

July 18, 1944.

R. E. J. NORDQUIST

2,353,748

CAN RUNWAY

Filed Nov. 24, 1942

2 Sheets-Sheet 1

Fig 2

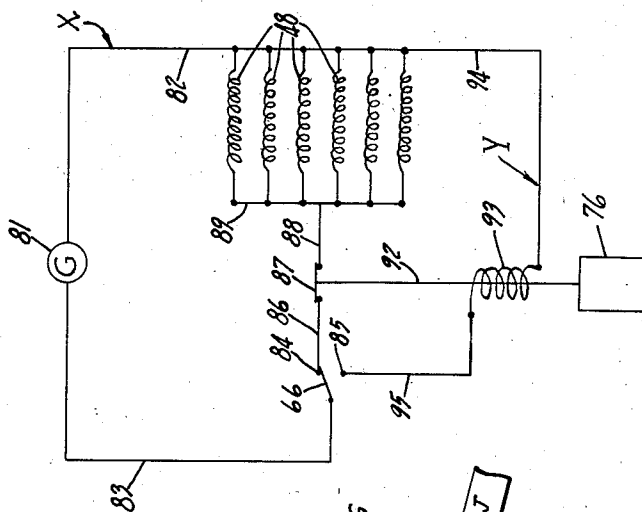
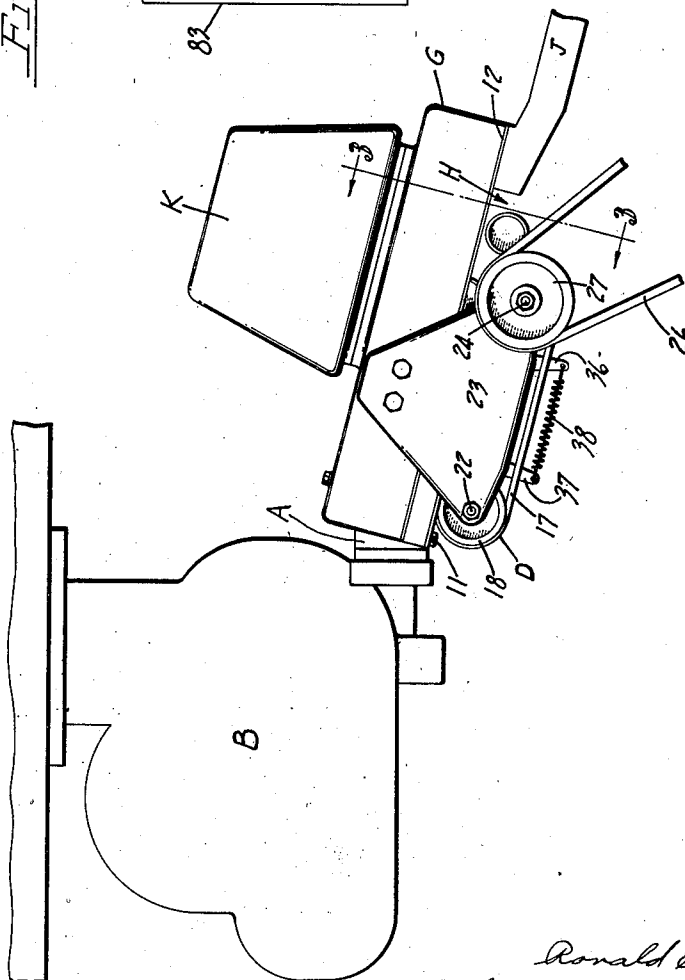


Fig 1



INVENTOR.
Ronald E. J. Nordquist
 BY *Ivan D. Thornburgh*
Charles H. Brine
 ATTORNEYS

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Fig 3

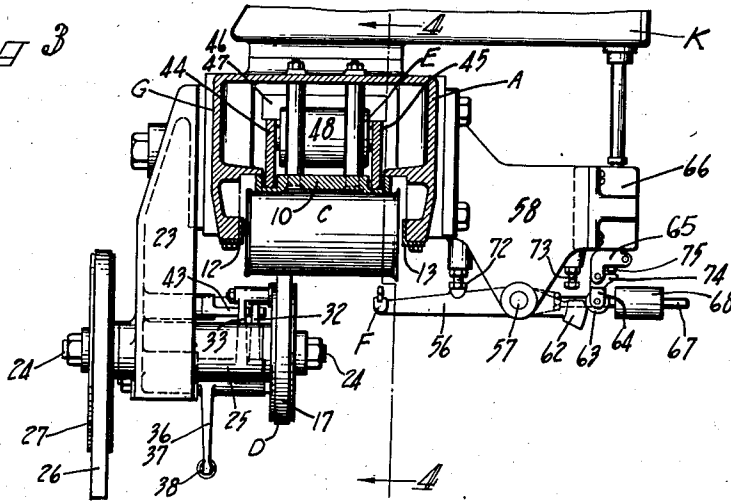


Fig 4

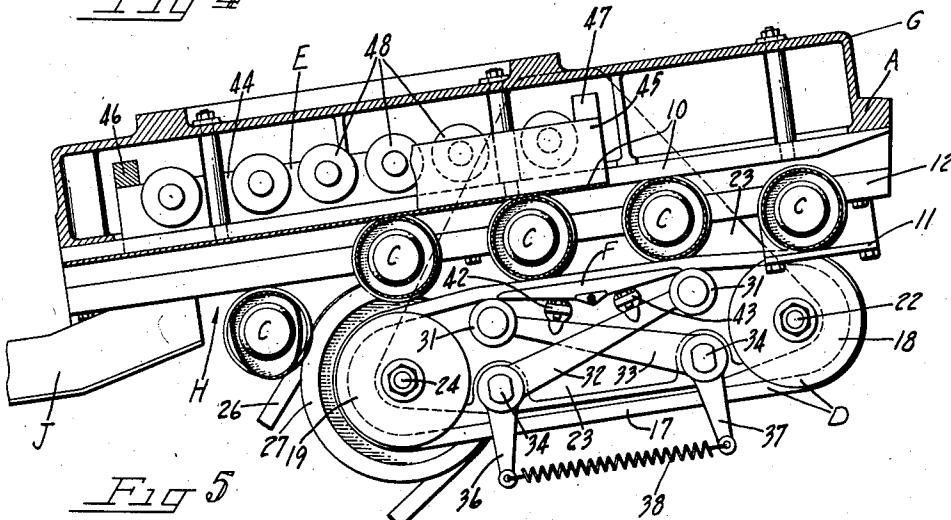
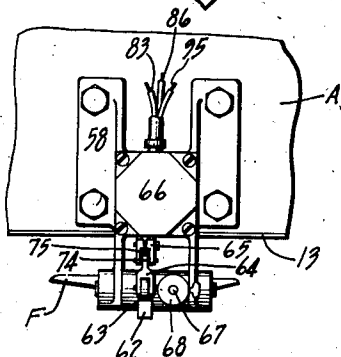


Fig 5



INVENTOR.
Ronald E. J. Nordquist
BY Ivan L. Thornburgh
Charles H. Ene
ATTORNEYS

UNITED STATES PATENT OFFICE

2,353,748

CAN RUNWAY

Ronald E. J. Nordquist, Maplewood, N. J., assign-
or to American Can Company, New York, N. Y.,
a corporation of New Jersey

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5 Claims. (Cl. 209—88)

This invention relates to can runways and the like and has particular reference to electro-magnetic devices for supporting empty cans moving therealong while being tested for roundness and for eliminating deformed cans from the runway by deenergizing the electro-magnetic devices. This is an improvement over the mechanism disclosed in my United States Patent 2,269,474, issued January 13, 1942, on Can runway.

In the rapid handling and transfer of empty cans from one high speed machine to another, there is always a possibility that some of the cans may become deformed or out-of-round so that a cover will not fit in place and therefore such a can is unsuitable for continuing along in a production line. Numerous testing and ejecting devices have been devised and installed in chutes and runways for detecting such a deformed can moving along in a continuous line of cans and for eliminating it therefrom. In some of these devices the operation of ejecting the deformed can is not fast enough for high speed lines. In other of the devices the detecting and ejecting are operated from different mediums, hence the failure of one medium prevents the operation of the other.

The present invention contemplates devices which operate through a single medium for detecting such a deformed, out-of-round can moving along in a runway and for eliminating it immediately from the can line without affecting advancement of normal round cans.

An object of the invention is the provision of a can runway mechanism wherein electro-magnetic devices are utilized to support round cans moving along a runway when the electro-magnetic devices are energized and upon being deenergized momentarily are adapted to eliminate a deformed, out-of-round can from the can line by dropping such a can free of the runway.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a side elevation of a runway mechanism embodying the present invention, the view also showing schematically an associate machine to which the runway mechanism is connected, with parts broken away;

Fig. 2 is a wiring diagram of the electric apparatus used in this mechanism;

Fig. 3 is an enlarged transverse sectional view

taken substantially along the line 3—3 in Fig. 1 with parts broken away;

Fig. 4 is a longitudinal section taken substantially along the broken line 4—4 in Fig. 3; and

Fig. 5 is a fragmentary side elevation of certain parts as they appear when viewed from the right of the mechanism shown in Fig. 3.

As a preferred embodiment of the invention the drawings illustrate an inverted U-shaped and inclined can runway A having a closed section and an open section. The higher end of the runway leads from some machine, as for example, a can washing machine B. Such a machine is used for washing empty cans C having one end open, prior to their being packed with food stuffs in a subsequent machine. The opposite or lower end of the runway leads to such a subsequent machine, which for the purpose of this invention need not be shown.

As the cans enter the runway A from the washer B they roll on their sides onto a conveyor D disposed below and at one side of the runway. This conveyor supports the cans adjacent their closed ends. The conveyor presses the rolling cans upwardly into engagement with a normally energized electro-magnetic unit E located above the runway. The electro-magnetic unit E holds the cans in suspension while they continue to roll. During this rolling action the open end of each can is tested for roundness by the can being rolled over a detecting bar F, disposed beneath the path of the moving cans (Figs. 3 and 4).

Normal, round cans rolling along the runway A pass over the detector bar F without touching it, while a deformed, out-of-round can engages the bar in some part and depresses the entire bar. The deflection of the bar operates an electric switch which temporarily deenergizes the electro-magnetic unit E. The deformed can being no longer held by the unit E passes to a position where it falls while the others are caught by the conveyor. The released deformed can falls to a suitable place of deposit.

The runway A includes an inclined ceiling 10 and a short bottom or can supporting plate 11 (Figs. 1 and 4). These parts are bolted in place to a housing G which constitutes the main frame of the mechanism. Cans entering the mechanism roll across the plate 11 for delivery onto the conveyor D. Side guide rails 12, 13 preferably of non-magnetic material, are secured to integral side extensions of the runway housing and guide the rolling cans along a predetermined path of

travel while they are passing along the conveyor.

The conveyor D closes off a portion of the bottom of the runway and this constitutes the closed section previously mentioned. This conveyor includes a narrow endless belt 17 (Figs. 1, 3 and 4) which operates over a pair of spaced and grooved pulleys 18, 19. The pulley 18 is mounted on a short idler shaft 22 which is journaled in a bracket 23 bolted to a side of the housing G. The pulley 19 is mounted on a drive shaft 24 journaled in a bearing 25 of the bracket 23. This drive shaft is rotated by a drive belt 26 which operates over a drive pulley 27 mounted on the shaft. The drive belt is actuated in any suitable manner and drives the conveyor belt 17 at a speed which is sufficient to take away the rolling cans delivered from the can washer B.

The conveyor belt 17 passes the entering cans upwardly against the inclined ceiling 10 of the runway and then controls the rolling of the cans therealong. For this purpose the conveyor belt 17 is pushed upwardly against the incoming cans by a pair of pressure rollers 31. These rollers are disposed below the upper run of the belt and are fastened to bell crank levers 32, 33 mounted on pins 34 carried in the bracket 23. The crank levers 32, 33 have extended lever arms 36, 37. These arms preferably are connected at their outer ends by a spring 38 and this spring maintains a steady yieldable pressure against the conveyor belt.

The movement of the bell crank levers 32, 33 is limited so that only a predetermined lifting action or pressure of the moving conveyor belt 17 is effective against the incoming cans. This is brought about by adjusting screws which are engaged by the levers. These screws are carried in stop lugs 42, 43 formed on the bracket 23 (Fig. 4).

The ceiling plate 10 of the runway A forms a part of the electro-magnetic unit E and preferably is made of non-magnetic material. This ceiling and the magnetic unit extend beyond the conveyor D and project over an open or bottomless portion H of the runway and terminate adjacent a chute J. This bottomless portion H constitutes the open section of the runway.

The electro-magnetic unit E includes a pair of longitudinal and inclined metallic side bars or members 44, 45. These members are arranged on edge and are held in spaced relation by spacer blocks 46, 47. A plurality of coils or electro-magnets 48 are secured between the bar members with the ends of the magnets in contact with the bar members. Suitable electrical circuits contained in part within a casing K mounted on the housing G connect these magnets with the detecting mechanism F and with a source of electrical energy, as will be described fully hereinafter.

The detector bar which detects the distortion of a deformed or out-of-round can is disposed parallel with and at one side of the conveyor D, beneath the path of travel of the rolling cans and adjacent their open ends (Figs. 3 and 4). Such a detector bar preferably is of a length greater than half the circumference of a can body. Thus any deformation of the open end of a can will be detected in half a revolution or less of such a rolling can body.

The detector bar F is an integral part of a lever 56 mounted on a pin 57 which is carried in a bracket 58 bolted to the runway housing

G (Figs. 3 and 4). The opposite end of the lever 56 has a cam segment 62 formed thereon which engages against a roller 63 carried in a clevis 64. Such a clevis is suspended from a support 65 which is carried by a normally closed electric detector switch 66 secured to the bracket 58.

The lever 56 on the cam segment side supports a rod 67 which carries a counter-weight 68. The counter-weight effectively counter-balances the lever and maintains the detector bar F in its normal operating and detecting position (shown in Fig. 3). In this position the weight 68 holds the lever 56 against an adjustable stop screw 72. Likewise, an adjustable stop screw 73 is used to limit deflection of the detector bar F in the opposite direction. Stop screw 73 is positioned on the bracket 58 near the cam segment end of the lever 56.

As normally round cans roll along the ceiling plate 10 of the electro-magnetic unit E they pass directly over the detector bar F without touching it (Fig. 4) as hereinbefore mentioned. These round cans continue rolling along the ceiling plate and across the bottomless portion H of the runway. When beyond this bottomless portion, the cans roll out of the field of the magnets and then fall off into the chute J, which guides them to a suitable place of deposit.

An out-of-round can wobbles along the ceiling plate 10 and engages the detector bar F and depresses it. When the detector bar F is depressed the cam segment 62 of the lever 56 moves upwardly and pushes the roller 63 outwardly, toward the right as viewed in Fig. 3. This action rocks the clevis 64 outwardly and forces a switch operating finger 74 formed thereon, upwardly against a movable switch element or stem 75 of the detector switch 66 and thus opens the switch. It is this opening of the switch that deenergizes the electro-magnetic unit E and thereby releases the out-of-round can from the ceiling plate 10 as hereinbefore mentioned. The released can falls through the bottomless portion H of the runway to any suitable place of deposit.

As soon as a falling out-of-round can has cleared the runway, the electro-magnets 48 are again energized and magnetically hold the remaining cans in the procession in place against the runway ceiling. While the magnets are deenergized the cans directly over the conveyor belt 17 are supported thereby. The length of time the magnets remain deenergized is controlled by a time delay dash pot 76 which is associated with the electric apparatus which will now be explained in connection with the wiring diagram.

Reference should now be had to the wiring diagram in Fig. 2. This diagram discloses two circuits, a normally closed magnet circuit X, and a normally open time delay circuit Y. These circuits transmit electric energy from any suitable source of such energy, such as a generator 81.

The magnet circuit X includes the electro-magnets 48 and the detector switch 66. One side of the magnets is connected in parallel to a lead wire 82 which connects with one side of the generator 81. The other side of the generator is connected by a lead wire 83 to one side of the detector switch 66. The detector switch is a two-way switch having a terminal 84 against which the movable element of the switch is normally closed, and having a terminal 85 which is normally open.

The closed terminal 84 of the detector switch 66 is connected by a wire 86 to one side of a normally closed relay switch 87. The opposite side of the relay switch is connected by a wire 88 to a magnet bar 89 to which the opposite sides 5 of the magnets are connected in parallel.

Hence as long as the detector switch 66 and the relay switch 87 are closed, electric energy from the generator 81 travels along this magnet circuit and maintains the electro-magnets 48 in 10 an energized condition. It is this condition that permits the good or round cans entering the mechanism to roll along the ceiling 10 of the runway and to discharge into the chute J.

When a deformed or out-of-round can comes 15 into the mechanism and is detected, it opens the detector switch 66 at the terminal 84 and closes it against the terminal 85. This breaks the magnet circuit X and thus de-energizes the magnets 48. The shifting of the movable element of the switch 66 into contact with the terminal 85 opens the relay switch 87 and thus prevents the re-energizing of the magnets until the deformed can has been discharged. Actuation of the relay switch is brought about by the time delay circuit Y which will now be explained.

The time delay circuit Y includes the dash pot 76. This dash pot controls the delayed closing of the relay switch 87. For this purpose the movable element of the relay switch is connected to the dash pot by way of a movable core 92 of an electric solenoid 93. One side of the solenoid is connected by a wire 94 to the generator lead wire 82. The opposite side of the solenoid is connected by a wire 95 to the open terminal 85 35 of the detector switch 66.

Hence when the movable element of the detector switch 66 closes against the terminal 85 of the time delay circuit, electric energy from the generator is transmitted through the time delay circuit by way of the wires 82, 94, solenoid 93, wire 95, switch terminal 85, switch 66, and back to the generator along the lead wire 83. The energy passing through this circuit energizes the solenoid 93. It is the energizing of this solenoid that opens the relay switch 87.

As soon as a deformed can passes the detector bar F, the bar is raised under the action of the counterweight 68 and this movement closes the detector switch 66 at the switch terminal 84. This breaks the time delay circuit Y and deenergizes the solenoid 93. The deenergizing of the solenoid permits the dash pot 76 to come into operation to effect the time delayed or slow closing of the relay switch 87 to insure sufficient time for the safe discharge of the deformed can from the runway as hereinbefore mentioned.

When the deformed can has dropped far enough away from the runway ceiling 10 to prevent its reattraction, the relay switch closes and thus reestablishes the magnet circuit X and the resultant reenergizing of the electro-magnets 48. This reenergizing of the magnets is effected before the next following can in the procession of cans supported on the conveyor D, comes adjacent the opening H in the runway, so that these cans will be attracted again to the runway ceiling 10, and if good such cans will roll along the ceiling toward the good can discharge chute J as hereinbefore mentioned.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts with-

out departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In a runway for the passage of round cans through a closed section having a ceiling and an open section, the combination of electro-magnetic means for holding the cans in suspended position while they pass the open section of the runway, the closed section of the runway including yieldable means for holding the moving cans against said ceiling, a detector element disposed adjacent the closed section of said runway for detecting cans which are out-of-round, and an electric switch responsive to and operable by said detector element for deenergizing said electro-magnetic means to eliminate the said out-of-round can from said runway by dropping it through the said open section.

2. In a runway for the passage of round cans through a closed section having a ceiling and an open section, the combination of an electro-magnetic unit for holding the cans in suspended position within said runway while the cans are rolling therealong over the open section of the runway, the closed section of said runway including yieldable means for holding the moving cans against said ceiling, a movable detector element disposed adjacent the closed section of said runway and adapted to be engaged by out-of-round cans, an electric switch responsive to and operable by said detector element for deenergizing said electro-magnetic unit as a said deformed out-of-round can approaches the open section of said runway, and a time delay instrumentality for keeping said electro-magnetic unit deenergized until the said out-of-round can is eliminated by falling through the said open section.

3. In a runway for testing round cans and including a closed section and an open section having an inclined ceiling, the combination of an electro-magnetic unit for holding the cans in suspended position against said runway ceiling while cans are rolled therealong over the open section of the runway, a chute located on the exit side of said open section, a conveyor disposed beneath said runway for rolling cans along the said inclined ceiling, a movable detector bar disposed in said closed section and being adapted for engagement by out-of-round cans, an electric switch responsive to and operable by said detector bar for deenergizing said electro-magnetic unit, and a time delay instrumentality adapted to hold said electro-magnetic unit deenergized until the said out-of-round can drops from said runway ceiling and falls through the said open section before reaching said chute.

4. In a runway for testing round cans and including a closed section and an adjacent section open at its bottom, the combination of an electro-magnetic unit for holding the cans in suspended position while they pass the open section of the runway, a movable detector bar disposed adjacent the path of travel of the cans rolling along said runway and being adapted for engagement by out-of-round cans, an electric switch responsive to and operable by said detector bar for deenergizing said electro-magnetic unit as a said out-of-round can approaches the open section of said runway, a solenoid operated relay switch, and a time delay instrumentality connected to the said relay switch and actuated simultaneously therewith by said solenoid when said electro-magnetic unit is deenergized, the

said time delay instrumentality being adapted to reset said relay switch following the elimination of an out-of-round can from the open section of said runway whereby said electro-magnetic unit is reenergized for a subsequent testing and elimination operation.

5. In a runway for testing the roundness of cans and including a closed section and an open section having an inclined ceiling, the combination of an electro-magnetic unit for holding the cans in suspended position against said runway ceiling while the cans are rolling past the open section of the runway, an endless belt conveyor disposed beneath and at one side of said runway for engaging the rolling cans, devices operative

against said belt conveyor for effecting through the conveyor the lifting of the rolling cans into engagement against said inclined ceiling and the rolling of the cans along said ceiling toward said open section, a detector bar disposed in the said closed section adjacent said belt conveyor for detecting rolling cans which are out-of-round, an electric switch responsive to and operable by said detector bar for deenergizing said electro-magnetic unit, and a time delay instrumentality adapted to hold said electro-magnetic unit deenergized until the said out-of-round can is eliminated from said runway by dropping through the said open section.

RONALD E. J. NORDQUIST.