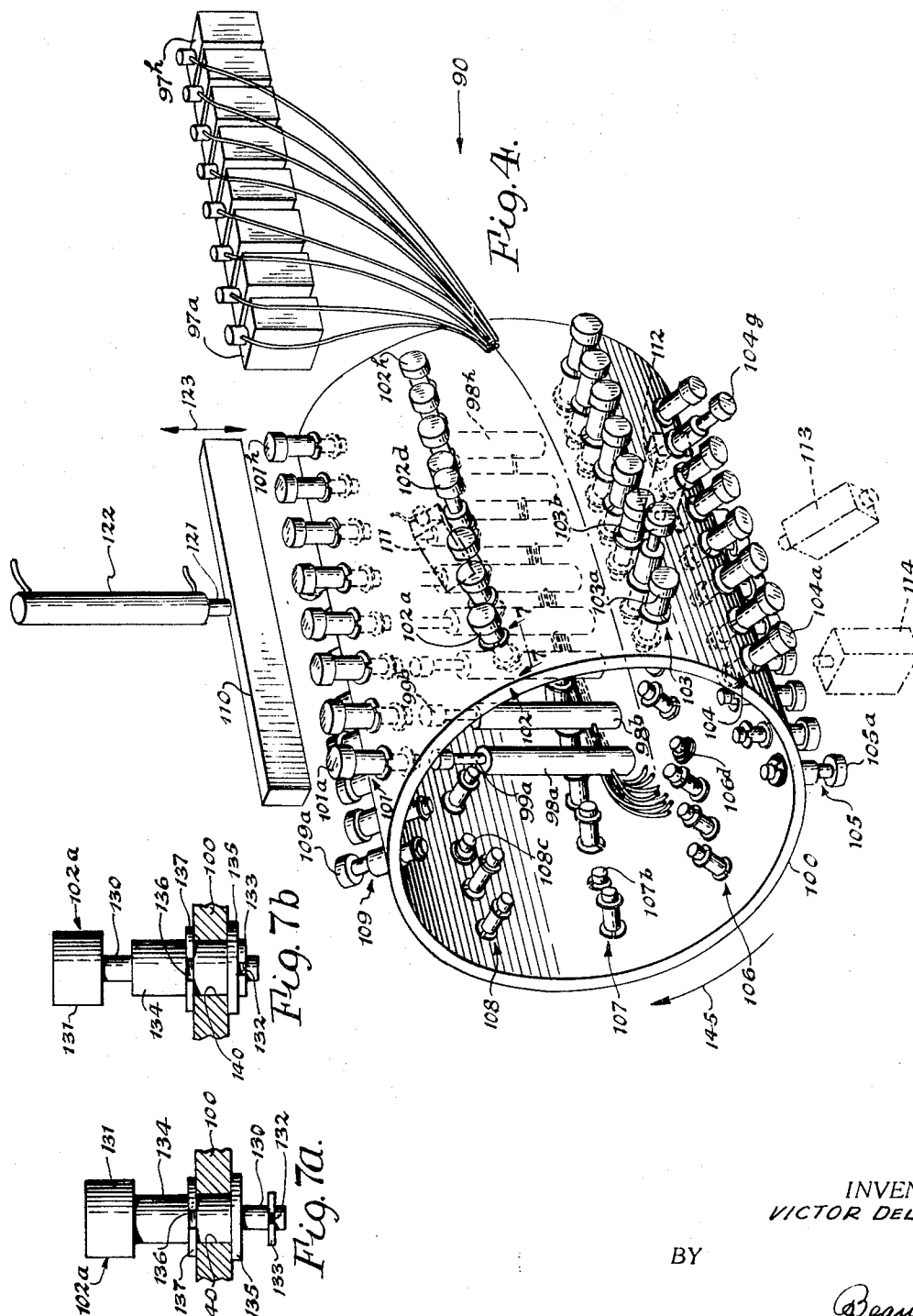




INVENTOR.
VICTOR DELROSSO

BY

Bean & Bean
ATTORNEYS



INVENTOR.
VICTOR DEL ROSSO

BY

Bean & Bean
ATTORNEYS

Fig. 5.

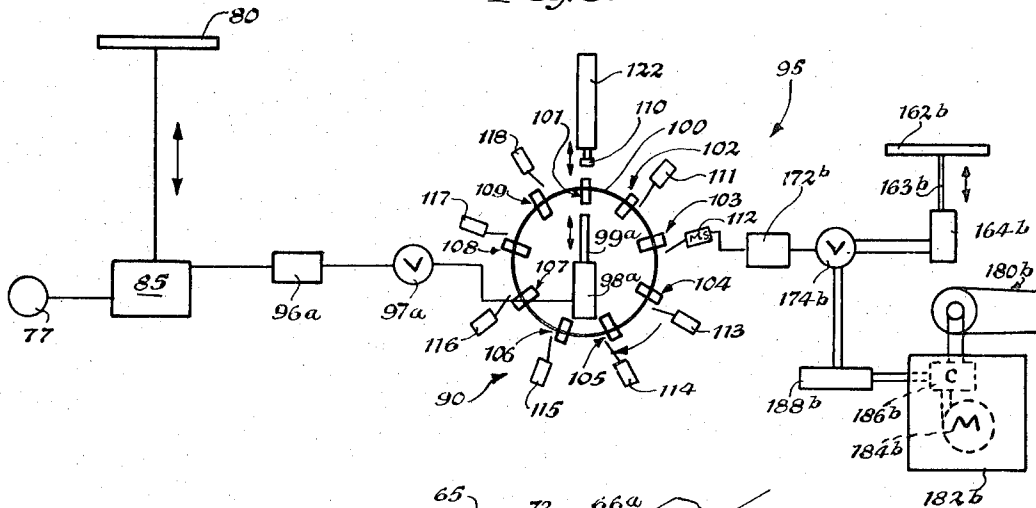
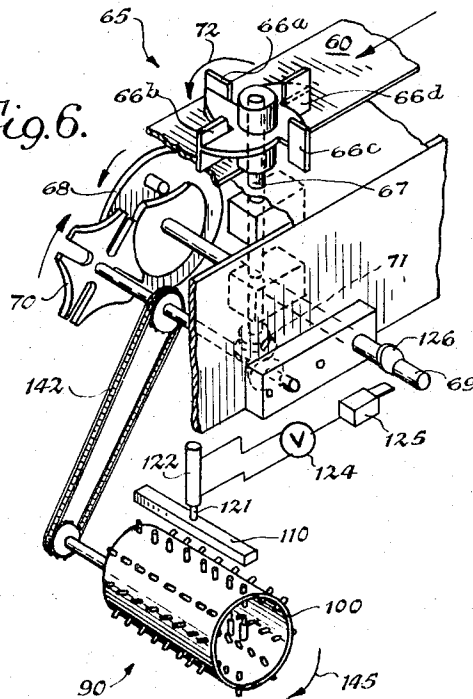


Fig. 6.



INVENTOR.
VICTOR DEL ROSSO

BY

Beam & Beam
ATTORNEYS

APPARATUS FOR WEIGHT-CLASSIFYING ODD-SHAPED ARTICLES

SUMMARY OF THE INVENTION

The present invention is primarily directed towards an apparatus for weight-classifying odd-shaped articles, including by way of example metal castings or stampings and food products, such as chicken legs and lobster tails. The apparatus employs a plurality of carrier buckets having open tops and hinged supported bottoms, which when closed are adapted to support an odd-shaped article within the bucket.

In the preferred form of the present invention, a plurality of buckets are continuously passed through a closed loop sequentially through a filling station at which articles to be weight classified are disposed one in each of the buckets, a weighing station at which the buckets and their contents are individually weighed, and a discharge classifying station at which the bottom of each bucket is opened in order to discharge articles onto one of a plurality of article takeoff conveyors on the basis of the previously recorded weight of the article. The number of takeoff conveyors employed is determined by the number of separate weight classes or ranges into which the articles are to be classified.

The closed-loop form of the present system is particularly advantageous when food products are to be classified, since additional carrier bucket cleaning and drying stations may be readily arranged between the discharge classifying and filling stations to insure purity of the food products.

Further, the present system permits classification on the basis of plural article or package weights, that is, when two or more articles, such as chicken legs, are to be packaged as a unit, such articles may be placed together in one bucket.

The carrier buckets employed in the present invention are of a novel design, which permits articles to be quickly deposited in and discharged therefrom, and the tare weights of the buckets to be individually adjusted to insure uniformity of bucket weights without requiring the maintenance of costly tolerances in the manufacture of the buckets.

Further, in accordance with the present invention, there is provided a novel designed mechanical memory drum assembly, which serves to record the weights of successively presented articles and control operation of the discharge classifying station in accordance therewith.

DRAWINGS

The nature and mode of operation of the apparatus according to the present invention will now be more fully described in the following detailed description taken with the accompanying drawings wherein:

FIG. 1 is a plan view of the apparatus employed in the practice of the present invention;

FIG. 2 is a side elevational view of the apparatus shown in FIG. 1;

FIG. 3 is a perspective view showing a carrier bucket moving through the discharge classifying station of the apparatus with parts removed for clarity;

FIG. 4 is a perspective view of the mechanical memory drum;

FIG. 5 is a schematic view of the discharge classifying station control system;

FIG. 6 is a perspective view showing the drive interconnection between the carrier bucket rotary timer and the mechanical memory drum; and

FIGS. 7a and 7b are sectional views taken generally along the line 7-7 in FIG. 4, but showing alternative positions of the setting pin.

DETAILED DESCRIPTION

The apparatus of the present invention, which is generally designated as 1 in FIGS. 1 and 2, defines a closed-loop system through which a plurality of carrier buckets 10 are passed for the purpose of permitting weight classification of various types of odd-shaped articles 12 transportable thereby. More par-

ticularly, the apparatus includes a rear transport table 13, which defines a filling station 14 at which articles 12 may be placed in buckets 10; a front transport table 15, which defines a weighing station 16 at which the bucket supported articles are weighed and a discharge classifying station 17 at which articles 12 are discharged from buckets 10 at spaced points therealong in accordance with the previously measured article weights; and turn tables 18, 19, which serve to transfer buckets 10 between adjacent ends of transport tables 13, 15. Transport tables 13, 15 may be end supported, as by pedestals 20, and are preferably interconnected by brackets 22, 23, which cooperate with the transport tables to adjustably mount inner and outer bucket guides 24, 25. Turn tables 18, 19 are rotatably mounted on pedestals 26 and are adapted to be suitably driven, as by front transport table mounted electric motor 27, via a drive linkage, not shown.

Carrier buckets 10 are best shown in FIG. 3 as including a pair of spaced sidewalls 30, 31; spaced front and rear walls 32, 33 which are edge joined to the sidewalls to form a generally rectangular bucket having an open top and bottom; and a bottom wall 34, which is hinged affixed as at 35 to sidewall 30 and serves, when in bucket bottom closing position, to support an article 12 within the bucket. The forwardly and rearwardly extending marginal edges of bottom wall 34 are deformed upwardly as indicated at 36a. The unhinged side marginal edge 36b of bottom wall 34 is adapted to project beyond sidewall 31, thereby permitting bottom wall 34 when closed to support the bucket walls 30-33 in a slightly spaced relationship above a bottom wall supporting surface. When bucket 10 is thus supported, the upwardly curved forward and rearward edges of bottom wall 34 permit the bucket to ride over variations in elevations encountered during passage thereof about the machine.

Preferably, when articles to be classified are heavy metallic articles, at least the upwardly facing surface of bottom wall 34 is covered with resilient material, such as a sheet of rubber or the like, not shown, which forms a cushion for the articles deposited in the bucket. Each bucket is also provided with generally L-shaped carrier bars 37, 38, which are suitably affixed one to each of sidewalls 30, 31, respectively. Carrier bars 37, 38 include horizontal flange portions 39, 40 having affixed to the bottom surfaces thereof strips 41, 42 formed of wear resistant material, such as nylon. Suitably carried one on each of carrier bars 37, 38 are receivers 43, 44, which define cavities 45, 46 adapted to receive tare weight adjusting metal shot 45', 46'. The metal shot may be sealed within the cavities by screw-type closures 47, 48. It will be understood that the empty or tare weight of any carrier bucket may be adjusted to conform with that of like buckets to be used in the apparatus by selectively adding metal shot to or removing it from one or both of cavities 45, 46. It is contemplated that the design of bottom wall 34 may be other than that specifically shown, as long as it serves the purpose of supporting an article when in closed position. Thus, the bottom wall may be of plural part construction, wherein the parts are individually hinge affixed to the body portion of the bucket.

Rear transport table 13 includes an endless belt conveyor 50, which is trained about table end supported drive and idler rollers 52, 53, respectively and adapted to support buckets 10 in a bottom wall closed condition for movement continuously in the direction indicated by arrow 54. Drive roller 52 may be suitably driven, as by motor 27 via transmission means, not shown.

Articles to be classified may be manually or otherwise deposited in carrier buckets 10, while the latter are being transported by conveyor 50. Alternatively, a suitable arresting mechanism, not shown, may be employed to momentarily arrest the movement of the buckets in order to facilitate depositing of articles therein. In instances wherein food or other readily contaminated products are to be weight classified, bucket sterilizing or washing and drying units may be placed adjacent the inlet end of transport table 13, as indicated generally in phantom at 58 in FIG. 1, to permit thorough

cleaning of each bucket following the discharge operation to be described.

Buckets 10 transferred onto front transfer table 15 by turn table 18 are conveyed towards weighing station 16 by an endless belt conveyor 60, which is trained about table supported drive and idler roll 61, 62, respectively. Drive roller 61 may be drivingly coupled to motor 27 by transmission means, not shown.

Intermediate the ends of belt conveyor 60, there is provided a rotary timer 65, which is adapted to momentarily arrest movement of buckets 10, as the latter are moved towards weighing station 16. Timer 65, which is described in detail in my prior U.S. Pat. No. 2,907,443, is shown for purposes of reference in FIG. 6 as including four bucket arresting blades 66a-66b, which are mounted for rotation with vertically rising shaft 67; a geneva driver 68, which is carried on drive shaft 69; and a geneva gear follower 70, which is coupled to shaft 67 by miter gear 71. Drive shaft 69 is adapted to be continuously driven by suitable means, such as electric motor 27. The above arrangement is such that during each full rotation of drive shaft 69, follower 70 is actuated by geneva driver 68 so as to drive blade supporting shaft 67 through a quarter rotation in the direction indicated by arrow 72. Thus, each time shaft 69 is driven, one of the bucket arresting blades, e.g., blade 66a, is removed from its position shown in FIG. 6 wherein it is disposed transversely of conveyor 60, in order to release a bucket for movement with conveyor 60 towards weighing station 16, and is replaced by an adjacent blade, e.g., 66d, for the purpose of arresting movement of a following bucket.

Adjacent the discharge end of conveyor 60 there is positioned a pair of belt drive devices 74, 75, which are spaced transversely of conveyor 60 and adapted to snugly engage sidewalls 30, 31, respectively, of buckets 10 at points beneath carrier bars 37, 38. Drive devices 74, 75, are suitably coupled to electric motor 27 for movement at the same linear speed as conveyor 60 and are adapted to cooperate with the latter to insure proper positioning or alignment of buckets 10, as the buckets are introduced into weighing station 16.

A photoelectric eye device 77 is positioned immediately above belt drive device 74, 75 for the purpose of sensing the presence of buckets 10 prior to the feeding thereof into the weighing station. As will be more fully hereinafter described, when the light beam of photoelectric device is broken by the presence of one of buckets 10, weighing of a preceding bucket in the weighing station is initiated.

Weighing station 16 includes a flat surfaced scale or weighing platform 80, which is suitably supported immediately adjacent the outlet end of belt conveyor 60 for slight vertical movement in accordance with the weight of a bucket and/or bucket and contents placed thereon. Platform 80 carries a pair of transversely spaced deformable spring plates 82, 83, which cooperate to form a guide for buckets 10 moving onto and off of platform 80 and to resiliently arrest forward movement of the buckets after the latter have been moved onto platform 80 by conveyor 60 and belt drive devices 74, 75.

Referring to FIG. 5, it will be understood that weight-induced vertical deflections of platform 80 are adapted to be sensed by a suitable weight measuring and indicating device, which is generally designated as 85. Device 85, which forms no part of the present invention, may be of the general type discussed in my copending patent application Ser. No. 647,748, filed June 21, 1967, wherein a linearly variable differential transformer, not shown, is adapted to produce an electrical output signal, which is proportional to the weight-induced deflection of platform 80; such signal being passed to a plurality of optical meters, also not shown. The optical meters may be housed within a suitable control panel 86 shown only in FIG. 1.

The number of optical meters provided for any given machine corresponds to one-half the maximum number of weight classes or ranges into which articles 12 are to be clas-

sified or divided; each meter having two individually adjustable control points to permit adjustment of the weight variation within any desired weight class. Each of the optical meters is adapted to produce an output signal whenever the transformer output signal indicates that an article being weighed is within the weight range for which one of the control points of such meter has previously been set, which serves to control setting of a mechanical memory unit, generally designated as 90, in the manner hereinafter to be described. Mechanical memory unit 90 in turn serves to record the weights of the weighed articles, or more accurately the weight class into which the article falls, and to subsequently control operation of a bucket-dumping mechanism, generally designated as 95 in FIG. 5, such that weighed articles are dumped at various points along the classifying station 17 in accordance with their previously measured weights.

For purposes of reference only, machine 1 will be described as being capable of classifying articles 12 into a maximum of eight separate weight classes. In this instance, four optical meters would be provided wherein each of the two control points thereof are adjusted to be responsive to different portions of the range or magnitude of output signal produced by the weighing transducer, and when responsive is adapted to effect setting of mechanical memory unit 90. This may be accomplished, as indicated in FIG. 5 in the case of a first control point of a first of such optical meters by employing its output signal, after momentary delay thereof, by timer 96a, to control solenoid operated valve 97a, which in turn serves to control operation of pneumatic memory unit setting cylinder 98a having a piston rod 99a. By referring to FIG. 4, it will be understood that in the machine embodiment illustrated, there are provided eight solenoid operated valves 97a-97h and eight memory unit setting cylinders 98a-98h, which are paired for operation with individual optical meters. Thus, the optical meters serve to detect into which of the eight weight classes the article being weighed falls and set the memory unit accordingly.

Mechanical memory unit 90 is best shown in FIGS. 4-6 as including, in addition to setting cylinders 98i-98h, a rotatably supported drum carrier 100, on which are supported rows of memory pins 101-109 arranged in an equally spaced relationship annularly of drum 100; a memory pin cancelling bar 110; and memory pin sensing microswitches 111-118. The memory pins of each of rows 101-109, which are designated a-h, are arranged in a spaced-apart relationship axially of drum 100, such that the respective pins of each of the rows are aligned in columns annularly of the drum. For purposes of reference, it will be assumed that when any one of pins 101a-109a is set, such pin serves to indicate that a weighed article is in a minimum or first class, whereas pins 101h-109h when set serve to indicate that weighed articles are in the maximum or eighth weight class.

Cancelling bar 110 is carried by piston rod 121 of pneumatically operated cancel cylinder 122 for reciprocation radially of drum 100, as indicated by arrow 123 in FIG. 4. As will be clear by referring to FIG. 6, cancel cylinder 122 is controlled by solenoid-operated valve 124, which in turn is under the control of a microswitch 125. Microswitch 125 is adapted to be actuated by cam 126 once during each rotational cycle of drive shaft 69.

Since the structure and mode of operation of pins 101a-109h is identical, only pin 102a, shown in detail in FIGS. 7a-7b, need be described. Pin 102a includes a stem portion 130, which terminates at one end thereof in an enlarged head portion 131, which is engageable by cancelling bar 110, and is provided adjacent the other end thereof, which is engageable by piston rod 99a, with an annular slot recess 132, adapted to receive a snap clip retainer 133. Stem portion 130 is received for snug fit sliding engagement within a bearing member 134, which is provided at one end thereof with a radially extending annular flange abutment 135 and at its other end with an annular slot recess 136 adapted to receive a snap clip retainer 137. It will be apparent that flange abutment 135 and retainer

137 cooperate to lock bearing 134 in place within an aperture 140, which extends radially between the inner and outer cylinder walls of drum carrier 100. It will be further apparent that pin head portion 131 cooperates with the radially outer end of bearing 134 and pin retainer 133 cooperates with flange abutment 135, so as to limit radial travel of pin 102a between retracted "cancel" and extended "memory" portions shown in FIGS. 7a and 7b, respectively.

By referring to FIG. 6 it will be understood that carrier drum 100 is drivably coupled to cam follower 70 of rotary timer 65 by a chain link drive 142, such that each time the follower 70 is actuated, drum 100 is rotated to position one of the pin rows 101-109 in a setting and cancelling station, wherein the pins of such row are disposed in collective radial alignment with cancelling bar 110 and in individual radial alignment with setting cylinder piston rods 99a-99h. Thus, the arrangement is such as to require nine full rotations of drive shaft 69 to move the rows of pins, as for instance row 101, in a stepwise manner in the direction indicated by arrow 145 through eight pin-sensing stations defined by microswitches 111-118 in order to return such row to its original position at the setting and cancelling station.

When one of pin rows 101-109, as for instance row 101 is moved into position beneath cancelling bar 110, reciprocation of the cancelling bar towards drum 110 will serve to force any or all of pins 101a-101h into their retracted or "cancel" positions, such as shown in the case of pin 102a in FIG. 7a. Thereafter, when one of setting cylinders 98a-98h is actuated in accordance with the weight of a bucket and/or a bucket and its contents measured in weighing station 16, its piston is extended so as to force the pin disposed in radial alignment therewith into its extended or "memory" position. For purposes of illustration, pins 102d, 103b, 104q, 105a, 106d, 107b, 108c, 109a are shown in FIG. 4 as being disposed in their "memory" positions; such having been effected by operation of cylinders 98a-98h in the sequence 98d, 98b, 98g, 98a, 98d, 98b, 98c, 98a.

Referring particularly to FIGS. 2, 4 and 5, it will be seen that the annular spacing of microswitches 111-118 in the direction of drum rotation corresponds to the spacing between adjacent rows of pins 102-109, and that such microswitches are equally spaced apart lengthwise of drum 100 in radial alignment with corresponding columns of aligned pins 101a-109a through 101h-109h, respectively. Thus, it will be apparent that when for instance any of pins 101a-109a is in its "memory" position, microswitch 111 will be actuated when drum 100 is rotated to position such pin in radial alignment therewith.

It will be understood that the number of pin-sensing microswitches provided in a given memory unit will correspond to the maximum number of memory pins in each row of pins, which will in turn depend upon the maximum number of weight classes into which articles 12 are to be divided. Preferably, the number of rows of memory pins will be one greater than the number of weight classes in order to provide a separate pin cancelling and setting station so as not to interfere with sensing of the pins.

Classifying station 17 includes a pair of parallel, chain link endless conveyors 150, 151, which are trained about a pair of axially aligned drive sprockets 152, 153 and a pair of axially aligned idler sprockets 154, 155, respectively. Drive sprockets 152, 153 may be suitably coupled to electric motor 27, such that conveyors 150, 151 may be continuously driven at a linear speed corresponding to that of conveyor 60.

By reference to FIGS. 1-3, it will be understood that conveyors 150, 151 are positioned such that they may frictionally engage beneath the horizontal flange portions 39, 40 of bucket carrier bars 37, 38, respectively, for the purpose of supporting the buckets as the latter are transferred by the conveyors from scale platform 80 to turn table 19. It will be understood that a bucket after having been weighed on platform 80 is forced or pushed therefrom onto conveyors 150, 151 by the next succeeding bucket, which in turn is forced onto plat-

form 80 by operation of conveyor belt 60 and belt drive devices 74, 75.

Positioned beneath and intermediate conveyors 150, 151 is dumping mechanism 95, which includes a guide rail device 160 adapted to slideably engage with the lower surface of the bottom wall of each bucket as the latter is moved through station 17. It will be understood that the vertical spacing between guide rail device 160 and conveyors 150, 151 is such that the former merely serves to maintain the bucket bottom walls in substantially closed position when in engagement therewith, while the latter supports the buckets during transfer through station 17.

Guide rail device 160 includes a series of stationary, axially spaced guide rail element 161, which are suitably fixed to transport table 15, and a plurality of movable guide rail elements 162a-162h, which are carried on piston shafts 163a-163h of pneumatically operated cylinders 164a-164h, respectively, and positioned in an interspaced relation with stationary rail elements 161. Pneumatic cylinders 164a-164h, which form a part of dumping mechanism 95, are adapted to be individually operated in order to reciprocate guide rail elements 162a-162h transversely of the path of travel of conveyors 150, 151, as best shown in the case of pneumatic cylinder 164b in FIGS. 1 and 3.

It will be understood that when the movable guide rails 162a-162h are moved into the position indicated by guide rail element 162b, they are removed from supporting engagement with bucket bottom wall 34, thereby permitting the latter to fall by gravity into an open position and the transported article to be discharged from the bucket. Bucket bottom wall 34 thereafter remains in open position until raised to a closed position by sliding engagement with inclined cam ramp 170 disposed adjacent the outlet end of station 17.

By reference to FIG. 5 it will be understood the operation of cylinders 164a-164h is controlled by microswitches 111-118, respectively, via suitable timer and flow control valve means indicated, respectively, as 172b and 174b in the case of cylinder 164b. Thus, it will be understood that rail elements 162a-162h are provided one for each of the weight classes into which articles 12 are to be classified; wherein for purposes of illustration only, rail element 162a corresponds to the first or lightweight class and 162h corresponds to the eighth weight class.

While any suitable means may be employed to catch or receive the discharged articles, it is preferable to employ a plurality of endless belt type takeoff conveyors 180a-180h, which are positioned beneath and in alignment with movable rail guide elements 162a-162h, respectively. Preferably, conveyors 180a-180h are driven by an arrangement including drive devices 182a-182h, shown in the case of device 180b as including a continuously driven motor 184b and a clutch 186b. Operation of clutch 186b is controlled by fluid cylinder 188b, which is in turn controlled by valve 174b. Thus, each time one of microswitches 112-118 is actuated, an associated cylinder 164 is actuated to move one of rail elements 162 and an associated cylinder 188 is actuated for the purpose of engaging its clutch 186 and thus effecting driving of conveyor 180. This arrangement results in stepwise driving of the article receiving conveyors through a distance sufficient to remove an article previously deposited thereon from beneath buckets 10 in order to prevent contact thereof with a subsequently discharged article, and affords an article residence time on the takeoff conveyors sufficient to permit visual inspection of the articles.

In describing the operation of the apparatus of the present invention, it will be assumed that a first article containing bucket is initially disposed on weighing platform 80, and that a second bucket whose path is to be followed for purposes of description is being conveyed by conveyor 60 after having been released by rotary timer 65. The second bucket is first brought into association with drive devices 74, 75, which thereafter cooperate with conveyor 60 to force the second bucket onto platform 80 and thereby displace the first bucket

therefrom. Immediately before the second bucket reaches platform 80 its presence is sensed by photoelectric eye device 77, which thereupon serves to initiate weighing of the first bucket.

The second bucket remains on platform 80 until displaced therefrom by a third bucket. Simultaneously with the release of such third bucket by rotary timer 65, drum 100 is indexed, via chain link drive 142, to position, as for example, the pins of row 101 at the setting and cancelling station. Immediately thereafter, continued rotation of drive shaft 69 brings cam 126 into engagement with microswitch 125, whereby cylinder 122 is operated to reciprocate cancelling bar 110 to insure that the pins 101a-101h of row 101 are disposed in their retracted or "cancel" positions.

When the presence of the third bucket is sensed by photoelectric eye device 77, weighing of the second bucket is initiated. For purposes of illustration, it will be assumed that the article contained within the second bucket falls with the second of eight weight classes. Thus, the optical meter associated with the second weight class serves to produce an output signal, which in turn effects operation of second weight class setting cylinder 98b. Upon operation of setting cylinder 98b, memory pin 101b is driven into its extended or "memory" position, thereby temporarily recording the weight or the weight class into which the article carried by the second bucket falls. Immediately thereafter, the second bucket is forced off platform 80 by the third bucket onto conveyors 150, 151 for travel through station 17 with the bottom wall thereof being maintained in a closed condition by sliding engagement with the first of the series of stationary guide rail elements 161.

Upon the release of a fourth bucket, drum 100 is again indexed so as to position row of pins 101 at the first pin-sensing station, whereat it is disposed in radial alignment with microswitch 111. Microswitch 111, however, is not operated, since it is spaced from pin 101b in a direction lengthwise of drum 100. Accordingly, movable rail element 162a is maintained in alignment with adjacent stationary rail elements 161, and serves to support the bottom wall of the second bucket in closed condition.

Simultaneous with the release of a fifth bucket, drum 100 is again indexed, so as to position row of pins 101 at the second pin sensing station, whereat pin 101b engages microswitch 112 to effect operation thereof. As a result, cylinder 164b is actuated to move rail element 162b out of alignment with its adjacent stationary rail elements and cylinder 188b is actuated to effect driving of article takeoff conveyor 180b. Removal of rail element 162b from alignment with stationary rail elements 161 permits second bucket bottom wall 34 to pivot downwardly into an open position and transported article 12 to be discharged by gravity onto conveyor 180b. Second bucket bottom wall remains in open position until engaged by cam ramp 170 adjacent the outlet of station 17.

It will be understood that timer 172b serves to control the period of time during which cylinders 164 and 188 remain actuated, it being necessary to return rail element 162b to its original position before passage thereover of the third bucket.

It will be understood that in order to insure proper discharging of articles at the individual discharging points, defined by rail elements 162a-162h, it is necessary that the dwell time during which drum 100 remains in one of its indexed positions, be equal to or less than the time required for buckets 10 to be transferred between adjacent discharging points. Thus, for a constant drum dwell-time, if it is desired to increase the spacing between discharging points, it would be necessary to effect a corresponding increase in the linear speed of conveyors 150, 151.

What is claimed is:

1. An apparatus for weight-classifying odd-shaped articles including in combination:

a plurality of article-carrying buckets having an open top and a bottom wall movable between bucket bottom closing and open positions, said bottom wall being adapted to

support an article to be classified within said bucket when in said closing position and permitting gravity discharge of an article from said bucket when moved to said open position, said buckets each being of substantially the same weight;

means to transport said buckets one at a time successively along a path of travel such that said bucket bottom walls are normally maintained in said closed position;

a weighing station arranged along said path of travel, said weighing station including means to determine the weights of articles carried by each of said successively transported buckets;

memory means, said memory means being settable in accordance with said determined weights; and

a discharge classifying station arranged along said path of travel downstream of said weighing station, said classifying station including discharge means arranged at points spaced apart along said path of travel, said discharge means being individually actuated in accordance with settings of said memory means, said discharge means when actuated permitting movement of said bucket bottom walls to open position, whereby said articles are discharged from said buckets at said spaced points in accordance with said determined weights thereof.

2. An apparatus according to claim 1, wherein said transporting means defines a closed loop path of travel for said buckets, and means is provided to return said bucket bottom walls to closed position, at a point downstream of said discharge classifying station along said path of travel.

3. An apparatus according to claim 1, wherein there is additionally provided in combination:

takeoff conveyors provided one adjacent each of said spaced points for receipt of articles discharged from said buckets and means to drive said conveyors in a stepwise fashion, said drive means being controlled by said memory means such that said conveyors are individually driven in accordance with which of said spaced points an article is to be discharged, whereby contact is prevented between articles successively discharged at the same spaced point onto the same conveyor.

4. An apparatus according to claim 1, wherein each said bucket includes a pair of carrier bars carried one on each of a pair of sidewalls thereof aligned with said path of travel, said weighing station includes a vertically deflectable weighing platform, said platform being adapted to support said buckets one at a time such that said bottom wall thereof is maintained in bottom closed position, said transporting means includes first conveyor means adapted to transport said buckets with bottom walls thereof in closed position one at a time onto said platform, a pair of parallel conveyors extending from adjacent said weighing platform through said classifying station and a bottom guide means extending through said classifying station intermediate said parallel conveyors, said first conveyor means being adapted to transport a bucket onto said weighing platform such that a bucket previously disposed thereon is forced by said transported bucket onto said parallel conveyors with said bucket carrier bars being supportedly engaged thereby, said bottom guide means including stationary guide elements and movable guide elements, said movable guide elements when in a first position aligned with said stationary elements cooperate therewith to slidably engage said bucket bottom walls so as to maintain same in closed position, said discharge means being associated one with each of said movable elements such that when said discharge means are actuated said movable elements are moved out of alignment with said stationary elements into a second position out of sliding engagement with said bucket bottom walls, thereby permitting the bottom wall of a bucket to move into open position when said parallel conveyors carry said bucket to a point along said path of travel at which said article is to be discharged in accordance with the determined weight thereof.

5. An apparatus according to claim 4, wherein said transporting means defines a closed loop path of travel for said

buckets, and means are provided to return said bucket bottom walls to closed position at a point downstream of said discharge classifying station along said path of travel.

6. An apparatus according to claim 4, wherein said bucket-transporting means additionally includes second conveyor means arranged parallel to said first conveyor means and said parallel conveyors, and a pair of turn tables, said turn tables connecting opposite ends of said second conveyor means to said first conveyor means and to said parallel conveyors.

7. An apparatus for weight-classifying odd-shaped articles into N weight classes comprising in combination:

a plurality of article-carrying buckets having an open top and a bottom wall movable between bucket bottom closing an open positions, said bottom wall being adapted to support an article to be classified within said bucket when in said closing position permitting gravity discharge of an article from said bucket when moved into said open position, said buckets each being of substantially the same weight;

means to transport said buckets one at a time along a closed loop path successively through a bucket filling station, a bucket and contents weighing station and a discharge classifying station;

weighing means associated with said weight station, said weighing means being adapted when a filled bucket is presented at said weighing station to determine into which of said N weight classes an article carried in said present bucket falls;

memory means, said memory means being settable in accordance with said determined weight classes of articles carried by successively presented buckets;

N discharge means associated with said classifying station, said discharge means being arranged at equally spaced apart points lengthwise of said classifying station along said path of travel, said discharge means defining N discharge points at which said weighed articles are to be selectively discharged from said buckets in accordance with said determined weight classes, said discharge means being individually actuated in accordance with setting of said memory means so as to permit movement of said bucket bottom walls to open position, whereby said articles are discharged from said buckets at said spaced points in accordance with said determined weight classes thereof.

8. An apparatus according to claim 7, wherein there is further provided in combination:

a rotary timer;

drive means, said drive means being adapted to drive said rotary timer such as to release one bucket at a time for transfer to said weighing station; and

means to sense release of said bucket by said rotary timer, said sensing means being operable to initiate operation of said weighing means such that the weight class of an article carried by a bucket previously positioned at said weighing station is determined, said released bucket being thereafter adapted to be transferred into said weighing station and during transfer thereof force said previously positioned bucket into said discharge classifying station for transfer therethrough;

said memory means includes a rotatably supported memory drum having a plurality of memory elements, said memory elements being normally in a cancelled condition but being settable in a memory condition, said memory elements being arranged in at least N rows of memory elements, said rows of memory elements being equally spaced apart annularly of said drum, each of said N rows of memory elements including N memory elements arranged in spaced relationship axially of said drum such that the respective memory elements of each of said N rows are aligned in columns annularly of said drum, said drum being rotatably driven in a stepwise manner by said drive means so as to index each of said rows successively through a memory-setting and N memory-element-

sensing stations arranged annularly of said drum, N memory-element-setting means selectively operable by said weighing means when one of said rows is placed in said memory-setting station to set one of said memory elements of said placed row in its memory condition so as to store an input in said placed row which is characteristic of the determined weight class of an article carried by said previously positioned bucket, memory element sensing means disposed one at each of said sensing stations, said element-sensing means being spaced apart axially of said drum in alignment one with each of said columns such that each of said element-sensing means is adapted to produce an output when one of said memory elements set in memory condition is indexed into radial alignment therewith, said element-sensing means being associated one with each of said discharge means, said discharge means being operable in response to said outputs, and memory-element-cancelling means, said cancelling means being operative to return said memory elements to said cancelled condition after indexing thereof through said sensing stations, said drum and cancelling means being coupled to said drive means such that said cancelling means and drum are driven in synchronization with said rotary timer, whereby when rotary timer is operated to release a bucket as aforesaid, said drum is indexed to place a first of said N rows in position at said setting position and said cancelling means operated, upon sensing of said released bucket said weighing means is operated and a memory element of said placed row is set in accordance with the determined weight class of an article in said previously positioned bucket, and upon release of the next succeeding bucket, said drum is rotated to position said first of said N rows in a first of said element-sensing stations.

9. An apparatus according to claim 8, wherein each said bucket includes a pair of carrier bars carried one on each of a pair of sidewalls thereof aligned with said path of travel, said weighing station includes a vertically deflectable weighing platform, said weighing means being responsive to vertical deflections of said platform, said platform being adapted to support said buckets one at a time such that said bottom wall thereof is maintained in bottom closed position, said transporting means includes first conveyor means adapted to transport said buckets with bottom walls thereof in closed position one at a time past said rotary timer and release sensing means onto said platform, a pair of parallel conveyors extending from adjacent said weighing platform through said classifying station and a bottom guide means extending through said classifying station intermediate said parallel conveyors, said first conveyor means being adapted to transport a released bucket onto said weighing platform such that a bucket previously disposed thereon is forced by said released bucket onto said parallel conveyors with said bucket carrier bars being supportedly engaged thereby, said bottom guide means including stationary guide elements and movable guide elements, said movable guide elements when in a first position aligned with said stationary elements cooperate therewith to slidably engage said bucket bottom walls so as to maintain same in closed position, said discharge means being associated one with each of said movable elements such that when said discharge means are actuated said movable elements are moved out of alignment with said stationary elements into a second position out of sliding engagement with said bucket bottom walls, thereby permitting the bottom wall of a bucket to move into open position when said parallel conveyors carry said bucket to a point along said path of travel at which said article is to be discharged in accordance with the determined weight class thereof.

10. An article-carrying bucket for use in combination with apparatus adapted to classify articles on a weight basis, said apparatus including conveyor means to transport said bucket successively through a filling station at which an article to be weighed may be placed in said bucket, a weighing station at

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which said bucket and article carried thereby is adapted to be weighed and a discharge classifying station at which the weighed article is adapted to be discharged from said bucket, said bucket comprising:

- a pair of spaced sidewalls;
- spaced front and rear walls, said front and rear walls being edge joined to said sidewalls to form a generally rectangular bucket having an open top and bottom;
- a bottom wall hingedly joined to one of said sidewall along adjacent marginal edges thereof for vertical pivotal movement between bucket bottom closing and opening positions, said bottom wall being adapted to be alternately engaged and disengaged by said apparatus such that when engaged it is maintained in a bucket bottom closing position wherein it is adapted to support an article within said bucket and when disengaged pivots vertically into said bucket bottom opening position to permit gravity discharge of said supported article;
- a pair of carrier bars carried one on each of said sidewalls and adapted to be supportingly engaged by said apparatus so as to support of said bucket at least when said bottom wall is disengaged by said apparatus; and

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means for adjusting the tare weight of said bucket.

11. An article-carrying bucket according to claim 10, wherein said adjustment means includes a pair of receivers carried one adjacent each of said sidewalls each said receiver defining a recess adapted to removably receive a plurality of metal shot, and means to retain said shot within the recesses defined by said receivers such that the tare weight of said bucket may be varied by varying the number of shot in said recesses.

12. An article-carrying bucket according to claim 10, wherein a marginal end of said bottom wall spaced from said hingedly joined marginal edge thereof is adapted to supportingly engage the other of said sidewalls spaced from said one sidewall when said bottom wall is engaged as aforesaid, whereby said bottom wall when in closed position is adapted to support said side, front and rear bucket walls.

13. An article-carrying bucket according to claim 12, wherein front and rear edge portions of said bottom wall are upturned and terminating inwardly of said bucket front and rear walls when said bottom wall is in closed position.

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