ABSTRACT OF THE DISCLOSURE

An apparatus for sorting bottles of different characteristics separates the bottles into groups having the same characteristics. A conveyor brings the bottles to be sorted past a station where a designated characteristic of the bottle is sensed. In accordance with the characteristic sensed, bottles are removed from the conveyor. Bottles may be segregated according to height, diameter, configuration or color.

This invention pertains to apparatus for sorting like articles from a series of unlike articles, and more particularly, it relates to an improved machine for sorting bottles of dissimilar character.

One may observe in a supermarket a variety of beverages contained in reusable bottles of various shapes, sizes and colors, according to the beverage and brand. Commonly, such bottles are returned in cases to the bottle for re-filling and it frequently occurs that bottles pertaining to different brands of beverages, particularly soft drinks, may be contained in the same case.

A bottle of beverages generally finds it convenient to segregate his bottles from those of another bottler, and also to segregate his own bottles according to size, capacity or character of the beverage sold therein. The bottle segregating or separating operation is usually performed before the bottle washing, sterilizing or inspection operation to achieve efficiency in those latter operations.

Machines have been suggested, and some have been provided, for sorting bottles being that both the volume of bottles and the cost of labor to sort them are high. However, those machines which have been provided have been limited in the variety of bottles they are able to handle. Further, such machines are of such an expense to the small or middle size bottler as to substantially limit their application and many of such bottlers continue to sort bottles manually.

In view of the above, it is a general object of this invention to provide an improved apparatus for sorting articles, such as bottles and the like, which is adapted to sort a wide variety of articles of different character.

Another object of the invention is to provide an apparatus of the type described having a capability for enlargement to accommodate the separation of additional varieties of bottles or the like.

Still another object of the invention is to provide an apparatus of the type described adapted for installation in a bottling operations line to be operated in association with the bottle conveyors therein.

Yet another object of the invention is to provide a sorting apparatus for selecting bottles or the like according to height, width or color.

Still another object of the invention is to provide apparatus of the type described for positively selecting bottles from an advancing line thereof to transfer selected bottles for conveyance in a second line.

A further object of the invention is to provide an improved sorting apparatus for articles, such as bottles and the like, which is automatic in operation, easy to maintain, and which is adapted for efficient selection of like articles from an array of unlike articles.

Additional objects of the invention will appear from the following description in which the preferred embodiment of the invention has been set forth in detail in conjunction with the accompanying drawings, in which:

FIG. 1 is an elevation view of an article sorting apparatus made in accordance with and embodying the principles of the present invention;

FIG. 2 is an enlarged plan view of the left-hand portion of the apparatus shown in FIG. 1;

FIG. 3 is a plan view on the scale of FIG. 2 of the right-hand portion of the apparatus shown in FIG. 1;

FIG. 4 is an enlarged, fragmentary, vertical sectional view taken generally in the direction of the arrows along the line 4—4 of FIG. 2;

FIG. 5 is an enlarged, fragmentary, plan view of two of the article engaging devices included in the present invention;

FIG. 6 is a vertical sectional view taken generally in the direction of the arrows along the line 6—6 of FIG. 5;

FIG. 7 is a vertical sectional view taken generally in the direction of the arrows along the line 7—7 of FIG. 5;

FIG. 8 is a horizontal sectional view taken generally in the direction of the arrows along the line 8—8 of FIG. 1;

FIG. 9 is an enlarged sectional view taken in the direction of the arrows along the line 9—9 of FIG. 2.

The present bottle sorting apparatus generally is comprised of a bottle receiving station and a plurality of bottle separating stations arranged along an operations path. A continuous conveyor traverses the path bringing bottles to the receiving station where they are arranged at a predetermined spacing for receipt by individual bottle engaging devices which move the bottles individually over the conveyors to the receiving stations. Bottle sensing means are disposed at each receiving station and are responsive to bottles of a particular characteristic. When a bottle of the particular characteristic is sensed, the bottle engaging device removes the bottle from the operations path and moves it to a star-wheel arrangement which conveys the removed bottle to a second conveyor line. In this manner bottles may be segregated according to height, diameter, etc.

Referring now to the drawings, particularly to FIGS. 1–3, it will be seen that there is shown an apparatus, designated generally by the numeral 10, adapted to sort articles, such as bottles and the like, which is made in accordance with and embodies the principles of the present invention. The sorting apparatus 10 has a general configuration of an elongated table 11 which is composed of a plurality of sections, in the present case three; these being an intermediate section 12 to the left of which is arranged a receiving section 13, a terminal section 14 being disposed to the right of the intermediate section 12, as shown in FIG. 1.

Each of the three sections 12–14 is equipped with its own self-supporting framework which, in the case of the intermediate section 12, includes the floor-engaging leg members 12a and 12b which are arranged in pairs, only one of each pair being shown. The leg members 12a and 12b are, at their upper ends, threadably mounted for purposes of vertical adjustment in a generally rectangularly shaped frame 12c which may be made up from angle iron or the like structurally and resiliently disposed mounting plate 12d is rigidly secured to the frame 12c to provide a platform for mounting various drive elements for the machine 10, to be fully described hereinafter. Arranged above the mounting plate 12d and co-extensive therewith is a horizontally disposed working-surface plate 13a which maintains an angular relation from the mounting plate 12d by a plurality of spacer columns 12f. Thus, the frame structure is arranged to provide adequate space between the plates 12d and
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12c to afford working access to the drive elements arranged upon the mounting plate 12d. A spaced apart pair of back plates 12g extends upwardly from the mounting plate 12d (see FIG. 4) and are covered at the top by a cap plate 12h.

Although the sections 13 and 14 each differ in its respective function from that of the intermediate section 12, the receiving section 13 and the terminal section 14 is effectively driven in a permanently similar manner of construction and arrangement to that of the intermediate section 12. Thus, the receiving section 13 is equipped with legs 13a and 13b, a frame 13c, a mounting plate 13d, a working-surface plate 13e, spacer columns 13f, back plates 13g, and a top plate 13h. The terminal section 14 is, like the intermediate section 12, equipped with legs 14a and 14b, a frame 14c, a mounting plate 14d, a working-surface plate 14e, spacer columns 14f, back plates 14g, etc.

An endless conveyor 16 is disposed adjacent to one side margin of the table 11 and is comprised of a multiplicity of flat plates 16a interleaved with one another, the top run of the conveyor 16 being in sliding engagement with the cap plates 12h, 13h and 14h, see FIGS. 4 and 9. The upper surface of the top run of the conveyor 16 lies in a horizontal plane and is arranged just slightly below the top surface of the working plate 13e, as clearly shown in FIG. 4.

The endless conveyor 16 is caused to move from left to right, as viewed in FIGS. 1-3, by power supplied to a right angle drive 17 (see FIG. 3) by the associated drive chains 18 which serve to rotate a drive sprocket assembly 19 mounted between the pair of back plates 14g on the terminal section 14, as shown in FIG. 8. Power is transmitted to the drive 17 through a drive train fully described below. The opposite or unpowered end of the conveyor 16 is supported from a bracket 21 which encloses the idler sprocket (not shown), the bracket 21 being mounted with respect to the receiving section 13 by conventional supporting structure well known in the art (not shown).

From FIGS. 1-3, it is clear that the conveyor 16 extends the entire length of the sorting apparatus 10, but along its length the conveyor 16 performs and furnishes different functions in relation to the receiving section 13, the intermediate section 12 and the terminal section 14. More particularly, the initial function performed by the conveyor 16 is to convey articles with respect to a receiving station designated generally 23 arranged on the receiving section 13.

Referring now particularly to FIG. 2, it will be understood that in this preferred embodiment of the invention the sorting apparatus 10 is adapted to sort bottles according to sizes and brands, although it is within the purview of the invention to sort other articles with the mechanism constructed within the principles of the present invention. In FIG. 2, it is contemplated that bottles 26 with their necks pointing upwardly will be delivered to the left or receiving end of the conveyor 16 by auxiliary conveying apparatus (not shown) to what is called the receiving or loading station. A spaced pair of upstanding guide rails 24 are arranged on the receiving section 13 to guide the incoming bottles along a predetermined path to align them on one side margin of the conveyor 16 adjacent to the edge of the working-surface plate 13e.

When the bottles are advanced by the conveyor 16 from the receiving section 23 they are advanced into a bottle spacing station. A bottle spacer member 27 having a helical configuration is mounted in the station, as shown in FIG. 2, so that it overlies the conveyor and extends longitudinally of the conveyor 16. The bottle spacer member 27 is preferably mounted in a pair of brackets 26c secured by fasteners 26a to an upper plate 26b [shown in FIG. 9] mounted on the inner one of the back plates 13g. The member 27 is rotated by a drive train including a universal joint equipped drive shaft 29 communicating with a reduction gear box 31 secured to a vertically arranged plate 33 on the receiving section 13, as shown in FIGS. 1 and 5. Motion means, such as an electric motor 34, connected to a reduction gear box 36 drives a main shaft 37 through a sprocket wheel and chain arrangement 38. The main shaft 37 is equipped with a relatively large diameter sprocket wheel 39 and a second sprocket wheel 40 to engage a sprocket plate 27d. A sprocket wheel 42 mounted on a shaft of the gear box 31. The motor 34 is suitably equipped with a starting box 34a and an off-on switch 34b. Operation of the motor 34 through actuation of the switch 34b supplies power to rotate the bottle spacer member 27 so as to successively spread the bottles 26 further apart as they are advanced along the conveyor 16.

Referring now to FIGS. 2 and 9, to maintain the bottles 26 in the selected path adjacent to the margins of the conveyor 16 and in operative confronting relation with the space plate member 27, an abutment or guide member 43 is disposed in the spacing station and extends longitudinally of and along the margin of the conveyor 16. It is also spaced from the recesses in the rotatable bottle spacer member 27 a distance substantially equal to a bottle's diameter.

To guard against crushing of oversized bottles between the abutment or guide member 43 and the bottle spacer member 27, or the crushing of a bottle which may fall over on the conveyor 16, the guide member 43 is yeadily mounted to cooperate with a motor cut-off switch 44 having an actuating pivot arm assembly 44a. More particularly, it will be seen from FIG. 9 that the guide member 43 is mounted for pivotal movement about a horizontal axis established by a pin 46 mounted in a boss 47 extending from a pad 48 secured to the outer one of the back plates 13g of the receiving section 13. A resilient bumper 49 mounted on the member 43 engages the top plate 130 and thereby limits pivotal movement of the member 43 towards the bottle spacer member 27. Outward pivotal movement of the guide member 43 about the pin 46 is yeadily constrained by a compression spring 51 co-axially arranged about a fastener 52 which extends through the member 43 and is threadably secured in the plate 130.

From FIGS. 1-3, it is clear that at the receiving section 23 bottles are received from an incoming conveyor means [not shown] and deposited upon the endless conveyor 16 to be guided by the rails 24 along a predetermined path adjacent the margin of the conveyor 16 and into engagement with the bottle spacer member 27 to issue therefrom with a predetermined spacing so that each bottle 26 may be received by one of a plurality of spaced bottle engaging devices 56. Each bottle engaging device 56 serves to carry one of the bottles 26 from the receiving section 23 on the receiving section 13 towards one of the spaced separating stations 57 arranged on the intermediate section 12 where bottles of a particular configuration are segregated according to their individual physical characteristics.

As will be seen from FIGS. 2, 3 and 7 that the bottle engaging devices 56 are connected in an endless line, one portion of which travels adjacent to and along the conveyor 16 from the spacing station and through the separating stations 57. Each of the devices 56 is secured to an endless chain 59 [see FIG. 4] arranged below the working plates 12, 13d and 14e, the chain 59 being driven by a sprocket wheel 60 on an electric motor 34, as already shown in FIG. 8. An idler sprocket wheel 65 is mounted on a shaft 70 extending from a chain tensioner assembly 75.
mounted on the plate 14d of the terminal section 14. The assembly 75 serves to maintain the chain 59 under proper tension.

Referring now particularly to FIGS. 5-7, it will be seen that the arm 64b includes a stacked assembly of generally planar members which are, from bottom to top, a sliding or bottom plate 61, a spacer 62 and a segment plate 63, each fixedly secured to the sliding plate 61. A rocker 64 is mounted for pivotal movement upon a pin 78 extending through the segment plate 63, and a bottle engaging member 66 is mounted for rotational movement on the receiver 75. A bushing 82 mounted in the bottom plate 61 serves to suitably position these members and is arranged in conjunction with the bushing 68 mounted in a shoulder-shaped portion 69 of the juxtaposed sliding plate 61 and spacer 62.

The sliding plate 61 is attached to the endless carrier chain 59 by the fasteners 72 and 73. The latter extending through the segment plate 63 and spacer 62 as well. A portion of the sliding plate 61 is generally trapezoidal in plan, as considered from the line extending between the fasteners 72 and 73, and has a straight side edge 61a which, when the device 56 traverses the working or feed run along the machine 10, confronts a substantially straight wall 71 [see FIGS. 2 and 3] which extends from the spacing station fully across the separating stations 57 and 58 and onto the terminal section 14, as shown in FIG. 3. The housing 71 and side edge 61a serve to maintain the device 56 in the desired alignment as the device travels adjacent the predetermined path for the bottle.

The bottle engaging member 66 also extends over the conveyor 16, the member 66 having an upper crescent-shaped pusher member 66a and a similarly shaped bottom pusher member 66b which together receive the bottle 26 and urges it along the path. It will be understood that the device 56 is caused to move at a slightly greater speed than the conveyor 16 so as to permit the bottle 26 to settle into the “pocket” defined by the crescent-shaped members 66a and 66b.

The member 66 is arranged to rotate on the shaft 67 from a first position, as shown to the left in FIG. 5, for conveying bottles 26 along an operations path, to a second position, as shown to the right in FIG. 5, for removing a bottle 26 from said path at a separating station. More particularly, the member 66 is maintained in the first position by a tensioned return spring 74 secured to one end to a pin 72a arranged in the bottom pusher member 66b, the other end of the spring 74 being fixed to the segment plate 63, as shown in FIG. 7. The tension in the spring 74 serves to urge and maintain the bottom pusher member 66b against an abutment or stop defined by an edge 63a of the segment plate 63, as shown in FIG. 5.

The member 66 is urged from the first to the second position by a fixed cam follower 76 [see FIG. 6] which engages a cam surface 77 disposed along the corner of the member 66b remote from the shaft 67, as shown in FIG. 5. More specifically, the rocker 64 is generally V-shaped in configuration having arms 64a and 64b and is mounted for pivotal movement about the pin 78 arranged at the apex of the rocker 64. The fixed cam follower 76 is mounted on the arm 64a and extends therebelow in adjacency to the cam surface 77 of the bottom pusher member 66b.

The arm 64b of the rocker 64 is equipped with a vertically shiftable, selector cam-follower 79 mounted at the end of an axially movable shaft 81 which extends through a bushing 82 disposed in the arm 64b. The upper end of the shaft 81 is provided with a cylindrical pad 83 adapted to cooperate with the plunger 84 (see FIG. 5) for the selector cam-follower 79 from the out-of-the-way or raised position, as shown in FIGS. 6 and 7, to the operative or lowered position, shown in FIG. 4, as so to permit the follower 79 to engage a selector-cam 86 or 86a arranged at a separating station.

As may be seen in FIGS. 2, 3 and 5, the selector-cam 86 is mounted on the way 71 and extends inwardly therefrom toward the conveyor 16, the cam 86 having a cam surface 86a which projects progressively inwardly in the direction of conveyor travel from the way 71 toward the conveyor. When the selector-cam follower 79 is disposed in the lower position, as shown in FIG. 4, it will engage the selector cam surface 86a. As the device 56 is carried forwardly, the follower 79 will follow the cam surface 86a and pivot the rocker 64 about the axle 78 serving to move the member 66 into engagement with the ejection cam surface 77 on the operations path once a bottle 26 has been ejected from the device 56, a self-cancelling or “cocking” feature is included on the device 56 which serves to shift the follower 79 upwardly to an out-of-the-way position where it may pass over successive selector cams along the operations path.

More specifically, the segment plate 63 is provided with a cancelling cam surface 87, as shown in FIGS. 5 and 6, which is arranged to incline upwardly in the direction towards the member 66. A cancelling cam-follower 88 is mounted on the shaft 81 immediately above the selector cam-follower 79. The cancelling cam-follower 88 has a general configuration of a truncated cone and, as arranged on the shaft 81, extends horizontally over the cam surface 87 so that when the plunger 84 has thrust the selector cam-follower 79 into the lower position, as shown in FIG. 4, the cancelling cam-follower 88 is disposed in engagement with the cam surface 87. The upper end of the shaft 81 is caused to pivot from the first to the second position, as shown in FIG. 5, the cancelling cam-follower 88 rolls upwardly on the ramp-like cam surface 87 reaching the top thereof and thereby raising the cam follower 79 at the time when the follower 79 has completed its traverse of the cam surface 86a.

To maintain the cam 79 and shaft 81 in the upper position, a detent 89 is arranged on the rocker 64, the detent taking the form of a wire-like element which extends through a horizontal slot in the bushing 82 to engage within a complementary receptacle on the shaft 81, as shown in FIG. 5. When the shaft 81 is forced downwardly, the arm of the detent 89 is urged outwardly
from the slot and conversely, as the shaft 81 is raised in response to the action of the cancelling-cam, the wire-like detent 89 snaps back into the recess, holding the shaft 81 and its associated cam-follower in the out-of-way position.

Previously mentioned was that at a separating station 57 the plunger 84 could be caused to descend to engage with the pad 83 so as to push the shaft 81 and its associated cam-follower into the lower end position, and thus to cause a bottle 26 to be removed from the operations path. The plunger 84 is arranged on the lower end of a vertically reciprocable shaft 91 which forms the core of a solenoid 92, the upper end of the shaft 91 being biased by a spring 93 secured to a C-shaped bracket 94 to return the shaft 91 to its raised position upon completion of the downward stroke. The bracket 94 and the solenoid 92 are supported by a vertically disposed standard 96, as shown in FIG. 4.

The solenoid 92 is energized through a relay [not shown] which is actuated in response to a sensing device responsive to the physical characteristics of bottles 26 passing along the operations path. More specifically, the sensing device may take the form of a photo-electric cell arrangement, as shown in FIG. 4, at the first separating station 57 or the form of a "ticker" actuated switch 97, having a detect 97a, as shown in FIG. 5, and disposed at the second separating station 58.

Considering now the bottle size sensing device at the first separating station 57, reference is had to FIG. 4 wherein is shown a photo-electric sensing arrangement 98 which includes a light source 98a and receiver 98b arranged in a horizontal plane at an elevation from the conveyor 16 corresponding to the height of a particular size of bottle 26. The light source 98a and receiver 98b are suitably mounted on a cross arm 99 adjustably secured at one end to a vertically arranged standard 101 at the first separating station 57. Should it be desired to separate at the station 57 bottles of a height differing from those separated in the previous run, the sensing means 98a and 98b may be raised and/or lowered on the standard 101 to detect a bottle having a greater height than that permitted to pass through the station 57.

When the bottle 26 passing through the separating station 57 breaks the light beam between the elements 98a and 98b, the photo cell mechanism 98c [see FIG. 2] permits the relay [not shown] to convey current to the solenoid 92 causing the plunger 84 carried by the shaft 91 to descend to engage the pad 83 to force the selector cam 85 into the lower end position for engagement with the selector cam surface 86a causing the device 56 to remove the bottle 26 from the operations path.

Bottles 26 may be selected according to diameter at the second separating station 58 from contact of a bottle with the ticker sensing switch 97, the switch 97 being of the variety well known in the art and including a projecting wire-like element 97a which extends towards the operations path for engagement with bottles having a diameter greater than those permitted to pass through the station 58. The switch 97 cooperates with a relay [not shown] and a solenoid in the manner previously described in regard to the separating station 57. Various other sensing means responsive to bottle size, bottle color, and the like, may be arranged at the sensing stations on the machine 10.

To convey bottles away from the conveyor 16 after they have been ejected by the device 56, a rotatable star-wheel 102 is arranged at the first separating station 57, a second star-wheel 103 being similarly arranged at the second separating station 58, as may be seen from FIGS. 2 and 3 respectively. Each star-wheel 102 and 103 rotates in the direction of the arrows shown respectively in FIG. 2. An arcuate guide on a star-wheel a distance to permit bottles 26 to be carried in the pockets 102a of the wheel 102.

Suitable endless conveyors 131 [as seen in FIG. 4] may be arranged at the exit point adjacent to a star-wheel 102 or 103 to carry bottles through a second separating station 104 and cooperate with the sprocket 111 to rotate the second star-wheel 103. A chain 120 is mounted on the counter shaft 114 [see FIG. 8] which, in turn, is driven through a chain and sprocket arrangement 116 which is driven from the shaft 37 through a gear 110 mounted thereon and meshing with a gear 115 which is secured to a shaft 120 upon which there is mounted a sprocket 125 for driving the chain and sprocket 116.

The second star-wheel 103 at the second separating station 58 is driven from the shaft 106 of the first star-wheel 102, the shaft 106 having below the sprocket 109 a sprocket 110. A chain and sprocket arrangement 116 is provided on the drive shaft 107 of the second star-wheel 103 and cooperates with the sprocket 111 to rotate the second star-wheel 103. A chain take-off from the shaft 106 [see FIG. 8] which includes the chain 122, and sprocket 123 and shaft 124 furnished power to an idler shaft 136 which, through a sprocket and chain arrangement 139, supplies power to the right angle drive 17 which powers the endless conveyor 16.

It will be understood that the star-wheel 102 and 103 are rotated at a speed so as to synchronize with the movement of the devices 56 through the separating stations so as to receive the bottles 26 as they are ejected from the operations path by the member 66.

Bottles which have not been separated at the stations 57 and 58 are ejected from the operations path near its terminal portion through the encounter by the devices 56 with a terminal cam 127 disposed on the terminal section 14, as shown in FIG. 3. The cam 127 is arranged above the working plate 14e a distance so as to engage the selector cam-follower when it is in the raised position. Thus, any bottles remaining in a device 56 are ejected from the path before the series of devices 56 make the return run to the spacing station. When ejected from the terminal portion 14, the bottles may be carried by the conveyor 16 to be received by another conveyor [not shown] and taken to another portion in the plant for further processing. A guard 128 is mounted along the outer margin of the conveyor 16 to ensure that bottles carried therealong are maintained upon the conveyor.

It will be observed from FIGS. 2, 3, and 3, taken in conjunction with FIG. 8, that the separating stations 57 and 58 are both contained upon the intermediate section 12e. Further, in FIG. 8, it is seen that the drive of the separating stations is also so disposed mounted upon the plate 12d. Where additional separating stations are desired in the machine constructed in accordance with the invention, additional intermediate sections 12 may be supplied and the drive train arranged to accommodate such new sections. Thus, the machine of the instant invention is advantageously of modular design flexibly adapted to the requirements of small, intermediate or large bottle separating operations.

To summarize the operation of the article separating machine 10, the initial step is to actuate the on-off switch 346 to set the motor 34 into operation. The motor 34, through the drive train previously described, causes the endless conveyor 16 of the second star-wheel 103, shown in FIGS. 2 and 3. Simultaneously, the spacer member 27 is caused to rotate in the direction to advance the
bottles in the direction of conveyor movement. The procession of devices 56 is also placed in motion in a clockwise direction as viewed in FIGS. 2, 3 and 5. The first 102 and the second 103 star-wheels are also placed in rotation in the direction of the arrows, as shown respectively in FIGS. 2 and 3.

Let it be assumed that a supply of bottles, which include bottles of different sizes and shapes, is placed upon the left end of the conveyor, as viewed in FIG. 2, these bottles will be carried between the guide rails 24 to be conveyed into engagement with the spacer member 27. Here, the bottles will be spaced 56 apart in a predetermined path, so that when exiting from the spacer member 27 each bottle 26 will be properly disposed as to be received in the member 66 of one of the devices 56.

The series of devices 56 convey the bottles at a slightly greater speed than the conveyor 16 so that each bottle 26 is secured within the "pocket" defined by the pusher elements 66a and 66b of the devices 56. By reason of this differential in speed the bottle is urged against the pushers 66a and 66b and maintained in a vertical position as it is carried along the operations path.

To be further assumed is that the sensing devices 97 and 98 have been each pre-set according to the physical characteristics of the bottles desired to be separated respectively at the first and second separating stations. For example, bottles may be separated at the first separating station 57 according to the height while at the second separating station 58 bottles may be separated according to diameter.

As a bottle 26, having a height greater than the elevation of the photo-electric sensing means 98 at the first separating station 57 passes through and breaks the light beam the solenoid plunger mechanism 94 descends to pull the selector cam-follower 79 in the lower position so that it may engage the selector cam 86 at the first separating station 57. As the selector cam-follower 79 traverses the selector cam surface 86a the member 66 pivots from the first to the second position, as shown in FIG. 5. When the member 66 is extended to the second position, the bottle 26 therein is so disposed as to be received by the star-wheel 102 and within one of its bottle carrying "pockets" and conveyed from the operations path in the direction of the arrow, as shown at the separating station 57 in FIG. 2. From the star-wheel 102 the bottle may be conveyed to another position in the plant by the conveyor means 13 as shown in FIG. 6.

Bottles which do not actuate the photo-electric cell sensing means at the first separating station 57 pass through the first to the second separating station 58. Here, each bottle confronts the diameter sensing mechanism 97. Should a bottle be of a greater diameter than that for which the mechanism 97 is set a similar solenoid actuated plunger mechanism will depress the selector cam-follower causing it to engage the selector cam 86 and thereby to eject the bottles to the selected size from the operations path for engagement with the second star-wheel 103 and to be carried thereby towards other conveyor means [not shown].

Bottles which have been carried by the devices 56 through both the first 57 and the second 58 separating stations are ejected from the operations path as the devices 56 pass along the terminal selector cam 127. These bottles remain upon the conveyor 16 while the procession of devices 56, now devoid of bottles, return to the receiving station 23. At the end of the conveyor 16 the bottles may be received upon auxiliary associated conveying apparatus [not shown].

After each selector cam-follower has been caused to travel across the surface of the cam-follower 79, engagement with the cancelling cam surface 87, serves to urge the selector cam-follower 79 to the raised position. At this time, the yoke return spring 74 pulls the bottle engaging yoke 66 into the original first position, as shown in FIG. 5.

While there has been described what is at present considered to be the preferred embodiment of the invention, it will be understood that various modifications may be made therein and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

I claim:

1. A bottle sorting apparatus for sorting bottles of different characteristics into separate groups of bottles with each group of bottles having the same characteristic, a conveyor travelling in a predetermined path and having portions thereof forming a receiving station and a plurality of spaced separating stations, the bottles to be sorted being delivered to the receiving station by the conveyor so that they are advanced by the conveyor along the predetermined path, means travelling substantially in synchronism with the conveyor and engaging the spaced bottles as they are advanced by the conveyor, means for sensing the desired characteristics of the bottles to be sorted and means operatively connected to said sensing means and to said means travelling substantially in synchronism with the conveyor for causing said means travelling substantially in synchronism with the conveyor to remove the bottles from the predetermined path in the separating stations in accordance with the characteristics sensed.

2. Apparatus as in claim 1 wherein the portion of the conveyor travelling through the receiving station and the discharge stations is disposed in a substantially horizontal plane and wherein the bottles are resting upon the conveyor with their necks facing upwardly.

3. Apparatus as in claim 2 wherein said conveyor is endless and wherein said means travelling substantially in synchronism with the conveyor engaging the spaced bottles includes a plurality of bottle engaging devices and means connecting the bottle engaging devices into an endless loop, each of the bottle engaging devices having a bottle engaging member, the bottle engaging member being movable between a bottle retaining position and a bottle removing position, said bottle engaging member being operable to override the conveyor when the bottle engaging member is in said bottle engaging position.

4. Apparatus as in claim 3 wherein each of the bottle engaging members has a recess, said bottle engaging devices being arranged so that the bottle engaging members engage the trailing side of the bottles as the bottles are engaged by the conveyor means 13.

5. Apparatus as in claim 1 together with means mounted adjacent the conveyor ahead of the separating stations and after the receiving station for arranging the bottles received in the receiving station in a predetermined space relationship.

6. Apparatus as in claim 1 together with means in each separating station for receiving each of the bottles removed in the separating station, said means for receiving the bottles in each separating station including an accurate guide member having one portion of the same adapted to engage the bottle when it has been moved out of the predetermined path by the bottle engaging member, a star-wheel, and means for rotating the star-wheel, said star-wheel being disposed adjacent the arcuate member and having bottle receiving recesses adapted in cooperation with the arcuate guide member to carry the bottles away from the conveyor.

7. Apparatus as in claim 1 wherein said means operatively connecting the sensing means to said means travelling substantially in synchronism with the conveyor and engaging the spaced bottles includes a cam member in each of the separating stations, each of the bottle engaging devices having a cam-follower movable between a cam engaging position and an out-of-the-way position, said cam member operatively connected to the sensing means for moving the cam-follower from the out-of-the-way position to the cam engaging position adjacent a separating station when a bottle of the desired characteristics has
been sensed having a characteristic corresponding to the characteristic of the bottles to be removed at said separating station.

3. Apparatus as in claim 7 together with means for causing said cam-follower to return to the out-of-the-way position after a bottle has been removed from the predetermined path.

4. Apparatus as in claim 3 wherein said last named means includes an additional cam member in each bottle engaging device, and an additional cam-follower adapted to engage the additional cam member mounted on the bottle engaging device and means connected to the additional cam-follower for causing said first named cam-follower to return to the out-of-the-way position when the additional cam-follower engages the additional cam member.

10. Apparatus as in claim 1 wherein said sensing means includes means for sensing the height of the bottles on the conveyor.

11. Apparatus as in claim 1 wherein said sensing means includes means for sensing the diameter of the bottles on the conveyor.

12. In a bottle sorting apparatus for sorting bottles of different characteristics into separate groups of bottles with each group of bottles having the same characteristics, said apparatus including a plurality of spaced separating stations, said conveyor in said receiving station and in said separating stations having a surface travelling in a horizontal plane whereby the bottles may be delivered to the receiving station so that they rest upon the conveyor with their longitudinal axis perpendicular to said surface, means mounted adjacent the conveyor for arranging the bottles delivered to the receiving station so that they have a predetermined spacing on the conveyor, means including a plurality of bottle engaging devices travelling at a speed just slightly greater than the speed of movement of the conveyor, each of said bottle engaging devices including a bottle engaging member movable between a bottle retaining position and a bottle removing position, sensing means for sensing the desired characteristics of the bottles to be separated, and means operatively connected to said sensing means and to said means including a plurality of bottle engaging devices for causing the bottle engaging member of the bottle engaging device having a bottle of a predetermined characteristic therein to move to the bottle removing position to thereby remove the bottle having the predetermined characteristic from the predetermined path.

In the separating station receiving bottles having said predetermined characteristic, and means mounted in each of the separating stations for removing the bottles which have been separated from the predetermined path.

13. Apparatus as in claim 12 wherein said means for arranging the articles so that they have a predetermined spacing on the conveyor consists of a helical member extending longitudinally of and overlying the conveyor and adapted to engage the bottles on one side as they adjacent the conveyor opposite the helical screw and extending longitudinally of the conveyor for guiding the opposite sides of the bottles as they are advanced over the conveyor, and means for rotating the helical member.

14. Apparatus as in claim 13 together with means mounting said guide member and permitting restrained movement of the same, and means sensing the movement of said guide member for stopping operation of said means for rotating the helical member when said guide member has been moved beyond a predetermined position.

15. Apparatus as in claim 12 wherein each of said advanced by the conveyor, and guide means mounted article engaging members is provided with a recess and is advanced so that it overlies the conveyor and engages the bottle with the helical member engaging the guide member, and wherein means is provided in each of the separating stations for removing the bottles which have been separated in the station, said means for removing the bottles including an arcuate guide member having a portion thereof overlying the conveyor in relatively close proximity to the predetermined path for the bottles and being adapted to engage bottles removed from the predetermined path by the bottle engaging member, a star-wheel, means for rotating the star-wheel, the star-wheel having bottle engaging recesses and being disposed adjacent the arcuate guide member whereby when a bottle is engaged by the arcuate guide member it is moved into a recess of the star-wheel and is advanced away from the conveyor by the star-wheel.

16. In a bottle sorting device for use in a bottling apparatus of the type utilized for sorting like bottles from a plurality of unlike bottles as such bottles are conveyed along a predetermined path, said bottles sorting device comprising a base, a bottle engaging member mounted on said base for pivotal movements from a first position for engaging and transporting a bottle along said path to a second position for removing said bottle from said path, said device including rocker means pivotally mounted on said base and engageable with said member to move the same from said first to said second position, a cam-follower associated with said rocker means and reciprocally movable between operative and an out-of-the-way position along a timed path and means for automatically moving said cam-follower along said operations path when said cam-follower is reciprocated to its operative position, and cancelling means on said device for returning said cam-follower to said out-of-the-way position when a bottle has been removed from said path.

17. A bottle sorting device as in claim 16 wherein each said device includes a cancelling cam having a cancelling cam surface engageable by said cam-follower and inclined progressively upwardly in the direction of pivotal movement of said rocker means when the same moves said member toward said second position.

18. The device as in claim 16 together with spring means inter-connecting said member and said rocker means, said spring means being tensioned during movement of said bottle engaging member to said second position and serving to return said bottle engaging member to said first position upon disengagement of said cam-follower from said cam.

19. The bottle sorting device as in claim 16 in which said rocker means includes detent means serving to maintain said cam-follower normally in said out-of-the-way position.

20. In apparatus for selecting like articles from a plurality of unlike articles, a framework having portions thereon forming a receiving station and a plurality of separating stations, spacing means for arranging articles delivered to said receiving station in a predetermined spaced apart relationship, means including a plurality of article engaging devices arranged to receive such spaced articles from said spacing means and to retain and convey such articles along a predetermined path from the receiving station successively to each of the separating stations, each article engaging device being equipped with an article engaging member movable from a first position to engage and transport an article along said path to a second position wherein said member removes such articles from said path, article sensing means at each separating station responsive only to articles of a selective variety moving along said path, means co-acting with said sensing means and said article engaging device for moving said article engaging member in response to said sensing means, and article receiving means arranged at each of said separating stations to receive articles of such selected variety removed from said path.

21. In apparatus for selecting like articles from a plurality of unlike articles, a supporting framework forming spaced roller members, said roller members engaging the bottle with the roller member engaging the guide member, and wherein means is provided in each of the separating stations for removing the bottles which have been separated in the station, said means for removing the bottles including an arcuate guide member having a portion thereof overlying the conveyor in relatively close proximity to the predetermined path for the bottles and being adapted to engage bottles removed from the predetermined path by the bottle engaging member, a star-wheel, means for rotating the star-wheel, the star-wheel having bottle engaging recesses and being disposed adjacent the arcuate guide member whereby when a bottle is engaged by the arcuate guide member it is moved into a recess of the star-wheel and is advanced away from the conveyor by the star-wheel.
ing from the receiving to the separating stations, sensing means at said separating station responsive only to articles of a selected variety, each article engaging device including a base, and an article engaging member mounted on said base for pivotal movements from a first position for engaging and transporting an article along said path to a second position for removing said article from said path, each of said devices also including rocker means pivotally mounted on said base and engageably with said member to move the same from said first to said second position, a cam-follower associated with said rocker means and reciprocally movable between operative and inoperative positions, a cam arranged at said separating station for cooperation with said cam-follower when the same is reciprocated to its operative position and serving to cause said rocker means to move said member from said first to said second position, reciprocating means actuated in response to said sensing means to urge said cam-follower into said operative position, and cancelling means on each of said article engaging devices for returning said cam-follower to said inoperative position when such article has been removed from said path.

22. Apparatus as in claim 21 wherein said cancelling means on each of said article engaging devices includes a cam having a cam surface engageable by said cam-follower and inclined progressively upwardly in the direction of pivotal movement of said rocker means when the same moves said member towards said second position.

23. Apparatus as in claim 21 together with spring means inter-connecting said member and said rocker means, said spring means being tensioned during movement of said bottle engaging member to said second position and serving to return said bottle engaging member to said first position upon disengagement of said cam-follower from said cam.

24. Apparatus as in claim 21 in which said rocker means includes detent means serving to maintain said cam-follower normally in said inoperative position.

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