

June 24, 1952

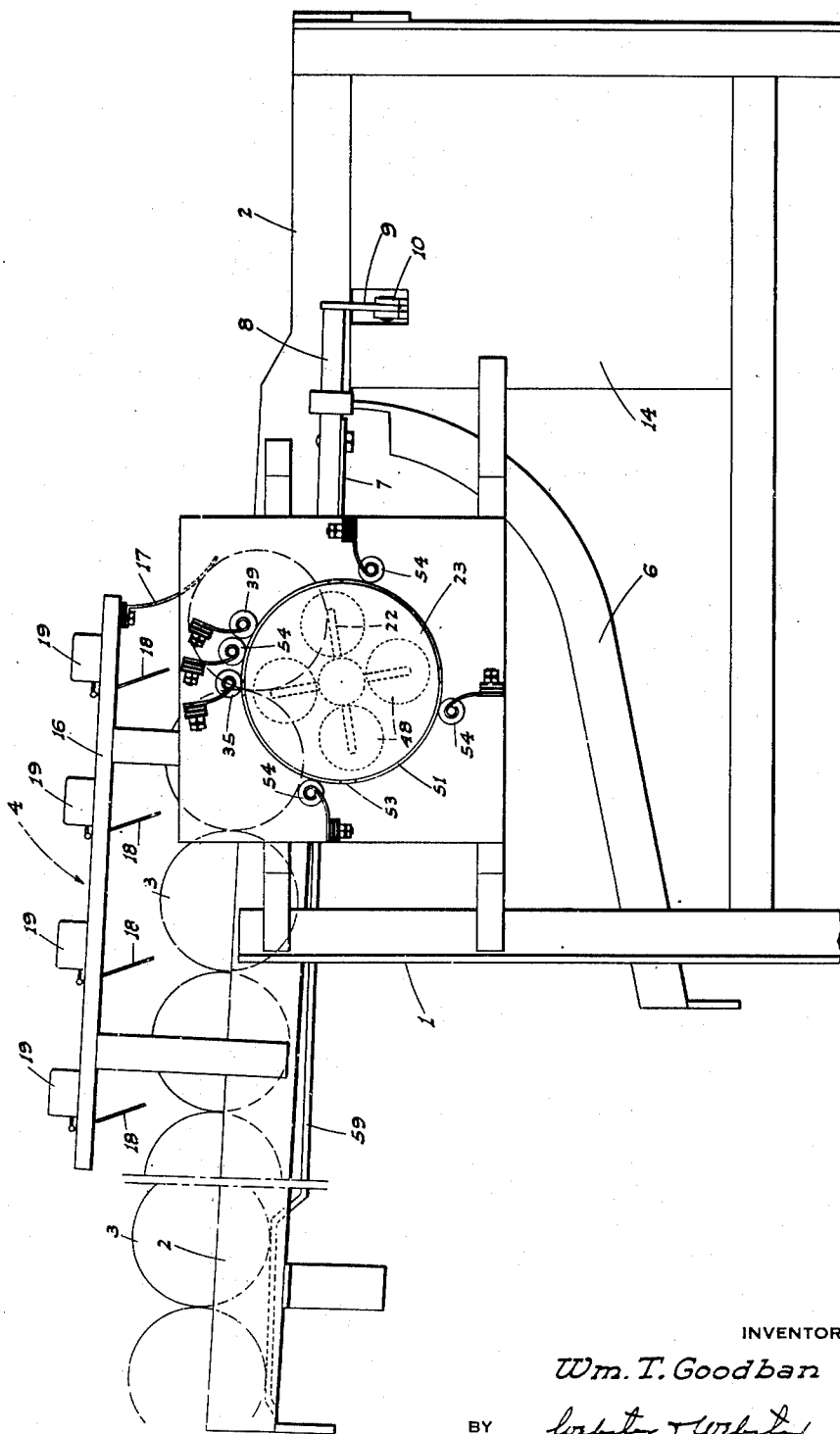
W. T. GOODBAN
CAN SORTING MACHINE

2,601,514

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4 Sheets-Sheet 1

Fig. 1



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Fig. 2

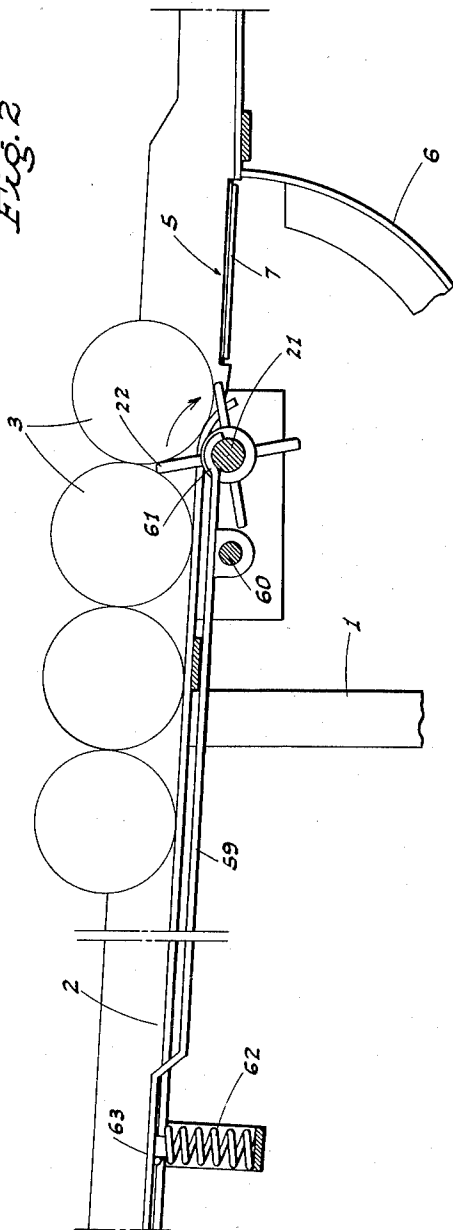
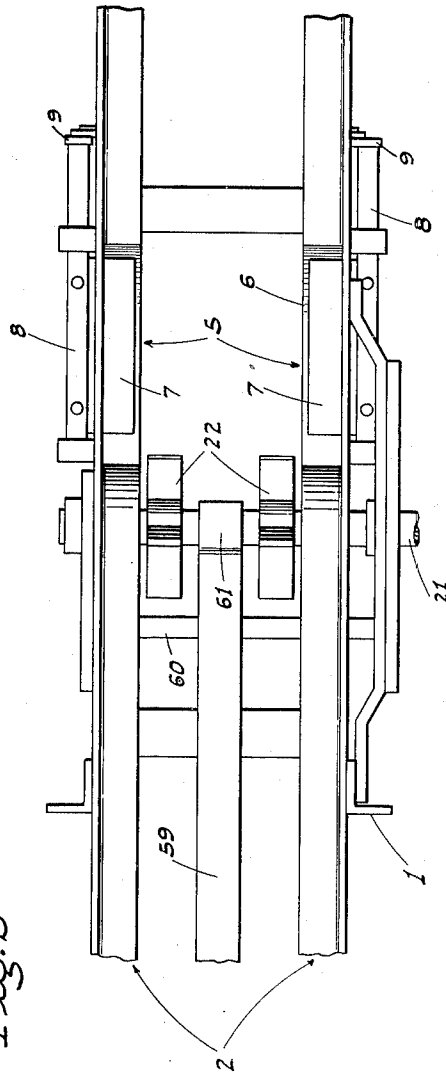


Fig. 3



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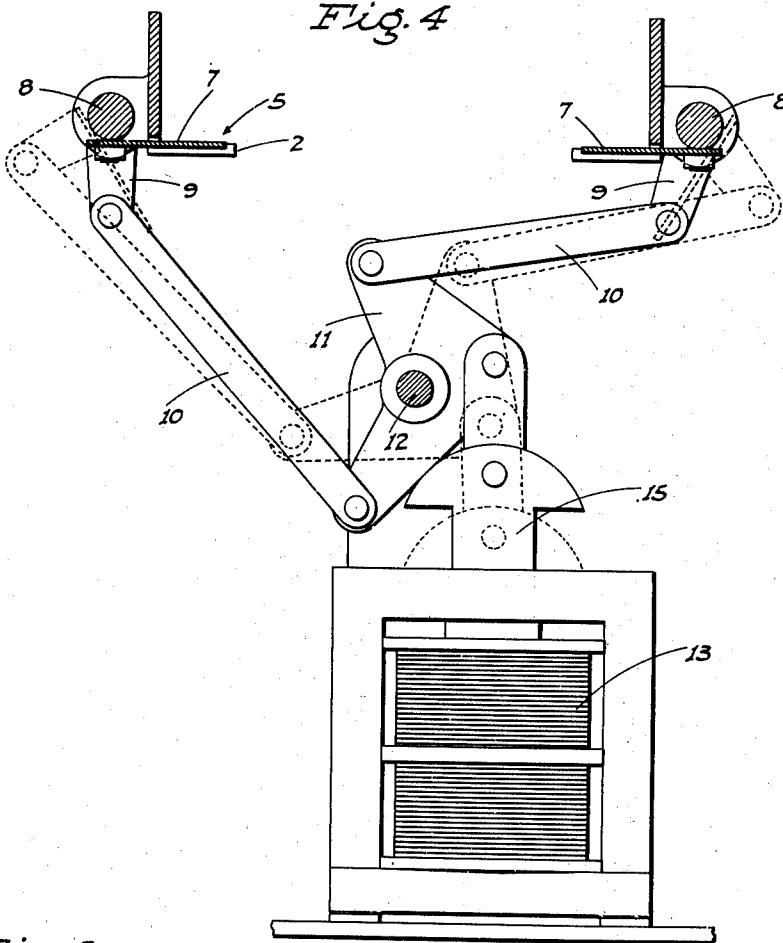
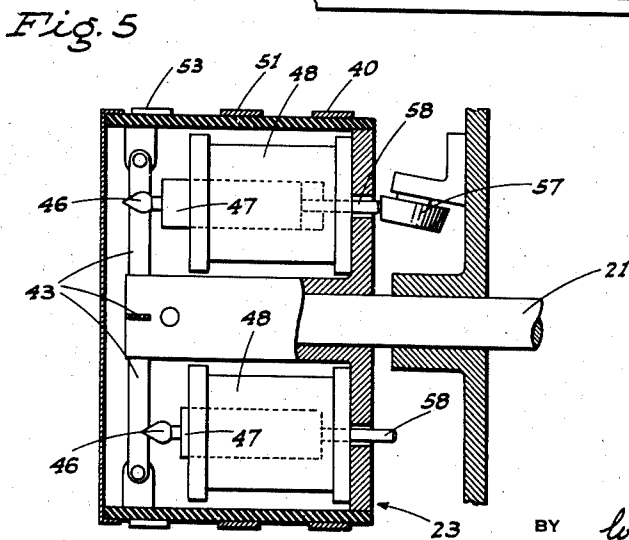
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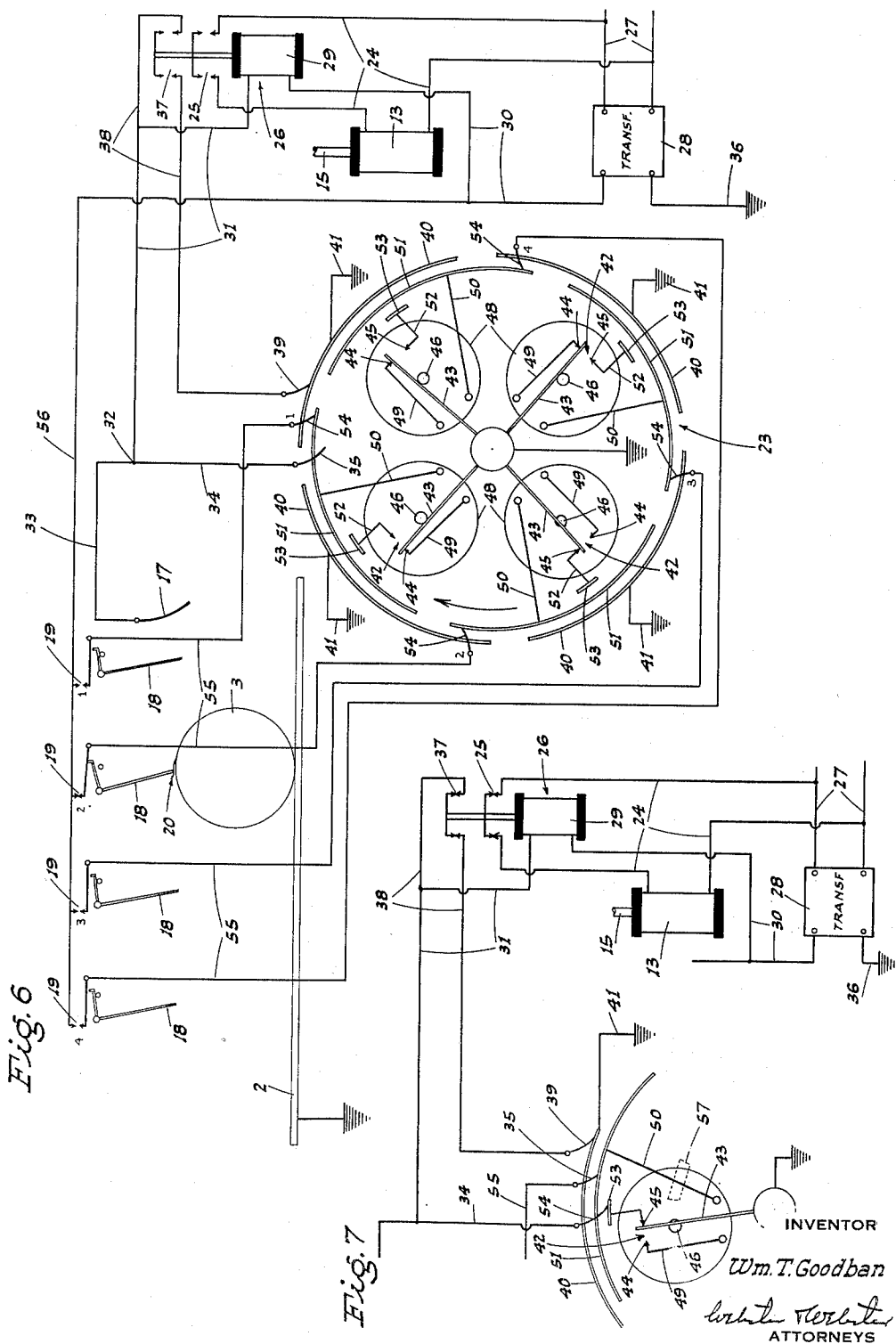
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UNITED STATES PATENT OFFICE

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CAN SORTING MACHINE

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7 Claims. (Cl. 209—72)

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This invention relates generally to cannery machinery.

In applying labels to round cans, which is done by automatic equipment, there are some cans which are skipped and remain bare, being known as "shiners." On other cans the label ends do not adhere and extend loose from the cans, the latter then being known as "flappers."

It is an object of this invention to provide a machine for automatically sorting the shiners and flappers from the cans delivered from the labeling equipment; thus eliminating the necessity of manual segregation of improperly labeled cans.

Another object of the invention is to provide a can sorting machine, as above, which includes a runway for a row of cans moving from the labeling equipment, and a gate in said runway adapted to be opened to segregate improperly labeled cans from such row; the gate being electrically controlled from a novel detector assembly and control circuit associated therewith.

A further object of the invention is to provide a can sorting machine, for the purpose described, wherein said detector assembly is arranged to detect shiners by electrical contact of a switch element with the bare metal surface of the can, and to detect flappers by mechanical engagement of a switch operating trigger or whisker with the free and projecting label end.

An additional object of the invention is to provide a can sorting machine, for the detection and segregation of shiners or flappers, which is practical and reliable in its structure and operation, and yet which will be exceedingly effective for the purpose for which it is designed.

These objects are accomplished by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings:

Fig. 1 is a side elevation of the can sorting machine, exclusive of the wiring of the control circuit.

Fig. 2 is a fragmentary longitudinal sectional elevation of the machine.

Fig. 3 is a fragmentary plan view of the machine.

Fig. 4 is an enlarged fragmentary cross section at the gate, and showing the operating mechanism therefor.

Fig. 5 is an enlarged fragmentary cross section showing the circuit control rotor.

Fig. 6 is a diagram of the control circuit.

Fig. 7 is a fragmentary diagram of the control circuit illustrating a differential position of certain of the parts thereof.

Referring now more particularly to the characters of reference on the drawings, the can sorting machine comprises a rigid upstanding

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main frame indicated generally at 1, which frame supports a gravity fed runway 2 adapted to receive a row of cans 3 as delivered from the labeling equipment (not shown). The row of cans 3 travels by gravity down the runway 2, passing—during the course of such travel—below a detector assembly, indicated generally at 4, and which assembly is hereinafter described in detail. Beyond the detector assembly the runway 2, which includes facing, transversely spaced angle irons, as shown, has a can gate, indicated generally at 5. This gate 5 is normally closed, and so long as the cans 3 are properly labeled they pass over said gate 5 and continue down the runway 2 for normal disposition.

However, should a shiner or flapper in the row of cans 3 pass below the detector assembly 4, the gate 5 is automatically opened, at the proper moment, to drop such shiner or flapper out of the row downwardly into a rejected can chute 6 which receives from said gate.

The gate 5 comprises downwardly and outwardly swingable gate plates 7 fixed on longitudinal actuating shafts 8 journaled exteriorly on opposite sides of the runway; each such shaft having an outwardly projecting radial arm 9. Links 10, corresponding to said radial arms 9, are pivotally connected between the same and opposite ends of a double-ended bellcrank 11 journaled on a shaft 12 in the main frame 1. The double-ended bellcrank 11 is adapted to be swung in a manner to open the gate plates 9, through the described connections, by means of a solenoid 13 mounted in an enclosure 14 on the main frame. The solenoid 13 includes a vertical plunger 15 normally in raised position, and pivotally connected, at its upper end, in operative relation to the bellcrank 11. The normal position of the plunger 15 is shown in full lines in Fig. 4, whereas the actuated end gate opening position of said plunger is shown in dotted lines in such figure.

Through the medium of a control circuit between the detector assembly 4 and solenoid 13, the gate 5 is opened to pass improperly labeled cans which said assembly detects.

The detector assembly 4 comprises a longitudinal bar 16 supported from the main frame 1 centrally above the runway 2, and at sufficient height to clear the row of cans 3 which moves down the runway.

At the end of the bar 16 adjacent the gate 5 there is a depending metallic contact wiper 17 which is flexible and resilient; such wiper sweeping each can 3 as it passes, but making electrical contact only with the shiners; this for the reason that a properly labeled can is insulated from the wiper 17 by the paper label.

Rearwardly of the contact wiper 17 the bar 16 of the detector assembly includes a plurality, here

four in number, of depending triggers or whiskers 18 spaced apart substantially the diameter of the cans 3 which pass therebelow. These depending triggers 18 are each connected in actuating relation to a normally open, sensitive type or micro-switch 19; the triggers terminating at their lower ends clear of the path of the cans, but adjacent thereto. If a flapper, with a free and projecting label end, passes below the detector assembly 4, such free label end will engage at least one of the triggers 18, moving said trigger sufficient to close the corresponding switch 19. A free label end causing the above closing of one of the switches 19 is indicated diagrammatically at 20 in Fig. 6.

The control circuit between the detector assembly 4 and gate actuating solenoid 13 includes, with the contact wiper 17 and trigger actuated switches 19, the following arrangement:

Directly rearwardly of, but closely adjacent, the gate 5 the frame 1 is fitted with a rotatable cross shaft 21, having thereon a pair of matching shaft actuating spiders 22, each having four projecting legs in equally spaced relation. The spiders 22 project into the runway 2 so that with passage of the gravity-fed row of cans 3, each can causes a quarter-turn of said spiders 22 and the cross shaft 21. Further, as each can leaves the spiders it delivers immediately onto the gate 5.

At one end thereof the cross shaft 21 is fitted with a circuit control rotor 23 whose purposes will hereinafter appear; such control rotor turning in the same quarter-turn relationship, with the passage of each can, as the spiders 22.

The gate-operated solenoid 13 is wired with its coil in a main energizing circuit 24, which circuit includes the normally open primary switch 25 of a relay 26; the leads of the main energizing circuit connecting to electrical supply or input lines 27, which latter couple also to a transformer 28. The relay 26 has its coil 29 interposed in a relay energizing circuit which comprises one lead 30 leading from the transformer to one side of the coil 29, and a ground lead 31 extending from the opposite side of said coil. The ground lead 31 is branched, as at 32, with one branch 33 leading to the contact wiper 17, while another branch 34 leads to a brush 35. A ground lead 36 connects the transformer on the side, opposite the lead 30, to ground. It will thus be seen that upon grounding of the lead 31 the relay energizing circuit will be energized from the transformer 28.

When a shiner travels down the runway 2 and is about to leave the spiders 22, such shiner is brushed by the contact wiper 17, grounding the branch 33 and lead 31, completing the relay energizing circuit. When this occurs the coil 29 closes the switch 25, whereupon the main circuit 24 is energized, causing the solenoid 13 to respond and open the gate 5. Thus, as the shiner leaves the spiders 22 it drops through the open gate 5 and runs down the can chute 6.

In order to maintain the gate 5 open a sufficient time to permit of the passage of a rejected shiner, and for a predetermined time after the contact wiper 17 breaks engagement with said can, the following holding circuit is employed:

The relay 26 includes a normally open secondary switch 37 operative simultaneously with the switch 25, and said secondary switch 37 is interposed in a holding circuit 38 extending from the ground lead 31 to a brush 39 mounted to work on the periphery of the circuit control rotor 23 and for electrical engagement with an annular row of circumferentially spaced segmental con-

tacts 40, which contacts are relatively long and of equal length, being spaced apart at the ends. The segmental contacts 40 are each circumferentially located on the circuit control rotor 23 so that the brush 39 breaks from each segmental contact only after a corresponding can has reached the gate, but before the next can gains such point.

The segmental contacts 40 are grounded, as at 41, whereby once the relay energizing circuit closes the primary switch 25, with resultant simultaneous closing of the secondary switch 37, the holding circuit 38 maintains said relay energizing circuit closed for a predetermined period and until the brush 39 runs off the then engaged segmental contact 40. When this occurs the relay energizing circuit is broken; the coil 29 deenergizes; the switches 25 and 37 open; and the solenoid 13 releases the gate 5 to return to its normally closed position.

The above description relates to the operation of the circuit when a shiner is being rejected, and there is now described the operation of the circuit for the detection and rejection of a flapper.

The circuit control rotor 23 is hollow and includes therein, in suitably supported and insulated relation, four control switch units, each indicated generally at 42, and which control switch units correspond to certain ones of the switches 19.

As these control switch units are identical, a description of one will suffice for all.

Each such control switch unit 42 includes a spring metal switch blade 43 which radiates from the shaft 21, with the outer end portion of such switch blade disposed between a pair of contacts, indicated at 44 and 45. The switch blade 43 tends to close toward the contact 45, but is normally maintained in engagement with the contact 44 by an in-the-way tapered cam head 46 on the normally advanced plunger 47 of a solenoid 48 fixed in the rotor 23, with said plunger parallel to the axis thereof.

The contact 44 is connected by a lead 49 to one side of the solenoid 48, while the other side of said solenoid is connected by a lead 50 to a corresponding one of an annular row of circumferentially spaced segmental contacts 51 on the periphery of the rotor.

The contact 45 is connected by a lead 52 with a corresponding one of an annular row of circumferentially spaced, relatively short segmental contacts 53 likewise on the periphery of the rotor 23; the rows of segmental contacts 40, 51, and 53 being in axially spaced relation. Brushes 54, corresponding in number to the switches 19, and connected to one side thereof by leads 55, are disposed in equally spaced relation about the rotor 23 for electrical engagement with the segmental contacts 51.

The branch 34 of the grounding lead 31 of the relay energizing circuit is, as previously described, connected to the brush 35, and the latter is positioned at the top of the rotor 23 to successively electrically engage the segmental contacts 53.

When a flapper travels below the detector assembly 4, the free label end 20 will engage and swing at least one of the depending triggers 18, closing the corresponding switch 19. When this occurs the corresponding lead 55 is connected, by said closed switch, with an energizing lead 56 which leads to one terminal of the transformer, whose other terminal is grounded, as at 36. At

the same time the corresponding brush 54 is running on one of the segmental contacts 51. This completes a circuit through the corresponding solenoid 48, as the switch blade 43 of the corresponding control switch unit 42 is then in engagement with the contact 44 to provide the ground connection. Upon said solenoid 48 being energized its plunger 47 retracts the tapered cam head 45 so that the switch blade 43 snaps clear of the contact 44 into engagement with the contact 45, as shown in Fig. 7. At the moment this occurs there is no reaction of the gate until the segmental contact 53 reaches the top of the rotor, at which time the flapper has progressed to a point for discharge onto the gate 5. When said corresponding segmental contact 40 makes electrical engagement with the brush 35, the ground lead 31 is grounded through the branch 34 and brush 35 to said segmental contact 53, which in turn grounds through the contact 45 and blade 43, as also shown in Fig. 7.

With such grounding of the lead 31, the relay energizing circuit functions to cause closing of the switch 25 of relay 26. When this occurs the gate 5 opens in the manner heretofore described, and the holding circuit 38 likewise functions, as previously described, to maintain the relay energizing circuit closed for a predetermined time sufficient to assure of passage of the flapper through the open gate, and even after the brush 35 runs clear of the previously engaged segmental contact 53.

The rotor 23, with the described control switch units 42 thereon, provides a time-delay mechanism responsive to any one of the triggers 18 and switches 19, but affording delay of closing of the relay energizing circuit until the flapper reaches the gate 5. It is of course requisite that the segmental contacts 40, 51, and 53 all be positioned on the rotor 23 in predetermined circumferential relation corresponding to the position of cans passing under the detector assembly 4.

With the described arrangement any one of the triggers 18 can be operated by a flapper, causing a response by the corresponding control switch unit 42, which latter, in combination with the described segmental contact arrangement, time-delays operation of the relay energizing circuit until the flapper, which operated said trigger, reaches the gate 5; the rotor 23 turning all the time, with passage of a row of cans 3, a quarter-turn to each can.

After one of the control switch units 48 has been actuated to reject a flapper, and after passage of said unit beyond top dead-center, a roller 57 on the frame engages an end stem 58 of the solenoid 48, re-advancing it to starting position, whereupon the tapered cam head 46 engages the spring switch blade 43, moving it from the contact 45 back to the contact 44 for the next operation.

As the row of cans on the runway 2 is gravity fed, and as the spiders 22 are turned by said gravity fed cans, it is desirable that means be provided to brake the cross shaft 21 when the load of cans on the runway becomes less than normal. To this end a longitudinal brake bar 59 is disposed below the runway 2 directly ahead of the cross shaft 21; said brake bar 59 being hinged, intermediate its ends, as at 60, but adjacent the cross shaft 21. At its forward end the brake bar 59 includes a curved shoe 61 which rides said cross shaft, and a spring 62 urges the brake bar 59 upwardly from its opposite end, tending to set the shoe 61 in holding relation on the cross shaft

21; such opposite end of the bar having an upward offset 63 which extends into the path of cans on the runway some distance to the rear of the cross shaft 21. Normally, when the row of cans is of sufficient length, the cans riding the offset 63 depress the brake bar 59 against the spring 62, whereby to hold the shoe 61 released. However, when the number of cans is such that none thereof ride the offset 63, the brake bar 59 is urged upwardly by the spring 62 to set the shoe 61 in braking relation to the shaft 21.

The can sorting machine as described provides a smooth functioning, practical and reliable apparatus for the automatic detection and segregation of improperly labeled cans as fed from labeling equipment in a cannery.

From the foregoing description it will be readily seen that there has been produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described the invention, the following is claimed as new and useful, and upon which Letters Patent are desired:

1. A can sorting machine for detecting and sorting cans, from a row thereof, which are not properly labeled, said machine comprising a frame having a runway along which the row of cans travels, a can rejection gate in the runway, electric power means connected to the gate to open the same, a control circuit for the electric power means, a detector assembly mounted ahead of and adjacent the row of cans, said detector assembly including a longitudinal row of spaced detector triggers projecting toward the row of cans, said triggers being adapted to be engaged and moved by free or flapping ends of labels on cans rolling along the runway, a cross shaft journaled adjacent the path of the row of cans, a spider on the shaft projecting into said path whereby the passage of each can turns the shaft a part turn, a contact rotor on the shaft, a plurality of normally open control switch units in the rotor corresponding to said trigger actuated switches, solenoids in the rotor connected to corresponding control switch units to close the same, each of the control switch units being adapted to close a portion of the control circuit, an actuating circuit for each solenoid including the corresponding trigger actuated switch, and a segmental contact relatively positioned on the rotor for engagement by a fixed brush as each can passes below the corresponding trigger whereby, if said trigger is engaged and moved, to cause closing of the corresponding trigger actuated switch whereupon the solenoid actuates the related control switch unit to close the aforesaid portion of the control circuit, and time-delay means in the control circuit acting to delay closing of a completing portion of the same, after closing of any control switch unit, until the detected can reaches a predetermined point adjacent the gate.

2. A can sorting machine, as in claim 1, in which said time-delay means in the control circuit comprises other segmental contacts circumferentially spaced on the rotor in predetermined positions relative to the position of cans on the runway, and a brush mounted to engage the corresponding one of said other segmental contacts

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as a detected can reaches said predetermined point adjacent the gate.

3. A can sorting machine, as in claim 1, including a holding circuit associated with the control circuit operative to maintain the same against opening for a predetermined time after its closing; said holding circuit including third segmental contacts on the rotor corresponding to said control switch units, and a brush mounted to successively engage said third segmental contacts; the latter being positioned on the rotor in predetermined relation to cans on the runway.

4. A can sorting machine, as in claim 1, in which each control switch unit includes a spring blade and opposed contacts; the blade when in engagement with one contact closing a portion of the corresponding solenoid actuating circuit, and when in engagement with the other contact closing said portion of the control circuit.

5. A can sorting machine, as in claim 1, in which each control switch unit includes a spring blade and opposed contacts; the blade when in engagement with one contact closing a portion of the corresponding solenoid actuating circuit, and when in engagement with the other contact closing said portion of the control circuit; the spring blade of each control switch unit tending to move into engagement with said other contact, and the corresponding solenoid having a plunger cam normally holding the spring blade in engagement with said one contact.

6. In a can sorting machine having a gravity runway for a row of cans and a spider projecting into the path of movement of the cans and including a cross shaft below the running and radial fingers on the shaft each adapted to project in turn between adjacent cans upon rotation of the spider by gravity movement of the cans along the runway; a means to brake the shaft when fewer than a predetermined number of cans are on the runway ahead of the spider, such brake means comprising a brake bar hinged intermediate its ends beneath the runway, a brake shoe on one end of the bar engageable with the

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shaft, a yieldable member normally acting against the other end of the bar and tending to hold the shoe against the shaft and the opposite end in the path of the cans on the runway, the weight of cans moving over said opposite end of the bar being effective to hold the brake shoe out of engagement with the shaft.

7. A can sorting machine comprising a runway for rolling cans along a definite path, a bar supported above the runway and in substantial parallelism therewith, a plurality of normally open switches supported on the bar and spaced apart longitudinally thereof, a dependent trigger on each switch effective to close the switch upon actuation of the trigger, such triggers being separate from each other and projecting to a point closely adjacent but spaced slightly from the plane of the upper sides of cans moved along said runway so as to be in position for engagement and switch closing movement by a flapping label on a can, can ejection means associated with the runway, and electric power operated means effective to operate said can ejection means and including an operating circuit which includes said switches in parallel.

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