

June 11, 1963

L. E. WORCESTER ETAL

3,093,245

SEGREGATION MECHANISM

Filed May 6, 1960

3 Sheets-Sheet 1

FIG. 1

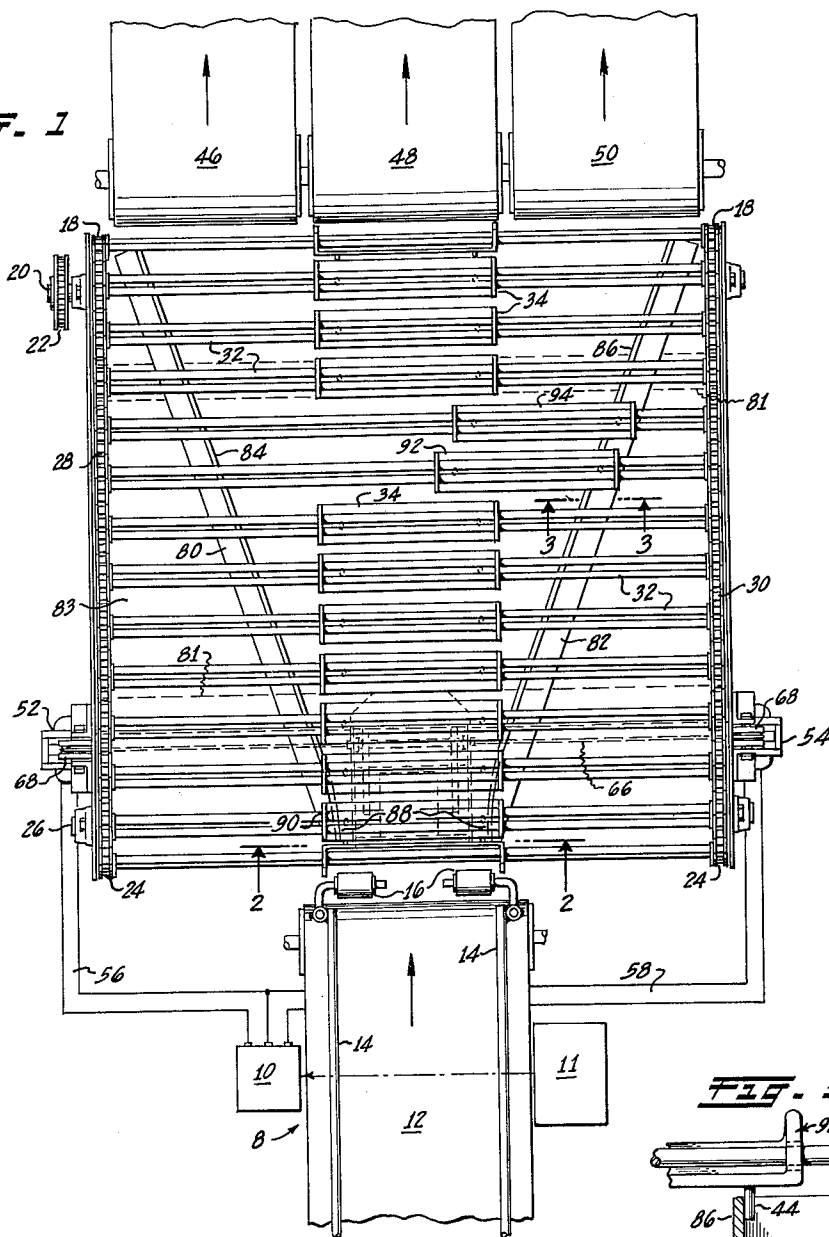


FIG. 2

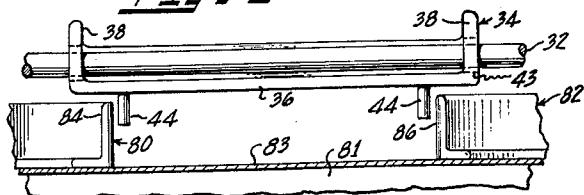
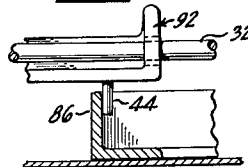


FIG. 3



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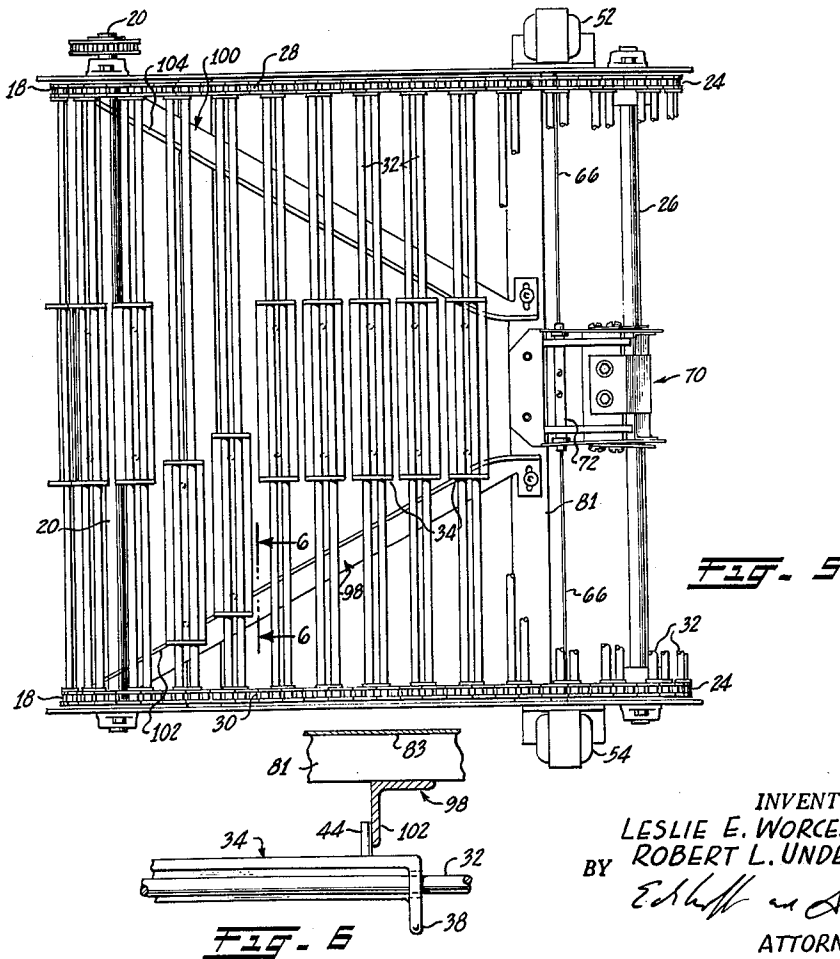
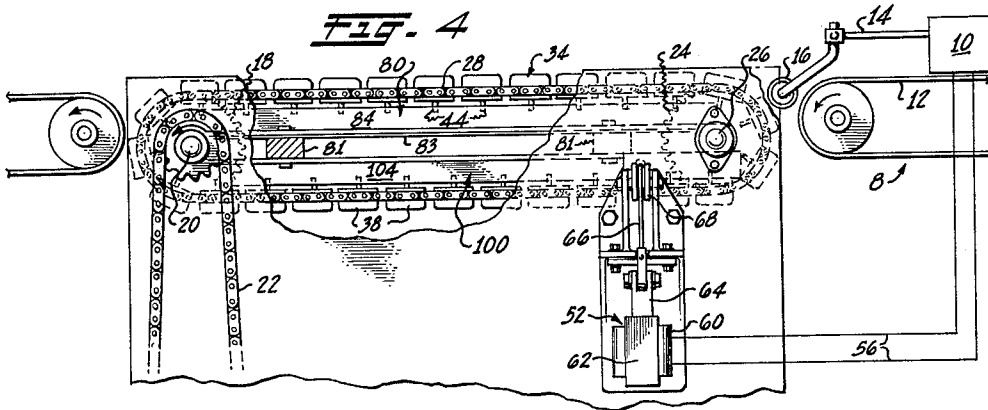
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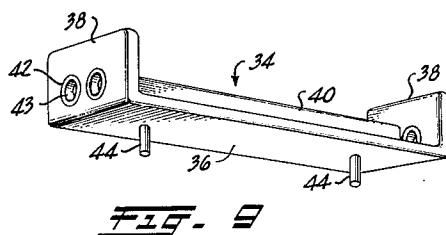
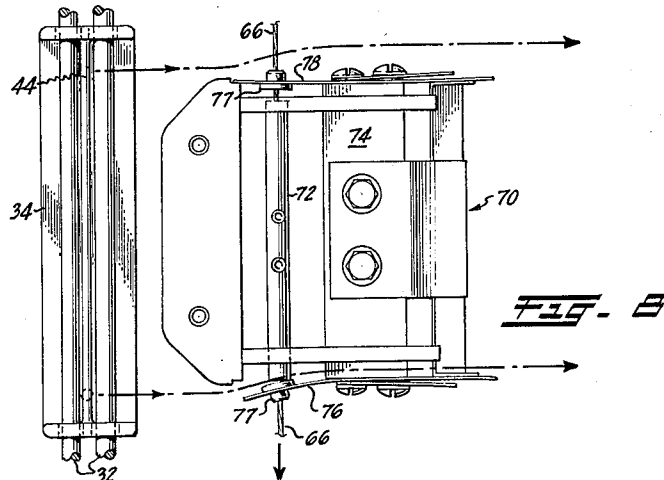
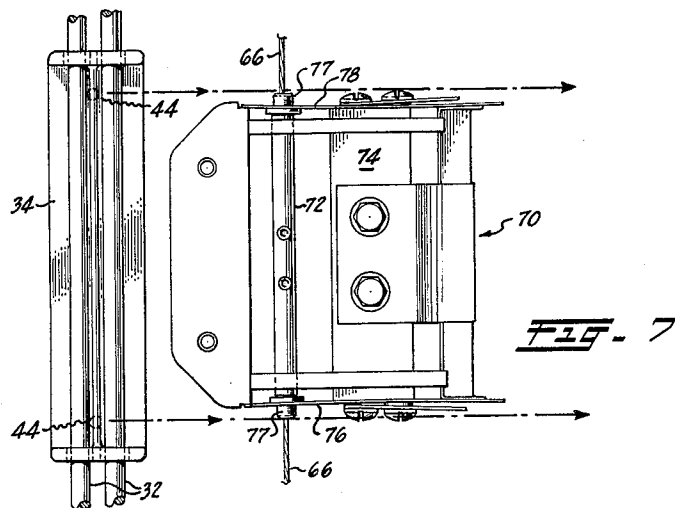
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SEGREGATION MECHANISM

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3 Sheets-Sheet 3



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SEGREGATION MECHANISM

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Filed May 6, 1960, Ser. No. 27,447
6 Claims. (Cl. 209-121)

This invention relates to a rejection system and more particularly relates to a mechanism wherein packages of merchandise or similar articles can be segregated into a plurality of groups dependent upon some particular property, such as the weight, of the articles.

Segregation or rejection systems which have heretofore been known are suitable for use at relatively low speeds. With modern packaging equipment, which frequently operates at rates of several hundred articles per minute, the systems heretofore used are not fully satisfactory. Most of such systems heretofore used have depended upon a gate of some kind which can be swung from side to side, diverting the articles. The gate is ordinarily swung when the article is in its path or just before the article comes into the path of the gate but, in either case, when articles are moving at high speeds they are easily knocked over or injured by the relatively rough treatment of passing through the swinging gate. Further, it is difficult to secure the proper operation of such gates at high rates of speed.

An object of the present invention is to provide a segregation system whereby the articles can be segregated into a plurality of paths at high speed, yet are subject only to gentle forces.

Another object of this invention is to provide a segregation system wherein a series of carriers are used for the articles being segregated wherein the carriers are diverted in such manner that they will follow a desired path, said diversion taking place before the articles come into contact with the carrier.

A further object of this invention is to provide a segregation system which is of relatively inexpensive construction and which is capable of running for extending periods of time without breakdowns or the requirement for service.

Other objects will be apparent from the balance of the specification which follows.

In the drawings forming a part of this application:

FIGURE 1 is a top plan view of a device embodying the present invention;

FIGURE 2 is a section on the lines 2-2 of FIGURE 1;

FIGURE 3 is a section on the lines 3-3 of FIGURE 1;

FIGURE 4 is a side elevation of a portion of the device shown in FIGURE 1;

FIGURE 5 is a bottom plan view, partially cutaway, of the device shown in FIGURE 1;

FIGURE 6 is a section on the lines 6-6 of FIGURE 5.

FIGURE 7 is a bottom plan view of the mechanical switch.

FIGURE 8 is a view similar to FIGURE 7 showing the parts in a deflected position.

FIGURE 9 is a perspective view of one of the carrier members.

Referring now to the drawings by reference characters, there is shown a weighing device 8 which is adapted to actuate a double throw switch 10 when an object passes over the weighing device. The switch 10 closes a first circuit when an article passing over the scale is overweight and closes a second circuit when an article is underweight. Neither circuit is closed when the article is of the correct weight. The exact weighing mechanism

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forms no part of the present invention and is thus not described in detail. Suffice it to say that the device includes an endless belt 12 which serves both to convey the articles and as a platform for the scales. The weighing mechanism also includes a pair of guide rails 14 and a pair of rollers 16 for guiding and supporting the articles from the scale onto the segregation device which forms the present invention. The weighing mechanism may also include a light 11, which shines across the path of movement of the objects, in which case the switch 10 will incorporate a photoelectric cell, the interruption of the path of light serving to activate the switch.

The segregation device proper includes a pair of sprockets 18 mounted for rotation on shaft 20, which is driven by the chain 22 from a source of power, not shown. A second pair of sprockets 24 are mounted on the idler shaft 26. Endless roller chains 28 and 30 are mounted between sprockets 18 and 24 to provide two parallel endless chains moving in the same direction. Mounted between the chains 28 and 30 are a series of smooth, round rods 32. Preferably two rods are mounted on adjacent pins, two pins are left blank, and so on, but other arrangements of the rods on the chains can be employed. It will thus be apparent that as the shaft 20 is driven, the series of rods 32 will form a moving path over which articles can be conveyed. On each pair of adjacent rods 32 a carrier member 34 is free to slide. The carrier member has a base 36 which serves as a platform to convey the articles. The base 36 may or may not have up-standing flanges 38 and may or may not have a center rib 40. Holes 42 having bushings 43 are provided in each carrier member so that the carrier can be mounted on two adjacent rods 32. The flanges 38, if used, extend above the rib 40 and the holes 42 so that the flanges 38 extend above the level of the top surfaces of the rods 32. On the bottom side of the base 36 are mounted two pins 44, the function of which will be later described. It will be noted from the drawings that the flanges 38 are separated by a distance somewhat greater than the separation between the guide rails 14. Located beyond the path of travel provided by the rods 32 are three endless belts 46, 48 and 50 for the purpose of conveying articles after they have been segregated. With the structure thus far described, it is apparent that the carriers 34 are free to slide back and forth on the rods 32 and when once placed in a certain position laterally will maintain that position unless forcefully displaced.

Located on each side of the mechanism are a pair of solenoids 52 and 54 which are connected by means of wiring 56 and 58 to the switch on the weighing mechanism 10. Each solenoid comprises a winding 60 around a suitable hollow core 62 into which an armature 64 will be drawn when the coil is energized. Connected between the armatures is a cable 66 passing over a pulley 68 to the mechanical switch, generally designated 70. It will be understood that the solenoids and pulleys are duplicated and that the one on the opposite side from that shown in FIGURE 4 actuates the cable 66 in the opposite direction.

Referring now particularly to FIGURES 4, 5, 7 and 8, the mechanical switch 70 is located at a convenient place on the path of travel of the rods under the segregator. The mechanical switch includes a frame member 74 having attached thereto two leaf springs 76 and 78. The leaf springs are provided with guides 77 through which the cable 66 passes. Between the springs 76 and 78 a spacer 72 is provided which is attached to cable 66. When neither of the solenoids is actuated, the leaf springs 76 and 78 remain at rest in the position shown in FIGURE 7. Then, as a carrier 34 passes over the switch, the pins 44 move on each side thereof as is shown in FIGURE 7

and the carriers 34 are thus not displaced by the switch. In FIGURE 8 is shown the action of the mechanical switch when one of the solenoids is actuated. Here solenoid 54 has been actuated, resulting in the displacement of the leaf spring 76 as is shown. Then, as a carrier 34 moves into the switch, one of the pins 44 strikes the open leaf 76, diverting the carrier to the path shown in dashed lines in FIGURE 8.

Spacer support bars 81 are provided between the chains and support a plate 83, which serves to catch any spilled material. Mounted on spacer support bars 81 are a pair of rails 80 and 82 having upstanding flanges 84 and 86 thereon. The flanges are angled generally in the position shown, but at the point where the flanges tend to converge, they are flattened for a short distance, as is shown at 88. The separation between the two flanges at the point 88 is just slightly greater than the separation between a pair of pins 44. Thus, if one of the carriers 34 moves in an undiverted path, as is shown in FIGURE 7, when it comes to the rail flanges 84 and 86, the pins 44 will pass between the flanges and the carrier will remain undeflected and continue on a straight path as is shown by the carriers at 90 and in FIGURE 2. On the other hand, if the action of the mechanical switch 70 has been such as to deflect the carrier slightly to one side or the other, one of the pins 44 will be engaged by one of the flanges 84 or 86 and the carrier will thus be propelled along a diagonal path and an article thereon will follow this path. Thus, the carriers 92 and 94 in FIGURE 1 have had pins engaged by the flange 86 and have been diverted on the diagonal path shown. FIGURE 3 shows how the pin is engaged. It will be obvious that if a carrier is undiverted it will deliver its load to the belt 48 while, if it has been deflected to the right as have been the carriers 92 and 94, the carrier will deliver its load to the belt 50. If deflected to the left, the carrier will deliver its load to the belt 46.

Under the path of travel, a somewhat similar pair of rails 98 and 100 having flanges 102 and 104 thereon are mounted on bars 81. These flanges are slightly further apart at their divergent ends and slightly closer together at their convergent ends, as is shown, so that the pins 44 of all of the carriers will pass inside of the flanges 102 and 104, regardless of the position of the carrier on the rods. Thus, if the carrier is on one side or the other at the time it delivers its load, as it passes under the device on the return trip, one of the pins 44 will engage one of the flanges 102 or 104, depending upon which side the carrier happens to be, and will be propelled along a diagonal path back to the center position, so that all carriers will again be centered at the time they encounter mechanical switch 70. The exact manner in which this is accomplished is shown more clearly in FIGURE 6. Here it will be noted that the pin 44 has come into contact with the inside edge of flange 102, causing the carrier 34 to slide along the rods 32 and thus become recentered.

Although the segregating device has been described in conjunction with a scale wherein articles within a given tolerance move in a straight path, while those which are under- or over-weight are diverted to other paths, it will be obvious that the segregating device need not be used with a scale but can be used in any instance wherein it is desired to segregate articles. For instance, instead of the scale 8, one might have a device for detecting whether articles were above or below a certain size limitation, to determine whether a box was fully filled or under filled, or to segregate articles as to color or other characteristics. It is also obvious that the exact form of scale need not be used and that other means could be used to replace the solenoids for displacing the carriers to the proper path.

It will be obvious that the mechanical switch 70 must be located in such a manner that articles passing over

the belt 12 will arrive at a carrier at the proper time. This can most easily be accomplished by making the distance between the mechanical switch and the position where the carriers pick up the articles equal to the distance between the point where the articles are weighed and then are picked up by a carrier and by having the weighing belt 12 and the segregator chains move at the same speed. However, other synchronization means can be used.

The distance between flanges 38 of the carrier must be slightly greater than the width of the articles to be conveyed thereby. In other words, the carrier must be shiftable by at least the width of a flange plus the width of a pin and still be wide enough to present an unobstructed opening to articles coming onto the segregating conveyor. As has previously been mentioned, the distance between the rails 14 is less than the distance between the flanges 38, so that a flange never obstructs an article regardless of the position of the carrier.

In the operation of the device, it has been assumed that each carrier would carry one article. However, the device is adapted to handle articles considerably longer than one carrier, so that the deflection of the switch 70 can be set so that 2, 3, or even more carriers are acted upon at each weighing, or like measurement, so that longer articles can easily be handled.

Although in its preferred embodiment the device of the present invention provides three exit lanes, it will be obvious that a two way segregating device can be built wherein articles of the correct weight move in one path and those articles which are over- and underweight are shunted to the second path. To accomplish this, it is only necessary to eliminate the upper and lower rails on one side of the device, together with one of the solenoids and associated switch. Of course, if this is done, the rods 32 can be made considerably shorter. On the other hand, a segregating device can be built utilizing more than three lanes by using multiple switches which act successively on the carriers. Thus, if two switches were used five lanes could be provided, and so on.

It will be apparent from the foregoing that we have provided a simple segregating mechanism which is capable of operating at high rates of speed and yet which handles the articles gently.

We claim:

1. A segregation device comprising:

- (a) an endless conveyor;
 - (b) means for driving said conveyor in a single direction;
 - (c) a plurality of carriers slidably mounted on said conveyor for movement laterally thereof perpendicular to the direction of movement of said conveyor each of said carriers having a cam follower thereon;
 - (d) first cam means below and adjacent said conveyor, said cam means being so mounted that when in a first position the cam follower of a carrier passing thereby will be engaged and the carrier thereby diverted slightly from its path and when in a second position the cam follower of a carrier passing thereby the carrier will not be contacted by said cam and will not be diverted from its path;
 - (e) means for changing the position of said cam;
 - (f) second cam means positioned adjacent the said conveyor at a point along the path of travel thereof subsequent to said first cam means, said second cam means being so positioned that the cam follower of a diverted carrier passing thereby will be contacted and will be further diverted from its path as the conveyor moves and a non-diverted carrier will not be contacted and diverted;
 - (g) and a loading station for said conveyor intermediate the said first and said second cam means.
2. A segregation device comprising:

- (a) an endless conveyor consisting of a series of parallel rods secured to spaced parallel chains at opposite ends of said rods;
- (b) means for driving said conveyor in a single direction;
- (c) a plurality of carriers slidably mounted on said rods for movement laterally thereof perpendicular to the direction of movement of said conveyor each of said carriers having a cam follower thereon;
- (d) first cam means below and adjacent said conveyor, said cam means being so mounted that when in a first position the cam follower of a carrier passing thereby will be engaged and the carrier thereby diverted slightly from its path and when in a second position the cam follower of a carrier passing thereby will not be contacted by said cam and the carrier will not be diverted from its path;
- (e) means for changing the position of said cam;
- (f) second cam means positioned adjacent the said conveyor at a point along the path of travel thereof subsequent to said first cam means, said second cam means being so positioned that the cam follower of a diverted carrier passing thereby will be contacted and will be further diverted from its path as the conveyor moves and a non-diverted carrier will not be contacted and diverted;
- (g) and a loading station for said conveyor intermediate the said first and said second cam means.
3. A segregation device comprising:
- (a) an endless conveyor consisting of a series of parallel rods secured to spaced parallel chains at opposite ends of said rods;
- (b) means for driving said conveyor in a single direction;
- (c) a plurality of carriers slidably mounted on said rods for movement laterally thereof perpendicular to the direction of movement of said conveyor each of said carriers having a cam follower thereon;
- (d) first cam means below and adjacent said conveyor, said cam means being so mounted that when in a first position the cam follower of a carrier passing thereby will be engaged and the carrier thereby diverted slightly from its path and when in a second position the cam follower of a carrier passing thereby will not be contacted by said cam and the carrier will not be diverted from its path;
- (e) means for changing the position of said cam;
- (f) second cam means positioned adjacent the said conveyor at a point along the path of travel thereof subsequent to said first cam means, said second cam means being so positioned that the cam follower of a diverted carrier passing thereby will be contacted and will be further diverted from its path as the conveyor moves and a non-diverted carrier will not be contacted and diverted;
- (g) a third cam means positioned adjacent said conveyor belt along the path of travel thereof subsequent to the said second cam means, said third cam means being so positioned that the cam follower of a diverted carrier passing therealong will be contacted and the carrier thereby will be returned to an undiverted position on said conveyor and undiverted carriers will not be contacted by said third cam means;
- (h) and a loading station for said conveyor intermediate the said first and said second cam means.
4. A segregation device comprising:
- (a) an endless conveyor;
- (b) means for driving said conveyor;
- (c) a plurality of carriers slidably mounted on said conveyor for movement laterally thereof and perpendicular to the direction of movement of said conveyor;
- (d) a pin on each of the said carriers;
- (e) a leaf spring mounted below and adjacent said

- conveyor, said leaf spring being so mounted that when in a first position the pin of a carrier passing thereby will strike said spring and said carrier will be diverted slightly from its path and when said leaf spring is in a second position, said pin of said carrier will not be contacted by said leaf spring;
- (f) means for changing the position of said leaf spring;
- (g) cam means positioned adjacent said conveyor at a point along the path of travel thereof subsequent to said leaf spring, said cam means being so positioned that a diverted carrier passing therealong will be contacted and will be further diverted from its path as the conveyor belt moves and a non-diverted carrier will not be contacted and diverted;
- (h) and a loading station for said conveyor intermediate said leaf spring and said cam means.
5. The structure of claim 4 wherein each carrier has two pins depending therefrom and wherein a pair of leaf springs are mounted beneath the said conveyor, one of said leaf springs being positioned for contact with one of said pins and the second of said leaf springs being positioned for contact with the other of said pins and wherein said cam means comprises a pair of diverging guide rails positioned opposite one another for contact with one or the other of said downwardly depending pins.
6. A segregation device comprising:
- (a) an endless conveyor consisting of a plurality of rods, each rod being secured at either end thereof to one of a pair of spaced, parallel chains;
- (b) means for advancing said conveyor;
- (c) a plurality of carriers slidably mounted on said rods for movement longitudinally of said rods and perpendicular to the direction of movement of said conveyor each of said carriers having at least a single cam follower thereon;
- (d) first cam means positioned below and adjacent said conveyor;
- (e) means for moving said cam means into three different positions, said first position permitting a carrier to pass thereby without contacting the said cam means, the second position diverting the said carrier to one side by contacting a cam follower of the said carrier and the third position diverting the carrier to the opposite side by contacting a cam follower of the said carrier;
- (f) second cam means positioned adjacent said conveyor at a point along the path of travel thereof subsequent to said first cam means, said second cam means being so positioned that a cam follower of a diverted carrier passing therealong will be contacted and will be further diverted from its path as the conveyor belt moves and a non-diverted carrier will not be contacted and diverted;
- (g) means for loading objects onto said carriers, said means being positioned between the first and second cam means;
- (h) weighing means for said objects;
- (i) and means joining said weighing means and the said first cam means for causing said first cam means to remain in said first position when an object being weighed is within a predetermined weight range, for causing said first cam means to move into said second position when an object being weighed is under a predetermined weight and for causing said first cam means to move into a third position when an object being weighed is over a predetermined weight.

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