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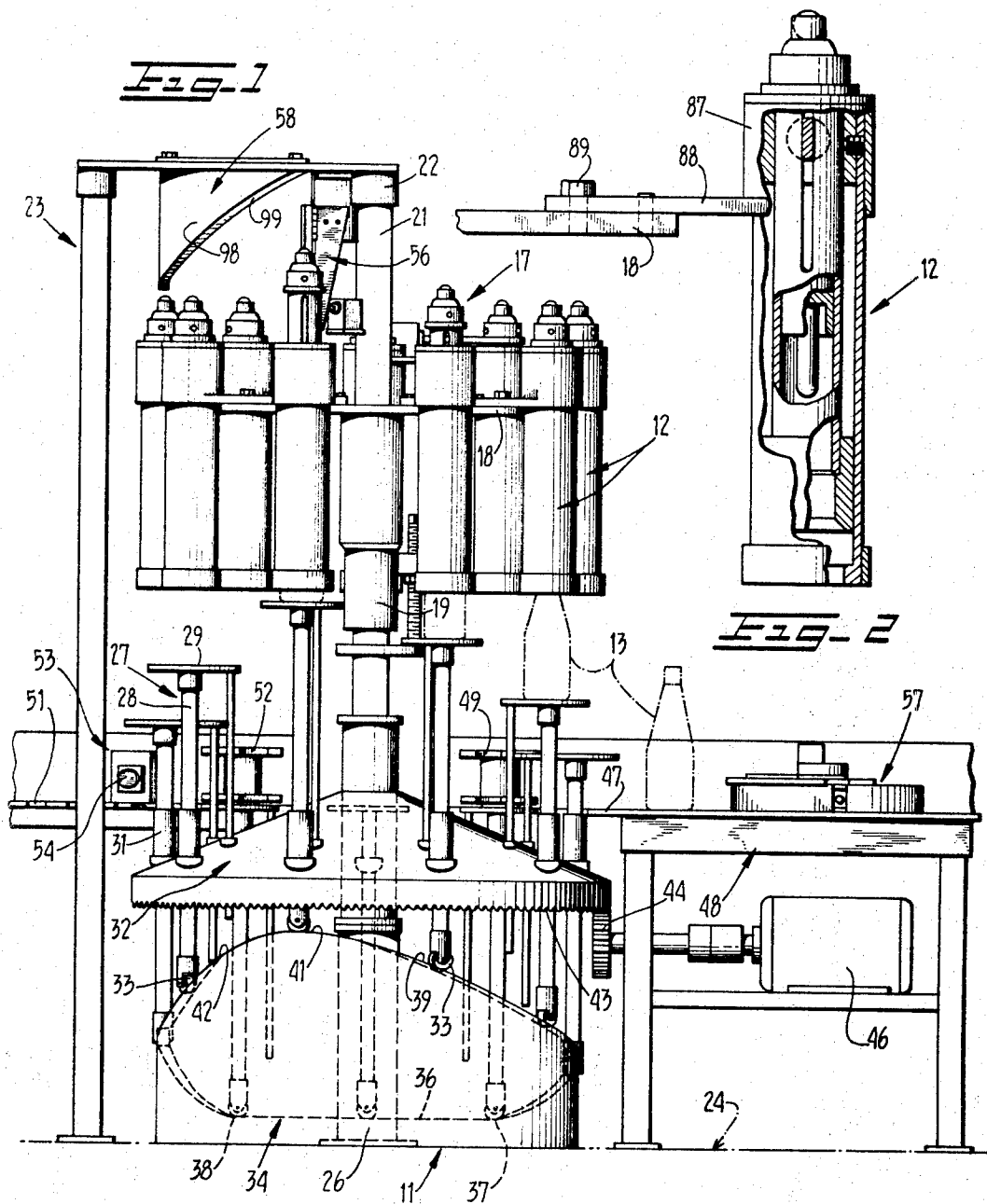
R. T. VINCENT

3,407,931

BOTTLE GAUGING APPARATUS

Filed Feb. 15, 1966

3 Sheets-Sheet 1



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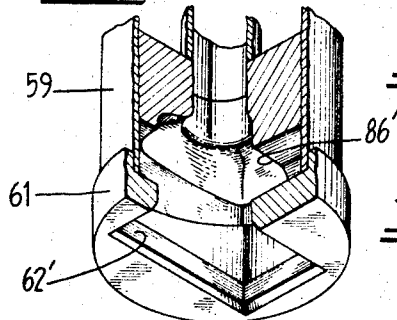
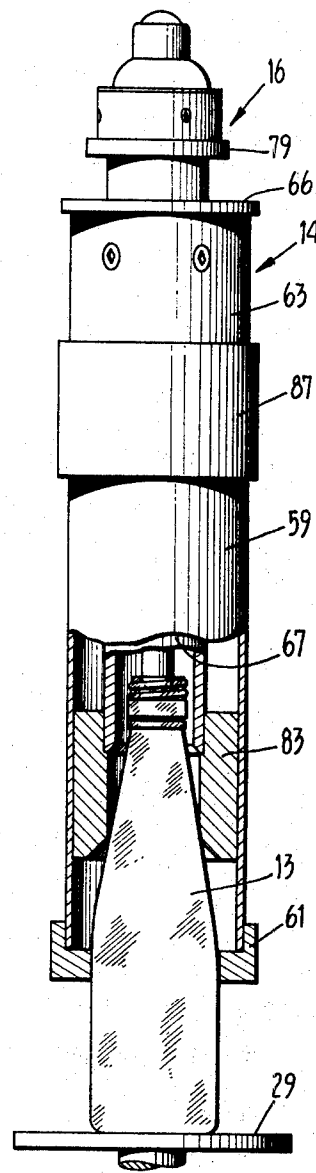
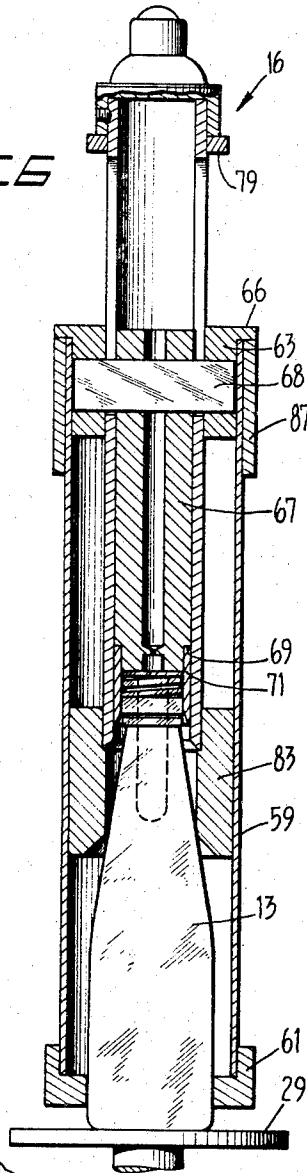
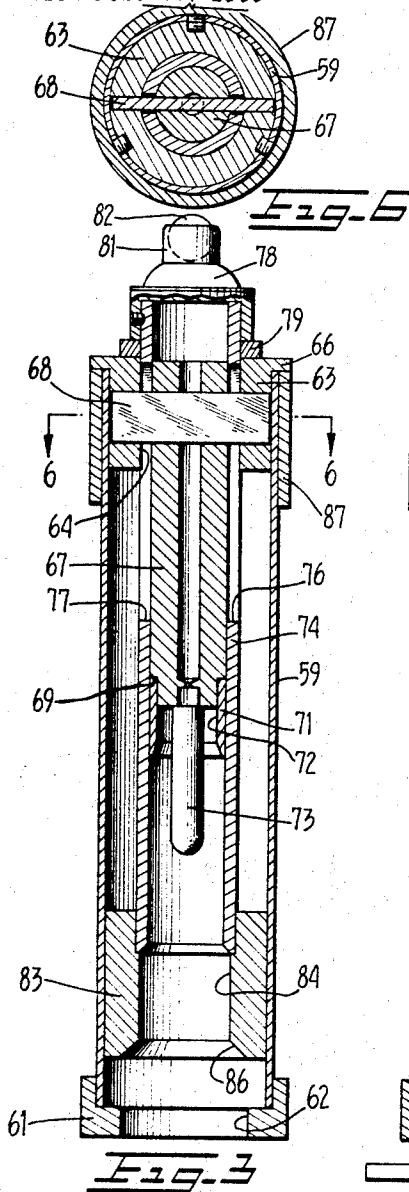
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3 Sheets-Sheet 2



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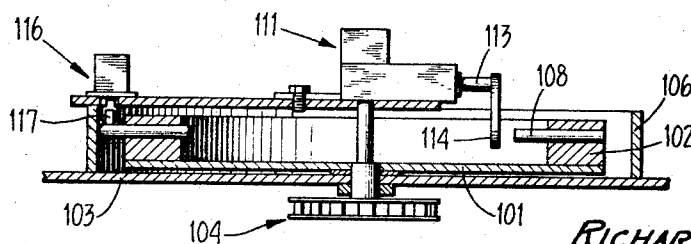
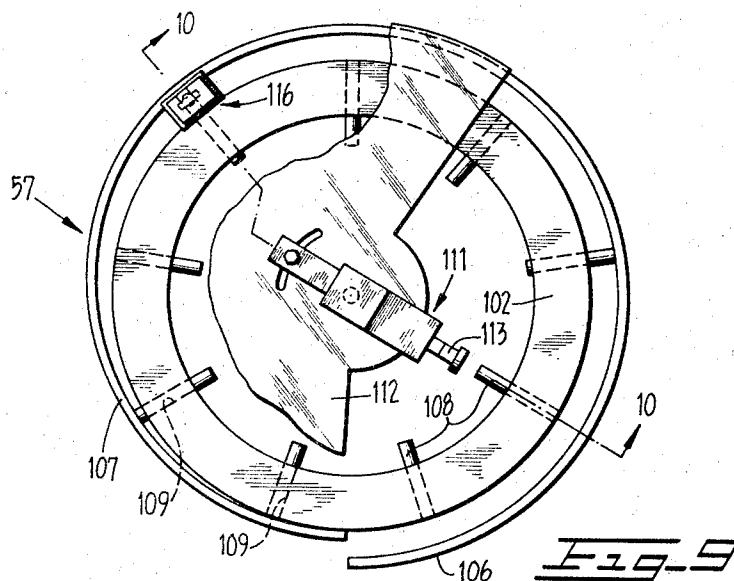
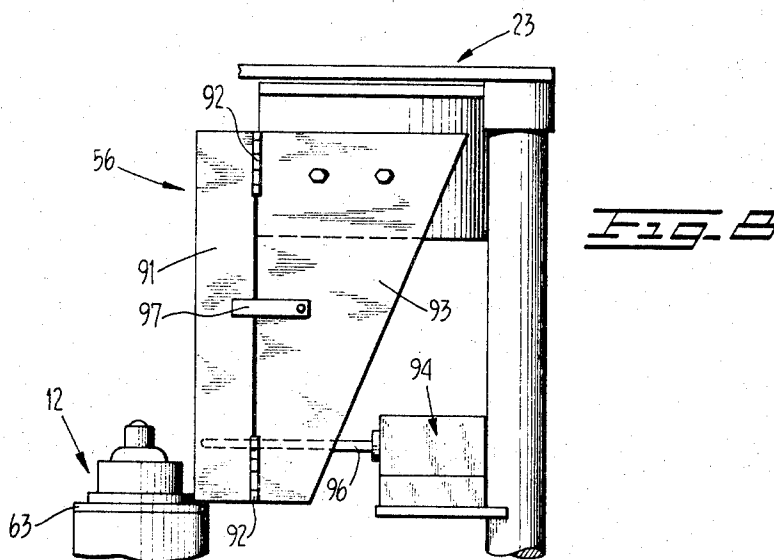
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3 Sheets-Sheet 3



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3,407,931

BOTTLE GAUGING APPARATUS
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7 Claims. (Cl. 209-75)

ABSTRACT OF THE DISCLOSURE

An automatic gauging apparatus is described for gauging the dimensions of bottles to classify them as having either acceptable or unacceptable dimensions. The apparatus includes a turret having adjacent its periphery, a plurality of circumferentially spaced gauging elements. Beneath each gauging element is a lifting platform for lifting a bottle into the element to determine whether it has acceptable dimensions. Each gauging element includes a bottom head through which a bottle must pass and which determines whether the body is out-of-round or greater than a prescribed dimension. An elongated finger within each classifier element checks the interior dimension of the neck of the bottle, and the peripheral wall of a recess which is coaxial with the finger checks the exterior diameter of the neck. The base wall of the recess determines the correctness of the height of the bottle. All of the gauging surfaces of the classifier element are provided as a unit and if any one of them indicates a defective dimension, the classifier unit is displaced vertically with respect to a supporting frame member. Any such displacement is sensed by a defect sensing means which through a memory system activates an ejector means for separating the defective bottles from the acceptable bottles.

This invention relates to automatic gauging and sorting apparatus in general, and is more particularly directed to apparatus for automatically gauging bottles to classify them as being acceptable or defective and separating the thus classified defective bottles from the acceptable bottles.

In the bottling of wine and other beverages, it is of importance that the bottles be within certain predetermined dimensional limits so as to function properly with the bottling process equipment. For example, the neck of the bottle may be "choked," i.e., the inside diameter may be less than a predetermined minimum limit for which a filler tube may be unobstructively inserted into the neck to facilitate filling of the bottle. The outer diameter of the neck may be greater than a predetermined maximum limit with which capping or corking apparatus will operate successfully. Likewise, the height of a bottle may exceed that for which the capping or corking apparatus will properly operate. In the event the exterior dimensions of the body of a bottle exceed predetermined limits, it may not be possible to properly package such bottles in crates. Excessive bottle height is also detrimental to packaging. Moreover, some bottles are "leaners," i.e., upper portions of the bottle significantly depart from a coaxial relationship with lower portions of the bottle. Leaners are not suited to use with the filling apparatus, capping apparatus, or packaging apparatus.

Thus, it is desirable to determine whether or not the bottles are within all of the foregoing predetermined dimensional limits before the bottles are used with bottling process equipment. This can be accomplished by gauging the bottles for such dimensional limits and classifying them as either acceptable or defective, depending upon whether they are within or without the limits. The bottles classified as defective may then be separated from the acceptable bottles and discarded. Only acceptable bottles remain for use with the bottling equipment. It is of

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course desirable that the steps of gauging, classification, and separation be accomplished automatically at high speed. Although various bottle gauging devices and systems of gaugers, classifiers, and separators have existed heretofore, they have been variously disadvantageous and limited in their operation. Some existing gaugers are capable of gauging bottles for only some, but not all of the previously discussed dimensional limits. To gauge all of the limits, it has usually been necessary to employ a number of gaugers, each for a different dimensional limit, operating in sequence. Aside from the complexity of the associated classification and sorting mechanisms attending the sequential use of separate gaugers, the throughput of the system is limited by the number of separate gauging operations required.

It is therefore an object of the present invention to provide an improved gauger which as a single unit is capable of gauging a bottle for predetermined dimensional limits of inside and outside neck diameters, height, leanage, and outside body diameter in a single pass at the bottle.

Another object of the invention is the provision of a gauger of the class described which is so arranged that in response to a bottle having a dimension outside of any one of the predetermined limits to be gauged, a classifier element of the gauger is actuated from an acceptable bottle indicating position to a defective bottle indicating position.

It is still another object of the invention to provide a gauger of the class described having a knockout mechanism for insuring the release of bottles from the gauger subsequent to gauging thereof.

Yet another object of the invention is the provision of gaugers of the class described in a bottle classifying and sorting system arranged to eject a bottle from a conveyor line in response to the classifier element of the gauger in which the bottle was gauged being actuated to defective bottle indicating position.

A more specific object of the invention is to provide a bottle classifying and sorting system having gaugers in the form of heads mounted on a turret rotating in synchronism with bottle lifters for progressively lifting bottles into the correspondingly positioned heads to classify same as defective or acceptable in route to a take off conveyor, and to effect actuation of an ejector when the conveyor moves a bottle classified as defective adjacent the ejector.

Another object of the invention is the provision of a system of the class described so arranged that defective bottles in engaging the gauge heads move classifier elements thereof to defect indicating positions wherein they are operable to trigger a defect sensor arranged to actuate a memory in turn effective to actuate the ejector at times the corresponding defective bottles are adjacent same.

It is a further object of the invention to provide a system of the class described wherein different sets of gauge heads may be readily interchangeably employed to classify different sizes and shapes of bottles.

A still further object of the invention is the provision of a system of the class described having a mechanical memory of unique design.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawings accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawings and description may be adopted within the scope of the invention as set forth in the claims.

FIGURE 1 is a side elevational view of a bottle classi-

fying and sorting system in accordance with the invention.

FIGURE 2 is a side elevational view with portions broken away of one of the novel gaugers employed in the system.

FIGURE 3 is a sectional view on an enlarged scale taken at a diametric plane through one of the gaugers.

FIGURE 4 is a view similar to FIGURE 3, but with a bottle partially received in the gauger and priming a knock-out element thereof for subsequent bottle releasing actuation.

FIGURE 5 is a view similar to FIGURES 3 and 4, but with a defective bottle received in the gauger and actuating a classifier element thereof to defect indicating position.

FIGURE 6 is a sectional view taken at line 6—6 of FIGURE 3.

FIGURE 7 is a fragmentary perspective view with portions broken-away of a modified form of gauger for gauging flask bottles.

FIGURE 8 is a fragmentary elevational view on an enlarged scale of a defect sensor arrangement employed in the system of FIGURE 1.

FIGURE 9 is a plan view on an enlarged scale of a preferred mechanical memory employed in the system of FIGURE 1.

FIGURE 10 is a sectional view taken at line 10—10 of FIGURE 9.

Referring to FIGURE 1 in detail, there is shown a bottle classifying and sorting system 11 which features a plurality of novel bottle gaugers 12 each arranged to gauge bottles 13 for any of predetermined dimensional limits of inside neck diameter or choke, outside neck diameter, outside body diameter, height, and leanage. If any of the bottles 13 have dimensions that are not within all of the predetermined limits, such bottles are unacceptable or defective. Conversely, those bottles 13 having dimensions within all of the predetermined limits are acceptable. A defective bottle introduced to one of the gaugers 12 causes a classifier element 14 thereof to be actuated to a defect indicating position (see FIGURE 5). An acceptable bottle does not actuate the classifier element 14 such that it remains in a normal acceptable product indicating position. In response to the introduction of either an acceptable or a defective bottle to one of the gaugers 12, a knock-out element 16 thereof is primed for subsequent actuated release of the bottles from the gauger (see FIGURE 4). In this manner, release of the bottles is assured.

Considering now the overall aspects of the system 11, it will be noted that the gaugers 12 are provided in the form of circumferentially spaced heads of a turret 17. In this regard a turret plate 18 is secured, as by means of a collar 19, to a vertical shaft 21. The upper end of the shaft is journaled in a bearing 22 carried by superstructure 23 mounted in elevated position relative to a horizontal support surface 24. The lower end of the shaft is journaled in a bearing 26 which is, for example, mounted on the support surface. The gaugers 12 are carried at circumferentially spaced positions of the plate 18 and are thus rotated with the shaft.

To introduce the bottles 13 to the gaugers 12 during their rotation there are provided a plurality of circumferentially spaced lifters 27 subjacent the gaugers in corresponding vertical alignment therewith. The lifters are arranged to be progressively raised towards the corresponding gaugers and to be retracted therefrom during their rotation. More particularly, the lifters are preferably provided as vertical rods 28 having bottle support platforms 29 at their upper ends. The rods slidably extend through guide bushings 31 carried at circumferentially spaced positions of a guide dome 32 coaxially fixedly secured to the shaft 21 subjacent the gaugers. The bushings are of course correspondingly aligned with the gaugers. The lower ends of the rods 28 carry follower rollers 33

which ride on the surface of a substantially cylindrical cam 34 mounted on the horizontal support surface 24. The cam is formed with a depressed horizontal surface 36 extending substantially 90° between input and take-off locations 37 and 38 subsequently described, a gradually rising surface 39 extending substantially 180° between the input location and an elevated horizontal surface 41, and a rapidly declining surface 42 extending substantially 90° between the surface 41 and the take-off location 38. Thus, as the shaft 21 rotates, the guide dome 32 moves the lifters in a circular path wherein the rollers 33 follow the previously noted surfaces of the cam 34 and correspondingly govern the vertical positions of the lifters. When a roller engages the surface 36 the platform of the associated lifter is at a predetermined lowermost elevation. The platform is at such elevation at both the input and take-off locations 37 and 38. As the roller encounters surface 39 in being moved arcuately away from the input location, the lifter is progressively raised toward the corresponding gauger and the platform of the lifter assumes a predetermined uppermost elevation when the roller is positioned on the surface 41. As will be subsequently described in detail, a bottle supported on the platform at such elevation is fully introduced to the corresponding gauger to a position wherein the classifier element 14 is either not actuated, or actuated to defect indicating position, depending upon whether the bottle is acceptable or defective. Thereafter, as the roller moves away from surface 41 over surface 42, the lifter is rapidly retracted to convey the bottle away from the gauger and, upon reaching the take-off location 38, support the bottle at the predetermined lowermost elevation. Rotation of the assembly of gaugers and lifters is preferably facilitated by a ring gear 43 depending from the rim of the dome 32 and meshing with a spur gear 44 secured to the shaft of a drive motor 46.

In order that the bottles 13 may be delivered to the lifters 27 at high speed for introduction to the gaugers 12, there is provided a longitudinal input conveyor 47 mounted by means of support structure 48 at an elevation corresponding to the predetermined lowermost elevation of the lifters 27. The conveyor 47 terminates adjacent the input location 37 and a star wheel 49 provided thereat is operable to synchronously move bottles from the conveyor to lifters correspondingly positioned at the input location with their platforms 29 at the elevation of the conveyor. In this manner, bottles are sequentially delivered to the lifters as they rotate through the input location. Similarly, a longitudinal take-off conveyor 51 is provided to extend away from the take-off location 38 at the predetermined lowermost elevation of the lifters. A star wheel 52 provided adjacent the take-off location operates to synchronously move bottles off of the platforms of lifters sequentially passing through the take-off location, and onto the take-off conveyor. An ejector 53 is mounted laterally adjacent the take-off conveyor 51 at a position slightly downstream from the take-off location 38. The ejector may, for example, comprise a solenoid actuated ram 54, which in response to energization of the solenoid is momentarily translated transversely of the take-off conveyor. Thus, the ram displaces an adjacent bottle carried by the take-off conveyor off of the side thereof.

In the basic operation of the system of FIGURE 1, the bottles 13 carried on the input conveyor 47 are sequentially delivered by star wheel 49 to the lifters 27 as they pass through the input location 37. The lifters progressively raise the bottles towards the correspondingly aligned gaugers 12 and as the lifters sequentially reach their uppermost elevation upon encountering surface 41 of cam 34, the bottles carried by the lifters are fully introduced to the corresponding gaugers. As previously noted, this primes the knock out element 16 of each gauger. Moreover, if the bottle is defective, the classifier element 14 of the corresponding gauger is actuated from

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its normal acceptable product position to a defect indicating position. As each lifter moves further over the cam surface 41, the corresponding gauger passes a defect sensor 56 mounted in corresponding fixed position on the superstructure 23. If the classifier element 14 of the gauger is in normal position, the sensor is unactuated. However, if the classifier element is in actuated, defect indicating position, the sensor is triggered to in turn actuate a memory 57 to store the indicated defect information until such time as the bottle corresponding to the particular gauger is subsequently carried adjacent the ejector 53. As the lifters move over cam surface 42 to lower the bottles away from the corresponding gaugers, the primed knock out elements 16 thereof encounter knock out actuating means 58 carried in corresponding fixed position on the superstructure 23 and are thereby actuated to release the bottles from the gaugers. The lifters carry the bottles to the take-off location 38 whereat star wheel 52 sequentially delivers them to the take-off conveyor. The memory 57 is synchronized to the movement of the bottles such that at the instant a defective bottle is adjacent the ejector 53, the previously stored defect information corresponding to this bottle is read out of the memory to effect actuation of the ejector. The ram 54, or equivalent means, is thus motivated to push the defective bottle off of the conveyor. Thus, only acceptable bottles are delivered to the output end of the take-off conveyor.

Considering now the novel gaugers 12 in detail, reference is made to FIGURES 2-6 which illustrate a gauger adapted for use in the gauging of a cylindrical bottle having a uniformly tapered upper portion terminating in a neck. The classifier element 14 of the gauger includes an elongated hollow cylinder 59 having a cap or collar 61 with a central circular aperture 62 coaxially secured to its lower end, or otherwise formed thereat to define a comparable aperture. The upper end of the cylinder 59 is closed by a plug 63 or equivalent means having a central circular bore 64 therein and formed with an outwardly flared annular flange 66 which extends radially beyond the periphery of the cylinder to define an outwardly stepped shoulder. Within the bore 64 in coaxial inwardly spaced relation, there is disposed a cylindrical guide member 67 rigidly secured to the plug 63 by a diametric key 68, or equivalent means. The member 67 is elongated to extend coaxially downward from the plug into the intermediate regions of the cylinder. The lower end of the member 67 is inwardly stepped, as shown at 69, to flushly receive a gauge sleeve 71 which extends coaxially downward from the member to inwardly define a cylindrical gauge recess 72. The recess may, of course, be defined by alternative means. In addition, a cylindrical gauge finger 73 depends centrally from member 67 through recess 72 in inwardly coaxially spaced relation to the sleeve.

The knock out element 16 of the gauger includes an elongated sleeve 74 coaxially slidably disposed upon the guide member 67 and extending exteriorly upward through the annulus defined between the periphery of the guide member and the wall of plug bore 64. In this regard, longitudinally elongated diametrically opposed slots 76, 77 are provided through the sleeve to slidably receive the key 68. The exteriorly extending upper end of the sleeve is provided with a dome shaped cap 78 formed with an outwardly flared annular flange 79 at its lower end. Such flange serves as a stop in engaging the upper end face of plug 63 to thereby support the sleeve 74 in normal position relative to the classifier element 14. The upper end of the cap 78 is provided with a socket 81 serving to swivelably mount a ball bearing 82 for purposes subsequently described. The knock out element is completed by a bottle engaging head 83 secured to the lower end of the sleeve 74. The head is of hollow cylindrical configuration with the bore 84 thereof receiving the sleeve in rigid connection. The lower tapered as indicated at 86 to provide a bottle engaging shoulder. The

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outer periphery of the head 83 slidably engages the interior wall of cylinder 59. When the knock-out element 16 is in its normal position with flange 79 engaging plug 63, the head 83 is spaced slightly upward from the cap 61 of the classifier element 14 and spaced downwardly from the finger 73 and recess 72.

The assembly of classifier element 14 and knock-out element 16 is supported by means of a collar 87 slidably receiving cylinder 59 and engageable with flange 66. The collar is carried at the end of a support bracket 88 arranged to be removably secured to the turret plate 18, as by means of bolts 89 (see FIGURE 2). Thus, in the normal condition of the gauger, the flange 66 of classifier element 14 rests upon collar 87 and the flange 79 of knock-out element rests upon the plug 63 of the classifier element as shown in FIGURE 3.

It is of importance to note that the wall of aperture 62, walls of recess 72, and periphery of finger 73, of the classifier element 14 define gauging surfaces for determining whether the dimensions of a bottle are within predetermined limits. In this regard, the diameter of aperture 62 is selected to correspond to a predetermined maximum limit for the diameter of the body of the bottle. The diameter of the peripheral wall of recess 72 corresponds to a predetermined maximum limit for the external neck diameter of the bottle, while the diameter of finger 73 corresponds to a predetermined minimum limit for the internal neck diameter. The coaxial distance between the base wall of recess 72 and the exterior end face of cap 61 is selected to correspond to a predetermined maximum limit for the height of a bottle.

With the foregoing in mind, it will be appreciated that an acceptable bottle, i.e., one having dimensions within the predetermined limits, may be introduced through aperture 62 to a fully inserted position wherein the neck of the bottle is disposed within recess 72 and freely receives finger 73 without engaging the walls of the recess and periphery of the finger nor the wall of aperture 62. In other words the bottle may be fully inserted into the gauger without contacting surfaces of the classifier element 14. During the early stages of insertion, however, the bottle engages the shoulder 86 of the knock-out element head 83. Thus, as the bottle is inserted, it moves the knock-out element 16 to an extended position relative to the classifier element 14. This extended position is the previously noted primed position of the knock-out element. FIGURE 4 illustrates the gauger with an acceptable bottle in fully inserted position. The knock-out element is in extended primed position, but the classifier element is in normal position with flange 66 resting on collar 87.

In the case of a defective bottle, i.e., one having any dimension outside of the predetermined limits, the bottle cannot be fully inserted into the gauger without contacting one of the surfaces of the classifier element. As a result, raising of the bottle to an elevation commensurate with full insertion into the gauger effects upward movement of the classifier element to a position wherein the flange 66 is displaced from the collar 87. For example, if the base diameter of the bottle exceeds the predetermined limit therefor, the base of the bottle engages aperture 62 and displaces the classifier element 14 upwardly as shown in FIGURE 5. The knock-out element is still extended to a primed position as indicated. In the event the base of the bottle was within the maximum limit but the external neck diameter was excessive, the neck would engage the peripheral wall of recess 72 and effect displacement of the classifier element from its normal position. Similarly, an internal neck diameter less than the predetermined limit, or an excessive height results in displacement of the classifier element from its normal position. The amount of displacement in any of these latter instances would not, however, be as great as that for an excessive body diameter. Thus, any displaced position of the classifier ele-

ment relative to the collar 87 represents the previously noted defect indicating position of the classifier element. In addition to the dimensional limits of body diameter, external and internal neck diameter, and height, gauged by the gauger 12, it will be appreciated that leanage is also gauged thereby. By virtue of the coaxial or aligned relationship between the gauging surfaces, a bottle having excessive leanage will contact at least one of the surfaces and displace the classifier element 14 to a defect indicating position.

It will be appreciated that the gauging of bottles of different sizes is readily facilitated by the interchangeable employment of gaugers 12 having different size gauging surfaces in the classifier element 14 and different size knock-out heads 83. Moreover, the gaugers may be appropriately modified to accommodate bottles having configurations other than cylindrical. For example, as shown in FIGURE 7, the gauger may be modified to accommodate a rectangular bottle or flask. In this regard, a rectangular aperture 62' is provided in the cap 61, and the knock-out head 83 is provided with an elongated rounded rectangular shoulder 86' conformed to the upper end of a rectangular bottle.

Considering now the defect sensor 56 in detail as to a preferred form thereof for use with the specific embodiment of gaugers 12 just described, reference is made to FIGURE 8. As shown therein, the sensor includes a vane 91 pivotally secured by hinges 92 to a support bracket 93 carried by superstructure 23. The vane is pivotal about a vertical axis and is disposed in the path of rotation of the gaugers 12 at a position overlying elevated surface 41 of cam 34. More particularly, the vane projects over the outer portions of the end faces of the classifier element plugs 63, as the gaugers are rotated past the vane location. The lower edge of the vane is positioned to closely clear the end faces of the plugs when the classifier elements 14 are in normal position with the flanges 66 resting on the collars 87. The sensor also includes a microswitch 94 carried in fixed position on superstructure 23 and having a horizontally projecting actuator arm 96 engaging the trailing face of the vane relative to the direction of movement of the gaugers. The actuator arm is spring loaded in the direction of the vane to resiliently retain same in a normal position wherein the leading face of the vane engages a stop 97 that projects outwardly from the bracket 93. The switch 94 is unactuated when the vane is in its normal position. However, if the vane is pivoted to displace the arm 96 in opposition to the spring loading thereof, the switch is actuated. It will be appreciated that since the classifier elements 14 of the gaugers which have received acceptable bottles are in their normal positions, the plugs 63 thereof clear the vane and the switch is not actuated. However, the classifier elements of those gaugers that have received defective bottles are in displaced defect indicating position. The classifier element plugs thus engage the vane to pivot same and actuate the switch. Actuation of the switch thus represents a defective bottle.

The knock-out actuating means 58 for use with the preferred embodiment of the gaugers hereinbefore described is advantageously provided as an arcuate cam 98 carried by superstructure 23 at a location overlying the surface 42 of cam 34. The lower surface 99 of cam 98 is declined in the direction of gauger rotation in substantial conformity with the cam surface 42. The ball bearings 82 in the caps of the knock-out elements 16 in primed position engage cam surface 99 and follow same as the lifters 27 are simultaneously being lowered in passing over cam surface 42. Thus, the knock-out elements are gradually urged downward by cam 98 as the bottles are being correspondingly lowered on the lifters. Release of the bottles from the gauges is thereby assured.

Referring now to FIGURES 9 and 10, a preferred form

of the memory 57 will be seen to be of a substantially mechanical nature. More particularly, the memory includes a circular turntable 101 having an upstanding annular marginal rim 102. The turntable is journaled upon a base plate 103 and coupled to rotary drive means 104. Also mounted on the base plate, there is provided an upstanding annular band 106 which is generally outwardly concentrically spaced from rim 102 and includes an eccentric terminal portion 107 which converges into contact with the periphery of the rim. A plurality of pegs 108 are slidably disposed in a plurality of circumferentially spaced radial bores 109 through the rim 102. As the turntable rotates, any of the pegs that are extended radially outward from the rim engage the eccentric terminal portion 107 of the rim and are thereby urged inward to positions wherein the outer ends of the pegs are flush with the outer periphery of the rim. In such positions, the pegs project radially inward from the inner periphery of the rim. A solenoid actuated ram mechanism 111 is mounted upon a bracket 112 supported atop the band in bridging relation to a portion thereof. The mechanism includes a ram 113 that is radially disposed and provided with a depending tab 114 at its free end. Upon energization of the solenoid of the mechanism, the ram is extended radially outward such that the tab 114 contacts a radially aligned one of the pegs 108 and drives same outward. Any of the pegs thus driven by the ram, project radially outward from rim 102. The memory also includes a microswitch 116 mounted on bracket 112 at a position having a predetermined angular displacement from the radial axis of the ram in the direction of rotation of turntable 101. Such position of the switch is short of the eccentric terminal portion 107 of band 106. The switch includes a depending actuator arm 117 which is spring loaded to a normal vertical position. The arm projects into the space between the rim 102 and band 106 in the path of any of the pegs 108 that have been driven outward by the ram. Such outwardly projecting pegs contact the arm in passing same to momentarily actuate the switch. Thus, after a predetermined time delay following the driving of a peg outward by the ram, the switch 116 is actuated. Such time delay corresponds to the time required for the turntable 101 to rotate through the angle between the radial axis of the ram and the position of the switch arm. Following actuation of the switch by an outwardly projecting peg, the peg encounters the eccentric portion 107 of the band and is reset to an inwardly projecting position, as previously described, prior to again passing the radial position of the ram.

It is of importance to note that each of the pegs 108 corresponds to a different one of the gaugers 12. The drive means 104 is synchronized with the drive motor 46 such that rotation of the turntable 101 is thereby synchronized with rotation of the gaugers 12 and lifters 27. Moreover, the predetermined time delay determined by the angular displacement of switch 116 from the ram radius is selected to correspond to the time required by a bottle in a gauger passing the defect sensor 56 to be conveyed to a position adjacent the ejector 53. The solenoid of the ram mechanism 111 is electrically connected in series with the switch 94 of the defect sensor 56 and a power source. The solenoid of the ejector 53 is similarly electrically connected in series with the switch 116 of the memory and a power source. It will be thus appreciated that in response to switch 94 being actuated by the classifier element of a gauger being in defect indicating position, the solenoid of the ram mechanism 111 is energized. A radially aligned one of the pegs 108 is driven outward by the ram to thus read defect indicating information into the memory. At the instant the bottle that was in such gauger is adjacent the ejector, the peg engages the arm 117 to actuate switch 116. The ejector is in turn energized to urge the adjacent bottle off of the take-off conveyor 51.

What is claimed is:

1. An automatic gauger for gauging bottles to classify them as being of predetermined dimensional limits, said gauger comprising a frame structure, a classifier element supported by a member of said frame structure for selective vertical displacement with respect to said member, a classifier element having a plurality of gauging surfaces of predetermined dimensions permitting free reception of an acceptable bottle introduced into said element and engageable with an unacceptable bottle introduced into said element, said classifier element being vertically displaced as a unit with respect to said frame to a defective bottle indicating position by engagement of any one of said gauging surfaces with a bottle having an unacceptable dimension in the dimension to be checked by said one gauging surface, said classifier element including a depending elongated finger defining one of said surfaces and adapted to be received within the neck of an acceptable bottle introduced into said element and engageable with the neck of an unacceptable bottle introduced into said element to cause vertical displacement of said element as a unit relative to said frame and including a collar in downwardly spaced fixed relationship to said finger having an aperture defining another one of said surfaces through which substantially the full length of a bottle must pass to be fully received within the remainder of said classifier element, said collar freely receiving a bottle having a body of dimensions within a predetermined limit and engageable with a bottle having an unacceptable body dimension to cause said displacement of said classifier element relative to said frame, the gauging surfaces of said finger and said collar aperture being aligned so that at least one of said gauging surfaces engages a bottle having unacceptable leanage and causes said vertical displacement of said classifier element, a knock-out element engageable with any unacceptable bottle within said classifier element for forcibly ejecting in a positive manner such an unacceptable bottle from said classifier element, defect sensing means for sensing said vertical displacement of said classifier element relative to said frame member, and an ejector means for separating the unacceptable bottles from the acceptable bottles.

2. An automatic gauge for gauging bottles according to claim 1 wherein said classifier element includes means defining a recess in alignment with said bottle body receiving aperture in said collar, said elongated finger depending coaxially from the base wall of said recess and the peripheral wall of said recess defining a gauging surface permitting reception within said recess for a bottle having an acceptable exterior neck dimension and engageable with the neck of a bottle having an unacceptable exterior dimension to cause said vertical displacement as a unit of said classifier element relative to said frame, and the base wall of said recess engageable with a bottle of unacceptable height to cause said vertical displacement of said classifier element.

3. An automatic gauge for gauging bottles according to claim 1 wherein said knock-out element includes a head having a base coaxially aligned with said finger and formed with a shoulder engageable with a bottle introduced through said aperture, and means for forcing said head downward to said classifier element in a positive manner to assure release of a bottle from said classifier.

4. A bottle gauger comprising a classifier element having a plurality of gauging surfaces of predetermined dimensions, said surfaces engageable with a defective bottle introduced thereto while freely receiving an acceptable bottle introduced thereto, and means slidably supporting said classifier element in a normal acceptable bottle indicating position whereby said classifier element is immovable by an acceptable bottle freely received by said surfaces but is displaced from said normal position to a defective bottle indicating position by a defective bottle engaging any of said surfaces during introduction thereto; said classifier element comprising a vertical hollow cylinder having an aperture in its lower end, the walls of said

aperture defining one of said gauging surfaces, means rigidly supported in said cylinder defining a recess in alignment with said aperture, the peripheral and base walls of said recess respectively defining a second and third of said gauging surfaces, a finger depending coaxially from the base wall of said recess, the periphery of said finger defining a fourth of said gauging surfaces, means defining a stop shoulder extending beyond the periphery of said cylinder, and a collar slidably receiving said cylinder and normally engaging said shoulder to define the slidable support means; a knock-out element slidably mounted in said cylinder and extending exteriorly through the upper end thereof, said knock-out element having a normal position of engagement with a bottle introduced through said aperture and being movable by said bottle to an elevated position, said knock-out element including a head at its lower end having a bore coaxially aligned with said recess and formed with a shoulder of a configuration substantially conformed to that of the upper body portion of bottles to be gauged.

5. A bottle gauger comprising a classifier element having a plurality of gauging surfaces of predetermined dimensions, said surfaces engageable with a defective bottle introduced thereto while freely receiving an acceptable bottle introduced thereto, and means slidably supporting said classifier element in a normal acceptable bottle indicating position whereby said classifier element is immovable by an acceptable bottle freely received by said surfaces but is displaced from said normal position to a defective bottle indicating position by a defective bottle engaging any of said surfaces during introduction thereto; said classifier element comprising a vertical hollow cylinder having an aperture in its lower end, the walls of said aperture defining one of said gauging surfaces, means rigidly supported in said cylinder defining a recess in alignment with said aperture, the peripheral and base walls of said recess respectively defining a second and third of said gauging surfaces, a finger depending coaxially from the base wall of said recess, the periphery of said finger defining a fourth of said gauging surfaces, means defining a stop shoulder extending beyond the periphery of said cylinder, and a collar slidably receiving said cylinder and normally engaging said shoulder to define the slidable support means, said recess being formed coaxially in the lower end of a cylindrical guide member disposed coaxially within said hollow cylinder, a closure member rigidly secured to the upper end of said hollow cylinder having a coaxial bore therethrough, said guide member extending coaxially into said bore in inwardly spaced relation thereto, a diametric key rigidly securing said guide member to said closure member, a sleeve slidably disposed on said guide member and extending exteriorly of said closure member, said sleeve having diametrically opposed longitudinal slots traversed by said key, a cap secured to the upper end of said sleeve, said cap engageable with the exterior end face of said closure member, said cap having a socket in the upper end thereof, a ball bearing swivelably disposed in said socket, and a cylindrical knock-out head carried at the lower end of said sleeve, said head having a coaxial bore terminating downwardly in a shoulder having a configuration conformed to that of the upper body portion of bottles to be gauged.

6. A bottle classifying and sorting system comprising a turret mounted for rotation about a vertical axis, a plurality of gauges carried at circumferentially spaced positions of said turret, each of said gauges including a vertically disposed classifier element having a plurality of gauging surfaces of predetermined dimensions engageable with a defective bottle translated vertically upward toward said element while freely receiving an acceptable bottle translated vertically upward toward said element, each of said gauges further including means slidably supporting the corresponding classifier element on said turret for translation vertically upward from a nor-

mal position to a defect indicating position responsive to a bottle engaging said gauging surfaces, a plurality of lifters adapted to support bottles subjacent said gaugers in corresponding vertical alignment with the classifier thereof, said lifters rotatable with said turret, means for progressively raising said lifters during rotation thereof from a lowermost elevation at a first location of the path of rotational movement of the lifters to an uppermost elevation at a second location of said path and lowering said lifters to said lowermost elevation at a third location of said path, means for rotating said turret and said lifters, input means for sequentially introducing bottles to said lifters at said first location, take-off means for sequentially removing bottles from said lifters at said third location, ejector means adjacent said take-off means for displacing bottles therefrom upon actuation, defect sensing means mounted in fixed position in overlying relation to said second location adjacent the path of rotational movement of said gaugers, said defect sensing means being actuatable in response to said classifier elements of said gaugers being in said defect indicating position when said gaugers pass said sensing means, and memory means coupled to said defect sensing means and said memory means to store defect indicating information in response to actuation of the sensing means for a time corresponding to that required for a bottle supported by a lifter at said second location to be moved adjacent said ejector means and to correspondingly actuate same in response to the stored defect indicating information, comprising a turntable having an upstanding annular marginal rim, means rotating said turntable in synchronism with said gaugers and lifters, a plurality of pegs slidably disposed in a plurality of circumferentially spaced radial bores through said rim, each of said pegs corresponding to a different one of said gaugers, ram means mounted in fixed position radially of said turntable and actuatable to drive radially opposite ones of said pegs outward to positions projecting outwardly from said rim, said ram means coupled to said defect sensing means for actuation in response to actuation thereof, an upstanding annular band generally outwardly concentrically spaced from said rim and including an eccentric terminal portion converging into contact with the outer periphery of said rim, and a switch mounted in a fixed position at a predetermined angular displacement from the radial position of said ram means, said switch having an actuator arm extending vertically into the space between said rim and band, said switch coupled in actuating relation to said ejector means.

7. A bottle classifying and sorting system comprising a turret mounted for rotation about a vertical axis, a plurality of gauges carried at circumferentially spaced positions of said turret, each of said gaugers including a vertically disposed classifier element having a plurality of gauging surfaces of predetermined dimensions engageable with a defective bottle translated vertically upward toward said element while freely receiving an acceptable bottle translated vertically upward toward said element, each of said gaugers further including means slidably supporting the corresponding classifier element on said turret for translation vertically upward from a normal position to a defect indicating position responsive to a bottle engaging said gauging surfaces, a plurality of lifters adapted to support bottles subjacent said gaugers in corresponding vertical alignment with the classifier elements thereof, said lifters rotatable with said turret, means for progressively raising said lifters during rotation thereof from a lowermost elevation at a first location of the path of rotational movement of the lifters to an uppermost elevation at a second location of said path and lowering said lifters to said lowermost elevation at a third location of said path, means for rotating said turret

and said lifters, input means for sequentially introducing bottles to said lifters at said first location, take-off means for sequentially removing bottles from said lifters at said third location, ejector means adjacent said take-off means for displacing bottles therefrom upon actuation, defect sensing means mounted in fixed position in overlying relation to said second location adjacent the path of rotational movement of said gaugers, said defect sensing means being actuatable in response to said classifier elements of said gaugers being in said defect indicating position when said gaugers pass said sensing means, and memory means coupled to said defect sensing means and said memory means to store defect indicating information in response to actuation of the sensing means for a time corresponding to that required for a bottle supported by a lifter at said second location to be moved adjacent said ejector means and to correspondingly actuate same in response to the stored defect indicating information, each of said gaugers including a knockout element slidably mounted relative to said classifier element and engageable with a bottle translated vertically upward toward said classifier element, said knock-out element being movable by a bottle engaging same to an upwardly extended primed position during movement of said lifters to said uppermost elevation at said second location, and cam means for engaging the upper ends of said knock-out elements during movement of said gaugers between positions overlying said second and third locations, said defect sensing means comprising a vane mounted for pivotal movement about a vertical axis, said vane extending over the path of rotational movement of said gaugers in closely spaced relation to said classifier elements thereof in normal position, said vane being engaged by said classifier elements in said defect indicating position, a switch mounted in fixed position having a horizontally projecting actuator arm engaging the trailing face of said vane relative to the direction of rotation of said gaugers, and a stop engageable with the leading face of said vane, said arm being spring loaded to normally retain said vane in a normal position of engagement with said stop, said switch being actuated in response to said vane being pivoted from its normal position, and said memory means comprising a turntable having an upstanding annular marginal rim, means rotating said turntable in synchronism with said gaugers and lifters, a plurality of pegs slidably disposed in a plurality of circumferentially spaced radial bores through said rim, each of said pegs corresponding to a different one of said gaugers, ram means mounted in fixed position radially of said turntable and actuatable to drive radially opposite ones of said pegs outward to positions projecting outwardly from said rim, said ram means coupled to said switch for actuation in response to actuation thereof, an upstanding annular band generally outwardly concentrically spaced from said rim and including an eccentric terminal portion converging into contact with the outer periphery of said rim, and a second switch mounted in fixed position at a predetermined angular displacement from the radial position of said ram means, said second switch having an actuator arm extending vertically into the space between said rim and band, said second switch coupled in actuating relation to said ejector means.

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