

Oct. 6, 1970

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3,532,215

CAN SORTING MACHINE AND METHOD

Filed May 22, 1967

4 Sheets-Sheet 1

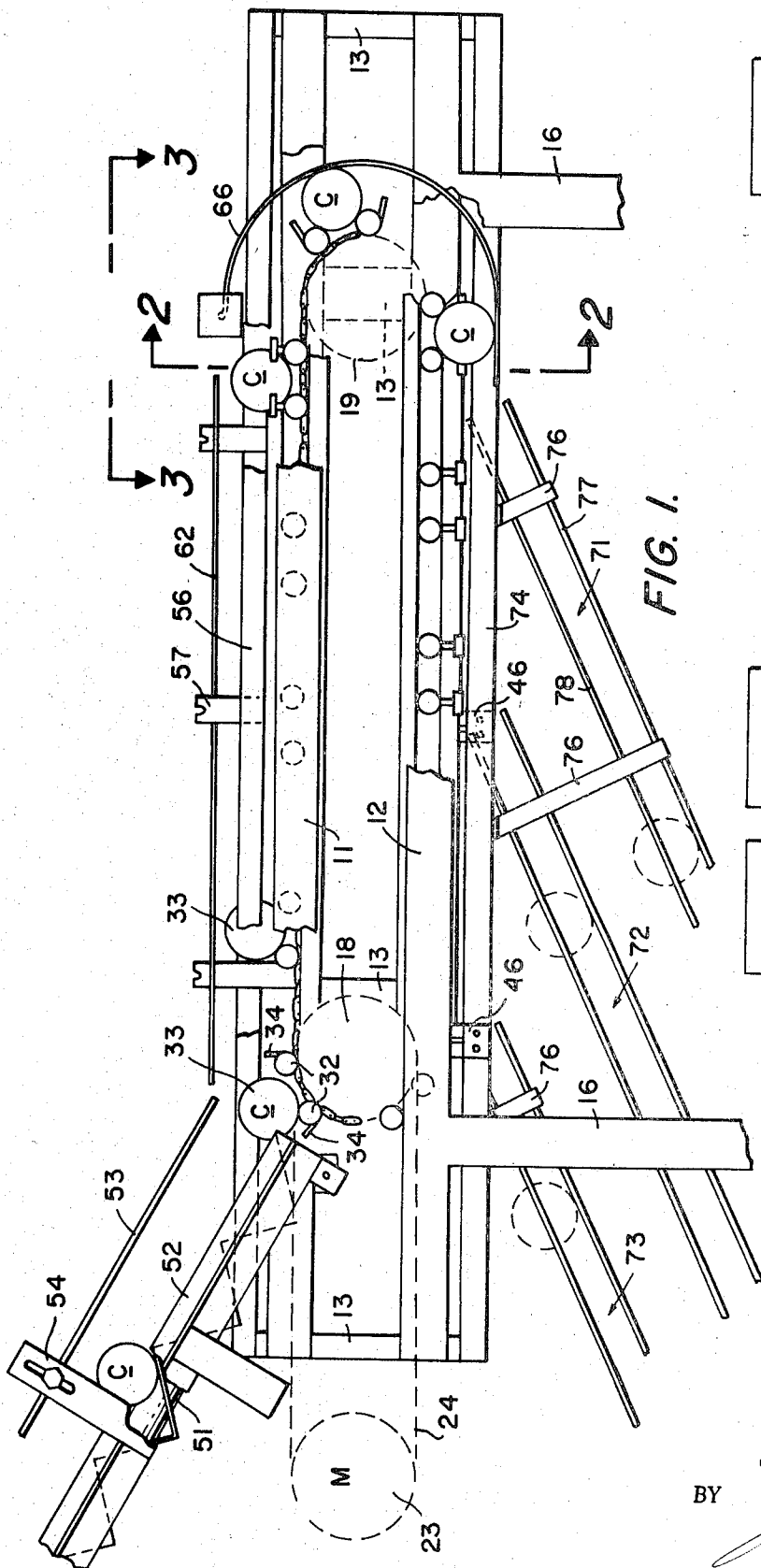


FIG. 1.

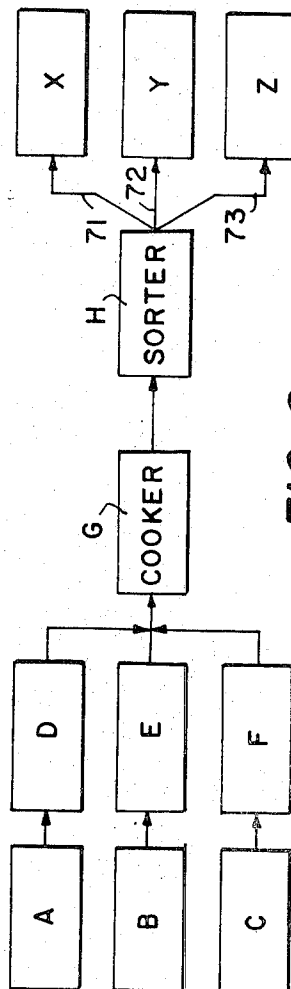


FIG. 8.

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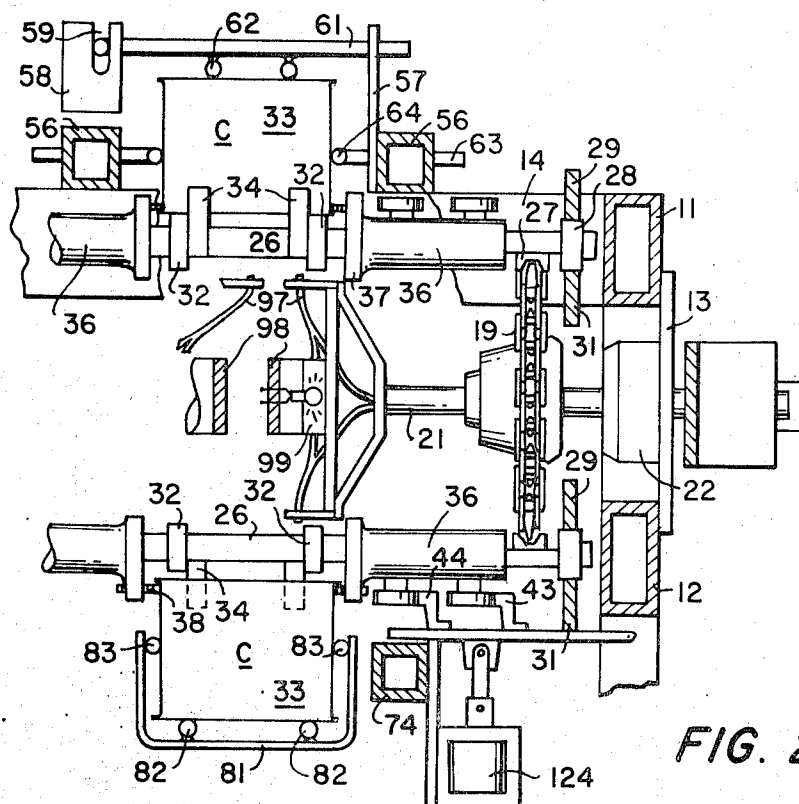
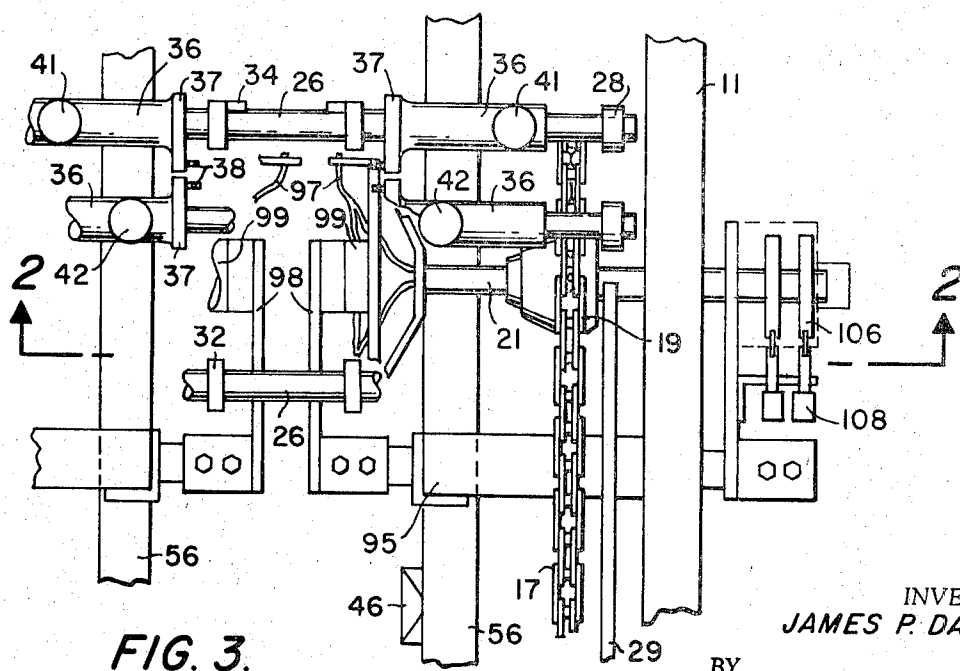
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CAN SORTING MACHINE AND METHOD

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4 Sheets-Sheet 2



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CAN SORTING MACHINE AND METHOD

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4 Sheets-Sheet 3

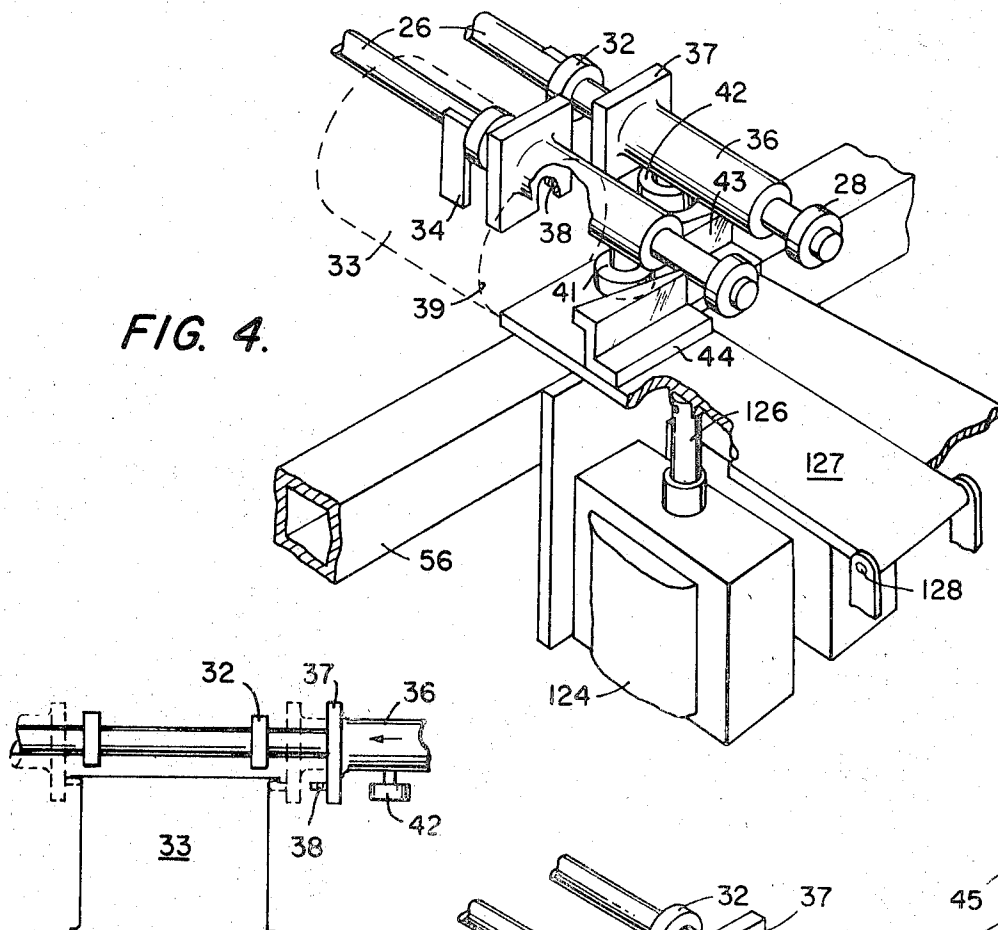


FIG. 4.

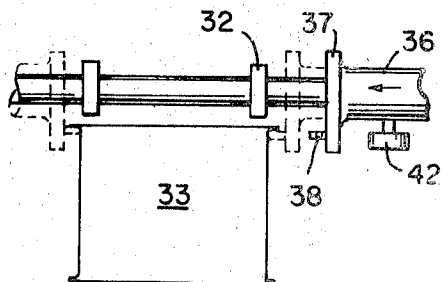


FIG. 4A.

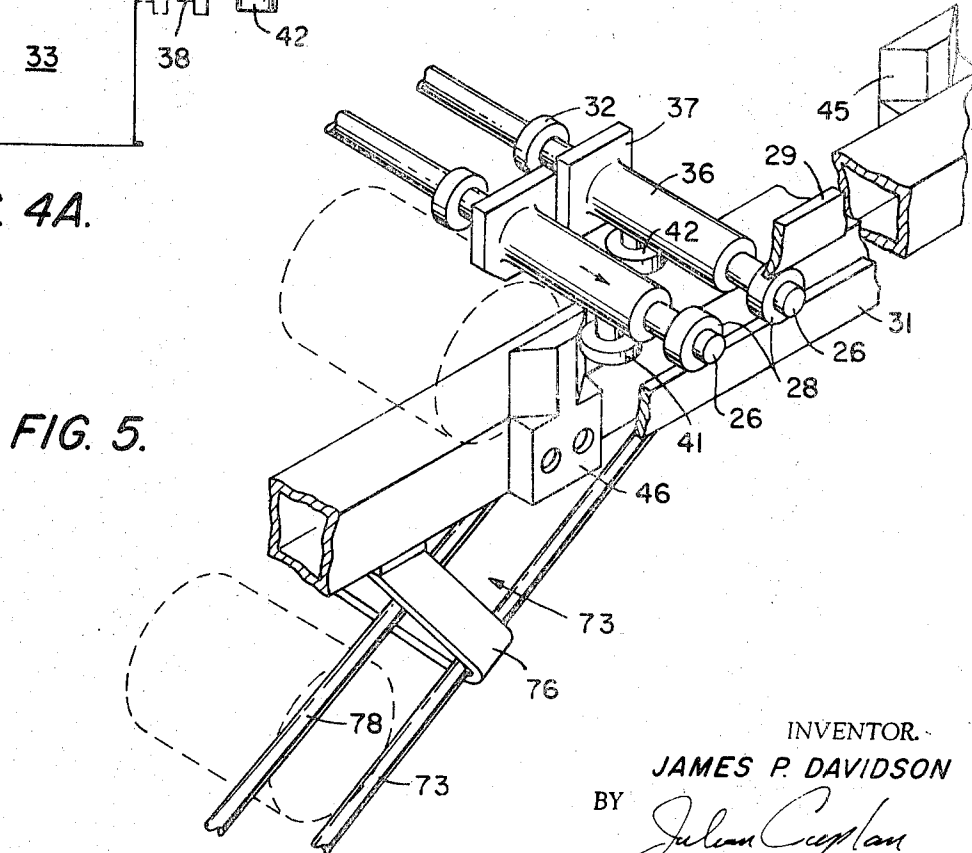


FIG. 5.

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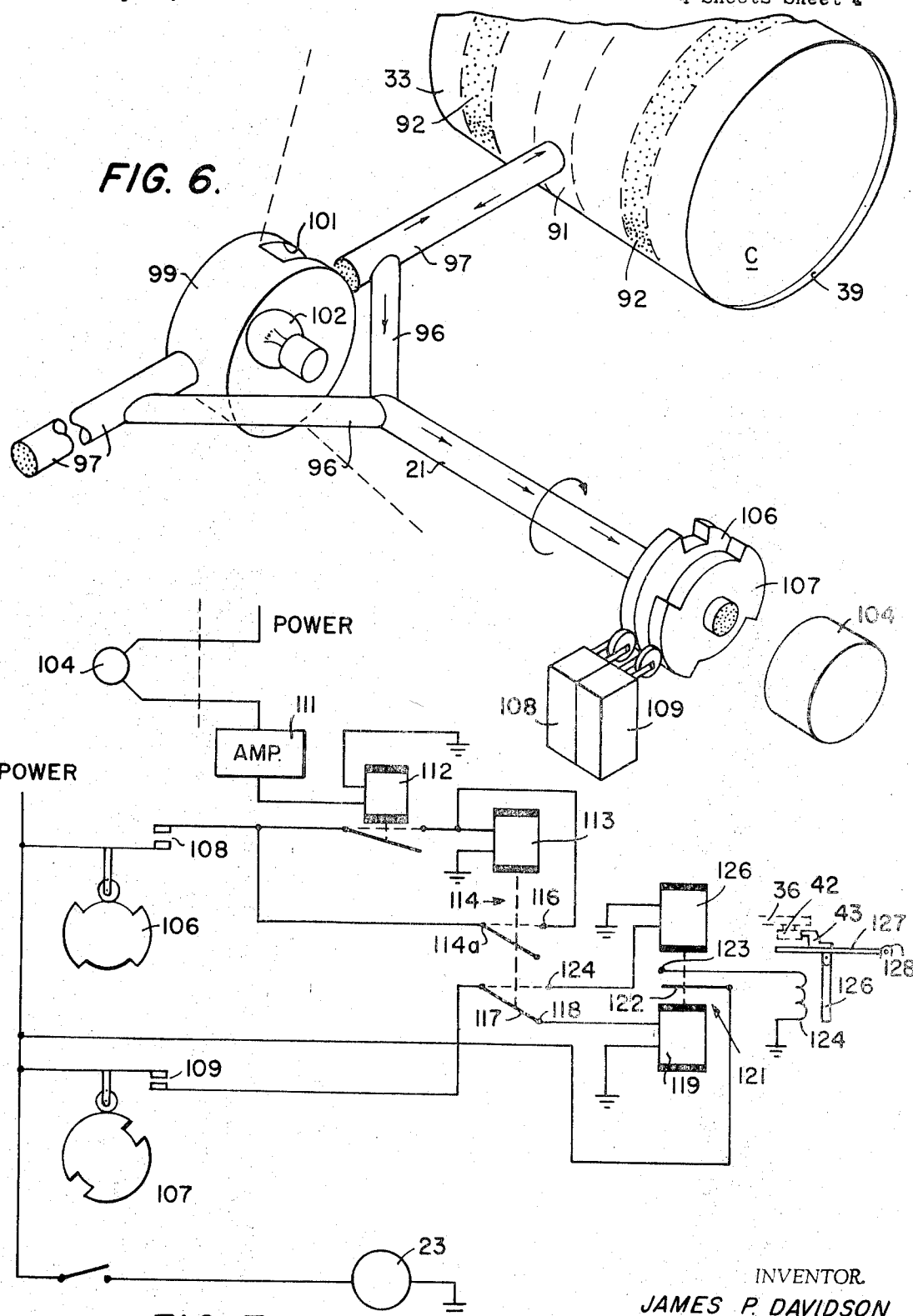
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CAN SORTING MACHINE AND METHOD

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4 Sheets-Sheet 4



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3,532,215

CAN SORTING MACHINE AND METHOD

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U.S. Cl. 209—73

7 Claims

ABSTRACT OF THE DISCLOSURE

A machine sorts cans and similar objects automatically by sensing the position of markings previously applied to the cans and which are spaced inwardly from the can ends at pre-selected distances. The cans are received on a continuous chain-type conveyor, which carries the cans past a sensing station where a beam of light shines on the can body. If reflection of light is unimpeded (i.e., no marking on the can), the can falls from the conveyor on the bottom stretch of its cycle into a first chute. If reflection of light is impeded by markings on the can, a photocell causes a setting cam to move detents on the conveyor to grip the can so that it does not fall into the first chute but is carried to a second chute where a reset cam releases the detent, allowing the can to drop. A second (or additional) set of photocell, detents, setting and resetting cams and chute may be used to provide a third or additional classification.

This invention relates to a new and improved can sorting machine and to a method of coding cans. One of the most expensive and space-consuming machines in a conventional cannery is a rotary cooker into which filled cans are fed, heated at a preselected temperature for a preselected time until the cooking of the product is completed, and then discharged. Because of the expense involved, it is desirable to keep the cooker operating at full capacity. Nevertheless, a single filling line will not ordinarily produce at a rate sufficient to achieve the capacity of the cooker. Accordingly, in order to fully load the cooker, some canners cook several different types of products in the same cooker. This is, of course, possible only where the size of the cans is the same and the cooking time is the same. In order to differentiate one type of canned product from the other, an ink mark or band of printing around the can, or an end mark is applied. After the cans are discharged from the cooker, heretofore a manual sorting has occurred. A principal object of the present invention is to sort the cans mechanically, thereby reducing the labor cost and also reducing the possibility of error.

In accordance with the present invention, different products can be filled into cans on different canning lines, a marking is applied to the can body, the output of several lines mingled in a single cooker and then after cooking the cans are sorted, depending upon the product. This permits the cookers to operate at full capacity.

A feature of a preferred form of the machine is that the cans are conveyed around an arcuate path while being sensed. The lamp used to actuate the sensing photocell is stationary while the can moves (and preferably spins) around the arcuate path. This arrangement avoids the need of rotating the lamp or the photocell and consequently eliminates use of brushes or contacts for slip rings and the like.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawings in which similar characters of reference represent corresponding parts in each of the several views.

In the drawings:

FIG. 1 is a side elevational view of the machine in accordance with the present invention, with portions broken away to reveal interior construction.

FIG. 2 is a vertical sectional view taken substantially along the line 2—2 of FIG. 1.

FIG. 3 is a fragmentary top plan view as viewed substantially along the line 3—3 of FIG. 1.

FIG. 4 is a fragmentary perspective view, showing the cam setting mechanism.

FIG. 4A is a fragmentary elevational view showing the sleeves in gripping and non-gripping positions.

FIG. 5 is a perspective view showing the cam resetting mechanism.

FIG. 6 is a schematic perspective view, showing the optical system of the sensing station.

FIG. 7 is a wiring diagram of the sensing and cam setting members with certain mechanical structure added.

FIG. 8 is a flow diagram of the method.

MACHINE FRAME AND CONVEYOR SYSTEM

In the particular version of the invention illustrated, a frame is provided having, on either side, top and bottom longitudinal rails 11, 12, which are here shown to be of rectangular tubing. Rails 11, 12 are interconnected at intervals by vertical ties 13, and at either end by horizontal transverse ties 14, to form a substantially rigid open structure which is elevated above the floor by legs 16. Mounted within the frame on either side is a continuous roller chain 17, which passes around front sprocket 18 and rear sprocket 19, each of which is supported on its horizontal transverse shaft 21, being journaled in a bearing 22, which is fastened to one of the vertical ties 13. The shaft of sprocket 18 is driven by a motor 23 through chain 24.

At regularly spaced intervals along chain 17 are pairs of transverse, horizontal rods 26, attached to chain 17 at either end by lugs 27. The outer ends of rods 26 carry outer rollers 28 which, in the top and bottom stretches of the cycle of travel of the rollers 28, are guided by upper and lower sets of top and bottom guides 29, 31. The guides 29, 31 insure that the rods 26 are maintained horizontal during said top and bottom stretches.

Rods 26 also carry inner rollers 32, which are spaced apart a distance slightly less than the height of the can 33 being carried by the machine. The spacing between adjacent pairs of rods 26 is such that the can 33, on the horizontal stretch of its cycle of travel, is supported thereby in a pocket. Immediately within rollers 32 are upstanding fingers 34, which are likewise carried by rods 26. Fingers 34 are positioned immediately before and behind the can 33 and insure that the can does not escape from the pocket between adjacent rollers 32.

Slidable axially on rods 26 on either side of the machine are sleeves 36, having flanges 37 on their inner ends carrying detents 38, said detents 38 comprising inwardly facing pins. When a particular sleeve 36 is moved inward, its detent 38 engages the chine or rim 39 which is conventionally formed in the cover seaming operation which is one of the steps in the manufacture or closing of cans 33. When opposed pairs of sleeves 36 are moved inwardly, their respective detents engage the chines at either end and thus support the can on the bottom horizontal stretch of its cycle of travel.

Each sleeve 36 carries a cam follower roller 41 or 42. The first rod 26 of each pair of rods carries roller 41 which is outwardly displaced, whereas the second rod 26 carries roller 42 which is inwardly displaced. As each can 33 approaches the sensing station of the machine, which is at the back end of the machine and is herein-

after described in greater detail, the rollers 41, 42 and consequently the sleeves 36 are outwardly displaced. As a part of the sensing process, one or the other of the setting cams 43, 44 may function to engage either roller 41 or 42 and move one pair of sleeves 36 inward (i.e., one sleeve on each side of the machine), the sleeve sliding over its rod 26. When such movement has occurred, detents 38 on each flange 37 of sleeve 36 engage each end of can 33 held in the particular pocket with which the detents are associated and carry the can along the horizontal bottom stretch of its travel to a discharge chute where resetting cams 45 and 46 are located which move the rollers 41 or 42 outwardly so that the sleeve 36 is at its initial outward position. As soon as the sleeve has moved outwardly, the detent 38 is disengaged from the can chine and the can drops into the adjacent chute as hereinafter explained.

Cans 33 may be fed into the conveyor portion of the machine by various means. As illustrated herein, a downwardly-rearwardly inclined feed screw 51 is provided at the forward end of the machine and driven in synchronism with chains 17. Cans are delivered to the upper end (not shown) of the feed screw 51 from the discharge end of the cooker with their axes horizontal and transverse and are carried down the feed screw 51 between side guides 52 and top guide 53, which are adjustable in brackets 54 to accommodate different can heights and diameters. As the cans 33 are discharged from the screw 51, they are received and supported by rollers 32 on adjacent pairs of rods 26 and moved rearwardly along the horizontal top stretch of travel of chains 17.

In the horizontal top stretch of the cycle of travel, cans 33 are held in position against displacement. For such purpose, top horizontal, longitudinal rails 56 may be provided on either side of the machine, which are secured to ends 14. Vertical legs 57 are positioned at spaced intervals along one of the rails 56 and second vertical legs 58 are positioned on the other rail 56. Leg 58 is formed with a notch 59 and at intervals are located transverse horizontal supports 61, to which are attached horizontal longitudinal guide-bars 62, which are so positioned (as best shown in FIG. 2) to prevent upward displacement of the cans from their pockets. Rails 56 also support brackets 63 to the inner ends of which are fixed side guide rods 64, which engage the ends of the cans and prevent lateral displacement. At the back end of the machine is a semi-circular transverse plate 66, the concave surface of which may be lined with a friction-type material such as a brake lining. As the cans travel around the arcuate back end of their travel, then engage the lining of guide 66 and because of the friction imparted thereto are caused to revolve around their axes, a movement which improves the sensing action of the machine.

Slanted downwardly-forwardly on the bottom of the machine are three chutes 71, 72, 73, each suspended from a longitudinal, horizontal rail 74 by brackets 76. Each chute has bottom supporting rod 77 and a side guide rod 78. Between adjacent chutes, cans 33 are supported by troughs 81 which carry bottom and side guides 82, 83. The troughs 81 and guides 82, 83 are interrupted at each of the chutes 71, 72, 73. Accordingly, if a particular can 33 is not held by a pair of detents 38, it drops into the first of the various chutes 71, 72, 73 which it encounters. Between chutes, however, to prevent accidental dropping of the cans, the trough 81 and guides 82, 83 support the cans.

SENSING AND SETTING CAM STATION

Prior to having been fed into the cooker, can 33 has been coded, the code depending upon the contents of the can and being used in the sorting machine to segregate cans of the particular products. Thus some of the cans 33 have received no marking. Other cans have received a stripe or series of circumferential spots 91 (see FIG. 6) at their middle, whereas other cans have received spots

92 at a fixed distance from either end. A can will be marked either with a stripe 91 or 92, or no stripes, but will not be marked with stripes both 91 and 92. Cans having no stripes, after passing through the sensing station, will be dropped into chute 71. Cans having stripes 91 will be dropped into chute 72 and cans having stripes 92 will be dropped into chute 73.

The sensing station of the machine, illustrated schematically in FIG. 6, is located at back end of the machine as the cans travel around the end plate 66. Essentially the station consists of two substantially duplicate parts, one sensing the band 91 and one sensing a band 92, one such part located on one side of the machine and the other on the opposite side, the only difference between the two stations being the displacement of one part relative to the center line of the machine. Accordingly, only one part will be described. Referring particularly to FIG. 6, shaft 21 at its inner end has two branches 96 in the form of a "Y" which connect to and support two radial bundles of fibre-optical rods 97 which are displaced 180° apart. Coaxial with shaft 21, but stationary relative thereto, is a lamp housing 99 which is supported by stationary bracket 98, which is in turn supported by member 95 from rail 11. Housing 99 is laterally adjustable in position by means of bracket 98 and member 95 to positions opposite band 91 or either band 92. Where more bands are used on the cans, corresponding additional sensing stations may be used and corresponding lateral positioning employed. Housing 99 has a mask formed with a window 101, facing rearwardly and having an arcuate length of less than 180°.

Within housing 99 is lamp 102, which illuminates the window 101. As shaft 21 revolves, the optical bundles 97 when they are opposite the window 101 transmit light outwardly to the can 33. Bundles 97 have certain rods which are positioned radially-outwardly relative to bulb 101 and other rods which first are directed radially-inwardly and then bend as indicated by reference numeral 96 and travel parallel to shaft 21 to a photocell 104. The function of the fibre optical rods is as follows: Light from bulb 102 is transmitted outwardly through window 101 and thence outwardly along one of these bundles 97. If there is no band 91 or 92 opposite the end of the bundle 97, light is reflected back from the reflective surface of the can through bundle 96 to the photocell 104 and the light from the lamp 102 thus activates photocell 104. On the other hand, if the light going outwardly from lamp 102 impinges upon a non-reflective band 91 or 92, there is no reflection back to the photocell 104 and it is not activated.

Shaft 21 on its outer end carries two cams 106 and 107 associated with microswitches 108, 109, respectively. When photocell 104 is activated by a light change from lamp 103, its output is amplified by amplifier 111 and fed into relay coil 112. If this occurs when switch 108 is closed by reason of position of cam 106, the coil 113 of holding relay 114 is energized and closing of the contacts 116 continues energization of the coil 113 so long as switch 108 remains closed. The movable contact 117 of holding relay 114 is connected to switch 109. Switch 109 is open and closed by pulse cam 107. When coil 113 is not energized, contact 117 engages contact 118, which energizes coil 119 of relay 121 and causes the movable contact 122 thereof to break from contact 123. On the other hand, when holding coil 113 moves movable contact 117 to engage contact 124, coil 126 of relay 121 is energized causing movable contact 122 to engage contact 123 and energize solenoid 124. The armature 126 of solenoid 124 is connected to pivoted lever 127, which is pivoted to a stationary part of the machine by pivot 128. Lever 127 carries one of the setting cams 43, 44. When lever 127 is pivoted downward, the cam 43 which it carries intercepts the path of the roller 42 on a sleeve 43 and forces the sleeve 36 inward, causing the detent 38 carried thereby to engage the chine 39 of the particular

can 33 being sensed. Cam 106 is arranged to close switch 108 for a number of degrees equal to the arcuate length in degrees of window 101. The contact points 114A and 117 of relay 114 are thus provided with power for a time equal to the number of degrees of viewing time. The power on these contacts 114A and 117 is only transferred to contacts 116 and 124 respectively after action of relay coil 112. If no mark is seen by the system on can 33, relay coil 112 remains non-energized. Relay 114 does not operate. When pulse cam 107 causes the contacts of microswitch 109 to close, however, current is allowed to pass from contact 117 of relay 114 through contact 118 and energize coil 119 of latching relay 121. Current normally supplied on contact 122 does not flow to contact 123 and setting cam solenoid 124 is not energized. If, however, on the next can a mark is detected, coil 112 closes, holding coil 113 snaps closed, and current is allowed to pass from contact 114A to 116 keeping holding coil 113 energized until cam 106 opens switch 108. Contacts 117 and 124 are closed when 113 is energized. When pulse cam 107 allows switch contacts 109 to close, current is then pulsed through to latch coil 126, causing contact 122 of relay 121 to feed current to contact 123 and solenoid 124 which in turn actuates pivot lever 127 carrying cams 43. Pulse cam 107 is located radially on the shaft 21 so that the action of lever 127 and cams 43 occurs at the ideal time of can pick-up irrespective of time when the spot or mark is detected on can 33. Also, the latching features of relay 121 allow solenoid 124 to operate only when there is a change from marked can to unmarked can, thus eliminating wear on electrical parts.

METHOD OF OPERATION

Directing attention to FIG. 8, a cannery has a plurality of can filling and closing lines A, B, and C, each handling a different product but each filling and closing a can of the same size and all of the products requiring the same cooking time. For example, line A might be filling half peaches, line B sliced peaches and line C pears, all of the cans being No. 2 cans. Each of the lines A, B, C feeds into a coding machine, D, E, F, respectively, which either applies a band of dark paint or other coding material in a location such as the band 91, or two locations such as the bands 92, which are spaced equally inwardly from the ends of the can, or no coding band at all. From the machines, D, E, F, the lines lead to a common cooker G, which has a capacity sufficient to handle the output of all three lines, and thus the cooker is supplied with cans up to its capacity and operates in an economically most efficient manner. The cans travel through the cooker G a sufficient length of time to cook the contents and are then discharged into the sorter H, which is a machine similar to that previously described.

Thus a can from cooker G travels down feed screw 51 and is deposited upon a set of rollers 32 on adjacent transverse rods 26 and carried along between the fingers 34 on the horizontal upper stretch of travel of the machine, being guided by rails 62 and 64. When the can reaches the back end of the machine it travels in an arcuate path and engages the lining of arcuate plate 66, causing the can to spin around on its axis. As the can spins, light from each lamp 103 (one in the center and one to one side of the centerline of the machine) travels out through one or the other of the bundle of fibre-optical rods 97. Light is reflected back to a photocell 104 when there is no marking on the can opposite that light, but is not so reflected when there is a mark.

When photocell 104 is activated, the coil of relay 112 is energized and when this coincides with closing of switch 108, coil 113 is energized and relay 114 is held in closed (upward) position. Coil 113 continues to be energized until cam 106 turns until switch 108 is opened, whereupon coil 113 is de-energized. Meanwhile pulsing cam 107 has closed switch 109 which causes either coil 119 or 126 to

be energized, depending upon whether coil 113 has been energized, which in turn depends upon whether photocell 104 has been activated by lamp 103. When coil 126 is energized, contacts 122, 123 are closed, energizing solenoid 124 and causing the cam 43 to be drawn into the path of travel of roller 42.

When there is no marking on the cam 33, both cams 43 and 44 are withdrawn from the paths of rollers 41, 42 and neither sleeve 36 is forced inwardly. Hence detents 38 do not engage the chine 39. Accordingly, the cans drop into the chute 71 as soon as they are carried around to the entrance to the chute. When there is a band 91 on the can 33, one of the photocells 104 is reactivated and, as is clear from a study of diagram FIG. 7, solenoid 124 is energized and hence cam 43 is interposed in the path of roller 42, forcing its sleeve 36 inwardly so that the detent 38 on either side of the machine engages chine 39 and holds the can 33 until it has passed chute 71. When the can reaches the entrance to chute 72, resetting cam 46 associated therewith engages roller 42 and moves it outwardly, causing the can to drop into the chute.

When there is a marking 92 on the can 33, corresponding photocell 104 causes its solenoid 124 to energize which causes the cam 44 to be in the path of the roller 41 and to move the corresponding detents 38 on either side inward engaging the chines of the can. Thus the can is carried past the entrance to chute 71. As it passes the entrance to chute 72, the resetting cam 45 associated therewith is located in a position so that it does not contact the roller 41 and hence the can passes the entrance to chute 72 as well. When the can approaches the entrance to chute 73, however, there is a resetting cam 46 located just ahead of the entrance thereto which engages the roller 41 and forces the sleeves and detents 38 outwardly, releasing the can.

Again directing attention to FIG. 8, chute 71 leads to a casing machine X, chute 72 to machine Y, and chute 73 to machine Z. Thus cans of the same variety are cased in the same carton.

What is claimed is:

1. Apparatus for sorting cans and wherein some, but not all, cans have been marked with a mark spaced inward a predetermined distance from the can end, comprising a frame, a continuous conveyor mounted on said frame and having a top and a bottom horizontal stretch; means for driving said conveyor, a plurality of can support means at spaced intervals on said conveyor each shaped to support a can in a first stretch of its travel, feed means for feeding cans sequentially onto said support means with their axes transverse to said frame, can gripping means on each said support means and movable between first and second positions and when in second position gripping a can to support said can in a second stretch, at least two chutes spaced along said second stretch, scanning means located at a third stretch intermediate said first and second stretches scanning said cans at said predetermined distance from their ends to detect said marks, cam setting means actuated by said scanning means when a marked can is detected, cam follower means on said can gripping means cooperating with said cam setting means to move said can gripping means from first to second position to grip the detected can to carry said can on said second stretch past the first of said chutes, and cam reset means located immediately ahead of the second of said chutes cooperating with said cam follower means to move said corresponding can gripping means from second to first position to release said detected can into the second of said chutes.

2. Apparatus according to claim 1 in which said conveyor comprises a pair of continuous chains extending along opposite sides of said frame and each said can support means comprises a pair of transverse rods fastened at opposite ends to said chains.

3. Apparatus according to claim 2 in which said can gripping means comprises on at least one side of said

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frame a sleeve slidable along one of said rods, and a detent located on the inner end of said sleeve.

4. Apparatus according to claim 3 in which said can follower means comprises a roller mounted on said sleeve.

5. Apparatus according to claim 1 in which said scanning means comprises a light source, a photocell, light transmission means for transmitting light from said source to a can on said conveyor when in third position and thence to said cell, said cell activated by reflection of light from an unmarked can.

6. Apparatus according to claim 5 in which said transmission means comprises at least one fiber-optic bundle, means for rotating said bundle about said source at the same speed as said conveyor, said bundle having two sets of fibers, one said set transmitting light from said source to adjacent said can and the other set transmitting light back from said can laterally of said conveyor, said photocell located at the outer end of said other set.

7. Apparatus according to claim 1 in which some said cans have been marked centrally, some a fixed distance intermediate each end and the center and some not marked and which further comprises second can

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gripping means on each said support means, a third chute on said second stretch beyond said first-mentioned two chutes, second scanning means spaced laterally relative to said first-mentioned scanning means, second cam setting means actuated by said second scanning means, second cam follower means on said second can gripping means to move said second can gripping means from first to second position and second cam reset means located immediately before said third chute to move said second can gripping means from second to first position.

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U.S. Cl. X.R.

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