Oct. 10, 1961 A. L. HENDERSON 3,003,629

CONTAINER SEGREGATING APPARATUS

Filed March 22, 1956 2 Sheets-Sheet 1

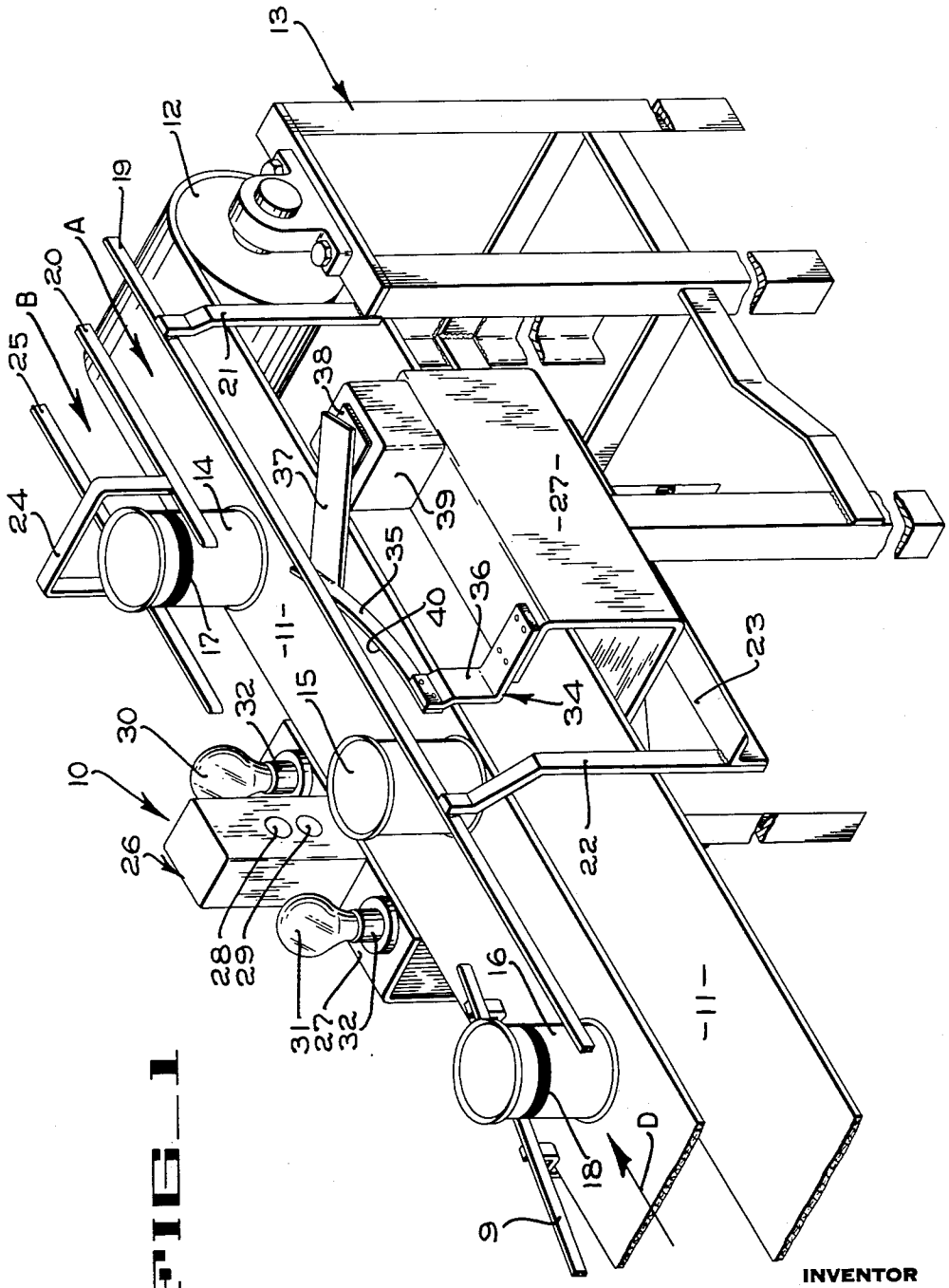


FIG. 1

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FIG_2

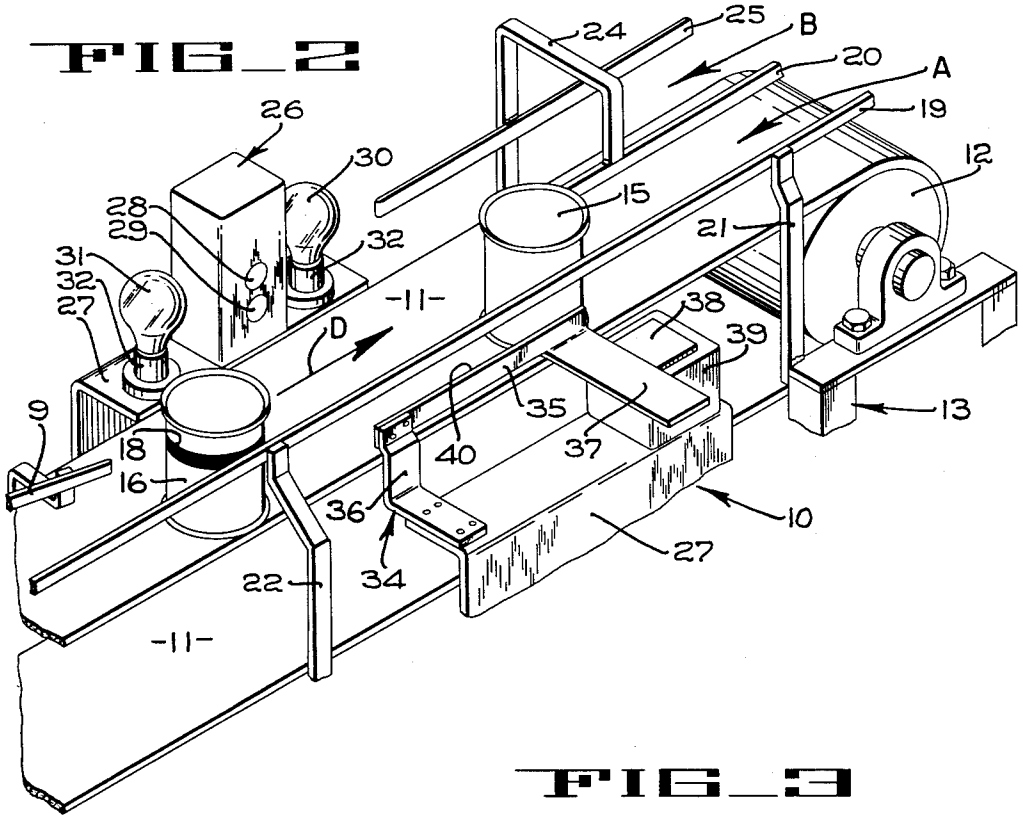
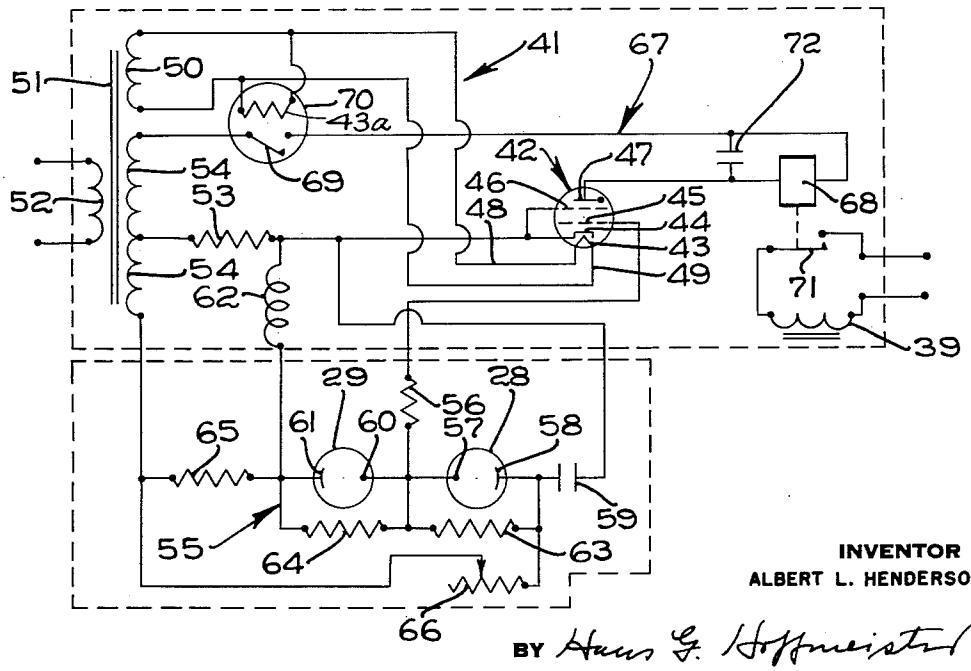


FIG_3



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CONTAINER SEGREGATING APPARATUS

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8 Claims. (Cl. 209—74)

The present invention appertains to a segregating apparatus, and more particularly to an apparatus for segregating containers in accordance with indicia carried thereon.

An object of the present invention is to provide an accurate and durable segregating apparatus of simplified construction.

Another object of the invention is to provide a segregating apparatus operable in a reliable manner to segregate container cans moving at high speeds.

Another object of the invention is to provide a can segregating apparatus which is capable of being automatically operated by the movement of the containers themselves.

Another object of the invention is to provide a simplified apparatus for detecting predetermined indicia on the bodies of containers, such as cans, and segregating such bodies in accordance with such indicia.

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

FIG. 1 is a fragmentary perspective of the segregating apparatus of the present invention showing the container deflecting member in one position.

FIG. 2 is a fragmentary perspective of the segregating apparatus of FIG. 1 showing the deflecting member in a different position.

FIG. 3 is a schematic circuit diagram for the segregating apparatus.

In canned food processing plants, different food products and different grades of the same food product are packed in similar size cans. Although each product is filled and sealed at separate sections, the various food products in similar size cans become intermingled over a common conveying line during the sterilizing and freezing processes. Prior to labelling, it is necessary to segregate or sort out the different products into separate groups or lines so that each group or line represents a certain grade or certain product to facilitate the labelling process.

In order to distinguish cans of similar sizes having different products or grades, each can body is marked at a filling and sealing station with predetermined indicia. One method of marking the can body is to stencil or imprint on the can body a circle or ring stripe, produced by black ink or similar substance, which completely encircles the can body. Can bodies containing different products are marked with ring stripes at different axial heights along the cylindrical can body. Each product or grade will be identifiable by the definite location of the ring relative to the ends of the can. It is to be understood that the absence of a ring stripe may also be used for coding and, accordingly, the blank surface of the can will be considered as one form of indicium.

Referring now to FIGS. 1 and 2, a can segregating apparatus **10** is herein provided for detecting predetermined indicia on can bodies and sorting the cans into separate lines or groups in accordance with the indicia detected.

The segregating apparatus **10** is positioned at any convenient location along a conventional horizontal conveying member or conveyor belt **11**. The conveyor belt **11** is power driven in a well-known manner by suitable means including a roller **12**, which is journalled in a suitable support member **13**.

The conveyor belt **11** advances can bodies, such as can

bodies **14**, **15** and **16**, to the segregating apparatus **10** in a single file for sorting, and then carries the can bodies **14**, **15** and **16** to another station or a discharge chute, not shown. The can bodies **14**, **15** and **16** are placed on the conveyor belt **11** in an upright position so that the cylindrical axes thereof are perpendicular to the surface area of the conveyor belt **11** as the cans travel in the direction shown by the direction arrows D. As the cans approach the segregating apparatus **10** they are channeled into a single file formation by a guide bar **9**. Certain can bodies **14** and **16** carry predetermined indicia thereon, such as ring stripes **17** and **18**. The presence of the circumferential stripes **17** and **18** at a predetermined height or location along the surface of the cylindrical can bodies **14** and **16** or the absence of a ring stripe, such as shown by can body **15**, is the means by which the different products or grades of products to be segregated are coded.

For guiding the can bodies **14**, **15** and **16** in their travel on the conveyor belt **11**, suitable guide rails **19**, **20** and **25** are provided. The guide rail **19** is supported by suitable support arms **21** and **22**, which are mounted on the support **13** and on a mounting bracket **23**, respectively. The guide rails **20** and **25** are supported by a suitable arched arm **24**, which is supported by a mounting bracket, not shown, similar to mounting bracket **23**. The guide rails **19** and **20** define therebetween a path of travel for the can bodies, which path for the purpose of convenience, will be referred to as lane A. Another path of travel for can bodies is provided, which other path is defined by the guide rails **20** and **25**. For the purpose of convenience, such other path is referred to as lane B.

In order to detect indicia on the can bodies, such as ring stripes **17** and **18**, or the lack of stripes, such as shown by can body **15**, an indicia detecting device **26** is provided. The indicia detecting device **26** is supported by a suitable mounting plate **27** and comprises photocells **28** and **29**, such as conventional cadmium sulphate cells. The coplanar photocells **28** and **29** are simultaneously responsive to variations in light intensity or color and are positioned with respect to one another so that a vertical plane through the photocells is parallel with the axes of the cylindrical can bodies **14**, **15** and **16**. Accordingly, the photocells **28** and **29** are positioned to respond simultaneously and individually to variations in intensity or color of light reflected from each can body passing in a single file, such as can bodies **14**, **15** and **16**. Photocell **28** is aligned with the stripes on can bodies to be directed into lane B. Therefore, the height of the photocell **28** above the conveyor belt **11** is equal to the axial height of annular stripes on the upright can bodies to be directed into lane B. Photocell **29** is aligned with and arranged to detect a portion of the can body where no stripe appears. From the discussion to follow it will be noted that many combinations can be provided for the photocells **28** and **29**. For example, photocell **29** can be aligned with stripes and photocell **28** can be aligned with the portion of the can body having no stripe thereon. Further, both photocells **28** and **29** can be aligned with stripes of different heights, which will have a similar effect as a can body having no stripe thereon. Further, can bodies having stripes not aligned with either photocell **28** or photocell **29** will have a similar effect as can bodies having either no stripes thereon or having stripes aligned with both photocells **28** and **29**.

To enable the photocells **28** and **29** to detect variations in the intensity or color of light caused by the indicia, illumination on the can bodies **14**, **15** and **16** is provided by conventional light emitters, such as incandescent lamps **30** and **31**. The lamps **30** and **31** are connected to any suitable source of electrical energy in a well-known man-

ner and are seated in sockets 32 which are mounted on the plate 27.

For deflecting can bodies having predetermined stripes thereon into lane B and permitting can bodies to continue in lane A when such stripes do not appear, a deflecting assembly 34 is provided. In order to guide the can bodies, such as can 14, into lane B, a resilient deflecting member 35 having a guide or an arcuate camming surface 40 is included in the deflecting assembly 34. The deflecting member or curved leaf spring 35 is supported at one end on a mounting bracket 36, which is secured to the mounting plate 27. At the other end of the deflecting member 35 is a laterally extending projection or slidable tongue 37 which is integrally formed therewith. The slidable projection 37 is suitably positioned above a core 38 of a conventional solenoid 39, whereby an electromagnetic lock is provided to hold the deflecting member 35 when the solenoid 39 is energized.

Under idle or normal condition, shown in FIG. 1, the deflecting member 35 is inwardly curved toward the conveyor belt 11 and is movable about the bracket 36 in a plane parallel to the surface area of the conveyor belt 11. The tongue 37 likewise moves in a plane substantially parallel to the surface area of the conveyor belt 11 and is slidable over the core 38 of the solenoid 39.

When predetermined indicia are detected on a can body, such as can body 14, by the photocells 28 and 29, the solenoid 39 is energized in a manner shown in FIG. 3 and to be described hereinafter. The energization of the solenoid 39 provides an electromagnetic lock for attracting and holding the projection 37 to the core 38, prior to the time can 14 reaches the deflecting member 35. Consequently, the deflecting member 35 is locked in position and guides the can body 14, advanced by the conveyor belt 11, into lane B by means of the arcuate camming surface 40, as shown in FIG. 1.

When no stripe appears on a can body, such as can body 15, the solenoid 39 remains deenergized in a manner shown in FIG. 3 and to be described hereinafter. As the can body 15 is advanced by the conveyor belt 11, it engages the resilient member 35, causing the member 35 to be moved outwardly from the conveyor belt 11 about the bracket 36 in a plane parallel to the conveyor belt 11 to permit the can body 15 to continue in lane A, as shown in FIG. 2. As the resilient member 35 is moved by the can body 15, the projection 37 slides over the deenergized solenoid core 38. After the can body 15 disengages the resilient member 35, the resilient member 35 returns to its idle position shown in FIG. 1.

Referring now to FIG. 3, an electrical circuit 41 is provide for energizing and deenergizing the solenoid 39 in response to variations of light intensity or color appearing on the can bodies as detected by photocells 28 and 29. The circuit 41 comprises a suitable gaseous discharge tube 42, such as a conventional thyratron tube. The gaseous discharge tube 42 performs as a switching device, since the solenoid 39 is energized when tube 42 conducts and is deenergized when tube 42 is non-conducting.

Tube 42 comprises filaments 43, cathode 44, grid electrode 45, screen grid 46 and a plate electrode 47. The filaments 43 are heated over a path including conductors 48, 49 and a secondary winding 50 of a conventional step-up transformer 51. The transformer 51 includes a primary winding 52 connected to a suitable source of electrical energy.

The gaseous discharge tube 42 is biased to cut-off over a path including cathode 44, cathode resistor 53 and secondary winding 54 of transformer 51. To overcome the bias potential and thus render the tube 42 conductive, a balanced network 55 interconnects the grid electrode 45 and the cathode 44 through a grid resistor 56. A suitable resultant current flow from the network 55 produces a potential across the grid resistor 56 and makes the potential on grid 45 more positive, thus rendering the tube 42 conductive.

The balanced network 55 comprises several parallel paths. One parallel path includes anode 57 of photocell 28, cathode 58 of photocell 28 and condenser 59. The other parallel path includes anode 60 of photocell 29, cathode 61 of photocell 29 and inductance coil 62. The condenser 59, in the path including photocell 28, causes the current to lead the voltage by approximately 90° and the inductance coil 62, in the path including photocell 29, causes the current to lag the voltage by approximately 90°. Accordingly, the current flow in one path is approximately 180° out of phase with respect to the current flow in the other path. When the effective resistances across photocells 28 and 29 are approximately equal, the network 55 is substantially balanced and there is no suitable resultant flow of current, since the currents are approximately equal and approximately 180° out of phase. It is of course understood that the effective resistance for the photocells 28 and 29, respectively, determines the current flow therethrough.

When photocells 28 and 29 have substantially different effective resistances, the network 55 becomes unbalanced and there is a suitable resultant current flow. Resistances 63 and 64, which are of equal value, are provided to protect the photocells 28 and 29 and do not affect the balanced network 55. Resistor 65 is also provided to protect the photocells 28 and 29. Variable resistor 66 is provided for adjusting the sensitivity of the grid circuit. By utilizing two photocells, such as photocells 28 and 29, the sensitivity of the circuit 41 to variations in intensity or color of light is improved.

The effective resistances of photocells 28 and 29 vary in accordance with variations in the intensity or color of light. Accordingly, when photocell 28 detects the annular black stripe 17 on can body 14, the effective resistance of photocell 28 increases. Simultaneously, the photocell 29 detects a portion of the can body 14 having no stripe thereon. Consequently, the effective resistance of photocell 28 is greater than the effective resistance of photocell 29. Therefore, tube 42 is rendered conductive, since the network 55 is substantially unbalanced. When the photocells 28 and 29 do not detect any stripes on the can bodies, the effective resistances thereof remain approximately equal to maintain the network 55 substantially balanced, thus rendering the tube 42 non-conductive. A similar result is produced when both photocells 28 and 29 detect stripes or fail to detect any stripes.

The plate electrode 47 of the gaseous discharge tube 42 has connected thereto a plate circuit or output circuit 67 comprising relay 68, contacts 69 and the secondary winding 54 of the transformer 51. The normally open contacts 69 delay the completion of the plate circuit 67 until the filaments 43 and 43*a* have been sufficiently heated. For this purpose, a time delay device, such as a conventional amperite tube 70, is connected in parallel with the secondary winding 50. When the filaments 43 and 43*a* are sufficiently heated, tube 70 closes contacts 69 to complete the plate circuit 67.

The secondary winding 54 supplies alternating current to the plate 47, which is rectified into half waves. The thyratron tube 42 is ready for conduction when a positive potential is applied to the plate 47 thereof and is nonconductive when no positive potential is applied to the plate 47.

Relay 68 in the plate circuit of tube 42 is energized when the gaseous discharge tube 42 conducts and is deenergized when the tube 42 is not conducting. As explained above, tube 42 conducts when the photocells 28 and 29 unbalance substantially the network 55 in response to different indicia on the can bodies and extinguishes when there is no positive potential on the plate 47 thereof.

The energization of relay 68 closes contacts 71 to energize the solenoid 39 over a path including contacts 71 and a suitable source of electrical energy, which may be a secondary winding of transformer 51. Filter condenser

72 is provided to reduce alternating current ripples, thereby reducing chattering in the relay 68.

In the operation of the can segregating apparatus 10 (FIG. 1), conveyor belt 11 advances can bodies 14, 15 and 16 in a single file past the indicia detecting device 26. Photocells 28 and 29 of the indicia detecting device 26 are positioned to detect the presence or absence of predetermined stripes on a passing can body. When a predetermined code is detected by the photocells 28 and 29, the network 55 becomes substantially unbalanced causing tube 42 to conduct. The conduction of tube 42 energizes relay 68, which in turn closes contacts 71 to energize the solenoid 39. The energization of solenoid 39 locks the deflecting member 35 in the position shown in FIG. 1 by drawing and holding the slidable tongue 37 to the core 38. As the can body carrying the predetermined code is further advanced by the conveyor belt 11, the can body engages the camming surface 40 of the locked deflecting member 35 to be directed into lane B. After the can body is deflected and the potential on the plate 47 of the tube 42 becomes negative from the alternating current supply, tube 42 extinguishes to deenergize relay 68. Thereupon the solenoid 39 is deenergized to unlock the deflecting member 35.

When a can body carrying no predetermined stripe thereon is advanced by the conveyor belt 11, the effective resistances of the photocells 28 and 29 remain approximately equal. Accordingly, the network 55 remains substantially balanced and the tube 42 is rendered nonconductive. As the can body carrying no predetermined stripe thereon further advances in travel, the can body engages the deflecting member 35 causing the deflecting member to be moved outwardly from the conveyor belt 11. The projection or tongue 37 slides freely over the surface of the core 38, since solenoid 39 is deenergized, and the can body continues its travel in lane A.

It is to be noted that the can segregator 10 of the present invention is adaptable for automatically sorting more than two different grades or products in similar size cans. This is accomplished by providing additional can segregating stations along the conveyor belt 11 similar to the one described herein. For example, a ring stripe may be provided on a can body out of alignment with the photocells. Under such a condition, the can continues to advance in lane A until it reaches the next segregating station. In the succeeding segregating station, the upper or lower photocell is aligned with the stripe on such a can body, thus directing the can body into lane B of the succeeding segregating station. This procedure can be extended to accommodate a large number of different products or grades in similar size cans.

It will be understood that modifications and variations of the embodiment of the invention disclosed herein may be resorted to without departing from the scope of the novel concepts of the invention. The invention is accordingly not to be limited to the specific embodiments shown and described, but only as indicated in the appended claims. The term article as herein used is intended to include, but not to be limited to, cans and containers.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. In an apparatus for segregating containers, a conveying member for advancing containers having surface markings varied to reflect light with unequal intensity and color, a photoelectric detecting device located adjacent to said conveying member for detecting a mark of predetermined light qualities on a surface of one of said containers, electromagnetic holding means operated in response to detection of a predetermined mark by said photoelectric detecting device, a resilient deflecting member positioned above said conveying member in the path of containers being advanced thereon, and an outwardly extending projection on said deflecting member operatively associated with said electromagnetic holding means to be held at times in a fixed position in response to the operation of said electromagnetic holding means for holding said deflecting member in said path for guiding said one container in one direction and arranged at other times to be moved over said electromagnetic holding means enabling another of said moving containers to outwardly deflect said resilient deflecting member from said fixed position for permitting said other container to advance in another direction.

2. In an apparatus for segregating containers, a conveying member for advancing containers having at least two surface markings whose sensitivity to light differ, a photoelectric detecting device located adjacent to said conveying member for detecting a mark of predetermined light qualities on a container, electromagnetic locking means operated in response to the detection of a predetermined mark by said photoelectric detecting device, a resilient deflecting member located adjacent to and above said conveying member for determining the direction of travel of a container, an outwardly extending projection on said resilient deflecting member at times held by said electromagnetic locking means in response to the operation of said photoelectric detecting device for holding said resilient deflecting member in a locked position and at other times movable relative to said electromagnetic locking means, and an arcuate camming surface on said resilient deflecting member arranged to direct a container in one direction when said resilient deflecting member is in the locked position and arranged to be deflected by engagement with a container to permit such deflecting container to travel in another direction.

3. An apparatus for segregating cylindrical containers having a plurality of circumferential stripes disposed at various axial positions to reflect light with unequal intensity and color, said apparatus comprising a conveying member for advancing cylindrical containers, a deflecting member mounted adjacent to said conveying member for movement between a plurality of positions for directing the travel of the containers into a plurality of lanes, holding means operatively connected to said deflecting member for holding said deflecting member in one of said positions, and a plurality of coplanar photocells positioned in parallel relationship to the axes of the containers, each of said photocells being arranged to detect a circumferential stripe at a different axial position, said photocells being operatively connected to said holding means to operate said holding means upon detecting stripes reflecting light of unequal intensity and color on one of the containers.

4. An article segregating device comprising a conveyor for advancing articles having surface markings varied to reflect light with unequal intensity and color thereon, a deflectable guide member normally disposed in an article diverting position extending into the path of articles being advanced by said conveyor, said deflectable guide member being mounted for movement out of said article diverting position when contacted by a moving article, holding means operatively connected to said deflectable guide member and arranged to lock said deflectable guide member in article diverting position upon being operated, and a detecting device disposed adjacent to said conveyor and including coplanar photocells simultaneously responsive to unequal light intensity and color as reflected by markings on an article being advanced on said conveyor, said detecting device being operatively associated with said holding means to operate said holding means only upon detecting unequal light intensity and color as reflected by markings on said article.

5. An article segregating device comprising a conveyor for advancing articles having indicia thereon, a guide member mounted over said conveyor for movement between a plurality of path-defining positions, a detecting device mounted adjacent said conveyor and arranged to detect a predetermined indicium on an article being advanced by said conveyor, a solenoid mounted adjacent said conveyor and operatively connected to said detecting

device for energization thereby upon detection of said predetermined indicia by said detecting device, a magnetic core disposed in said solenoid and arranged to be magnetized upon energization of said solenoid, and a projection rigid with said guide member and extending over and immediately adjacent said core, said projection being arranged to be magnetically locked against said core upon energization of said solenoid to hold said guide member in one of said path defining positions.

6. An article segregating device comprising a conveyor for advancing articles having indicia thereon, a resilient guide member fixed at one end adjacent said conveyor and having the other end mounted for movement from an unstressed position over said conveyor to a resiliently stressed position along one side of said conveyor to define a plurality of path-finding positions, a photoelectric detecting device mounted adjacent said conveyor and arranged to detect a predetermined indicium on an article being advanced by said conveyor, a solenoid mounted adjacent said conveyor and operatively connected to said detecting device for energization thereby upon detection of said predetermined indicia by said detecting device, a stationary magnetic core fixed in said solenoid and arranged to be magnetized upon energization of said solenoid, and a projection rigidly connected to said guide member adjacent the movable end thereof and extending over and disposed immediately adjacent said core, said projection being arranged to be magnetically locked against said core upon energization of said solenoid to hold said guide member in one of said path defining positions.

7. In an article segregating apparatus, a deflecting

assembly comprising a resilient deflecting member mounted in a deflecting position in the path of advancing articles to be segregated and capable of bending from said path upon contact by advancing articles, a projection extending laterally from said deflecting member in an outwardly direction opposite the deflecting surface, and electro-magnetic means disposed below said projection when said deflecting member is in a deflecting position, said electro-magnetic means being arranged to magnetically lock said projection and thereby hold said deflecting member in a deflecting position upon being energized.

8. The combination, as in claim 7 in which the electromagnetic means comprises a solenoid with a stationary magnetic core fixed in said solenoid.

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