

Nov. 15, 1955

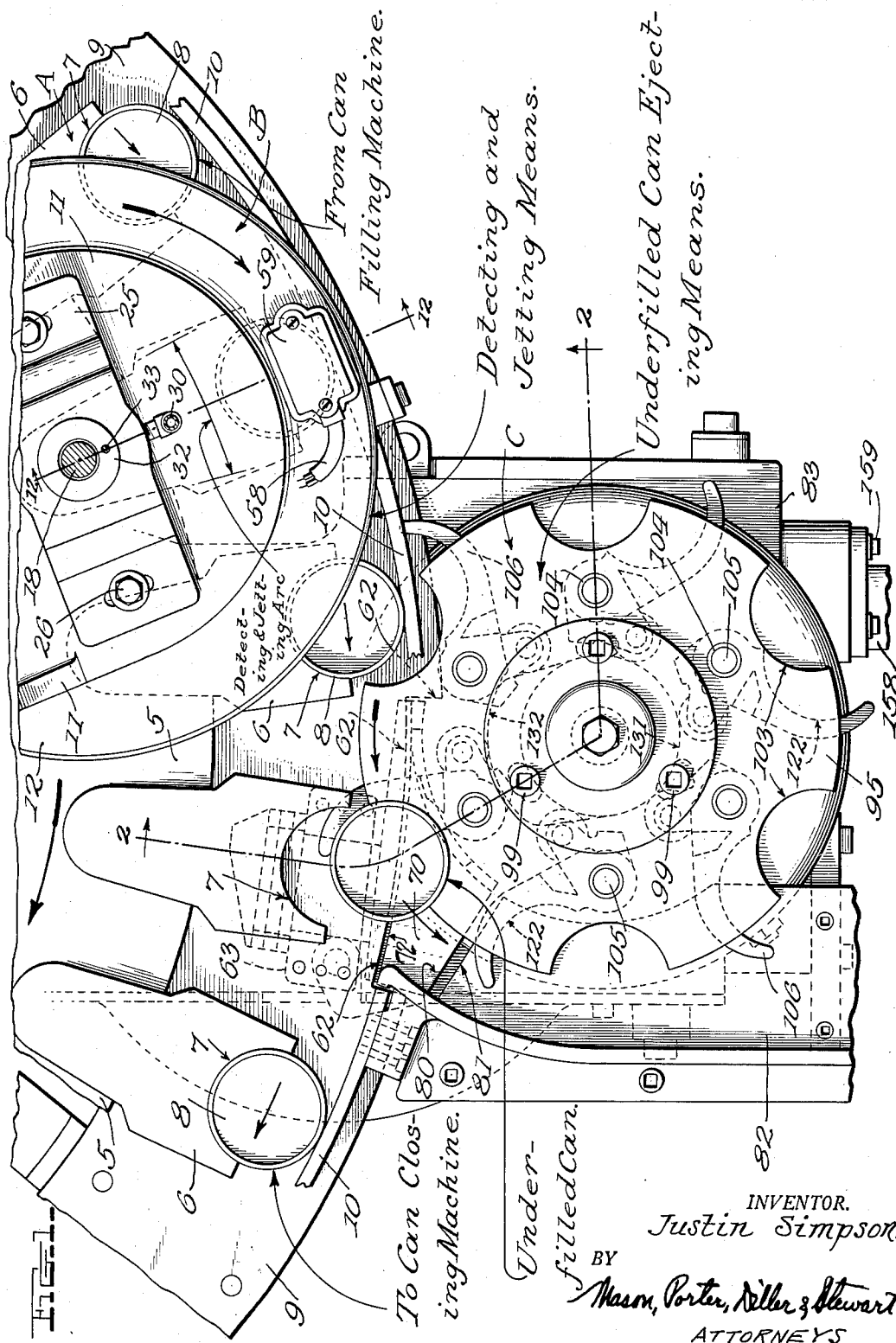
J. SIMPSON

2,723,748

SLACK FILLED CAN DETECTING AND EJECTING MEANS

Filed April 6, 1950

9 Sheets-Sheet 1



Nov. 15, 1955

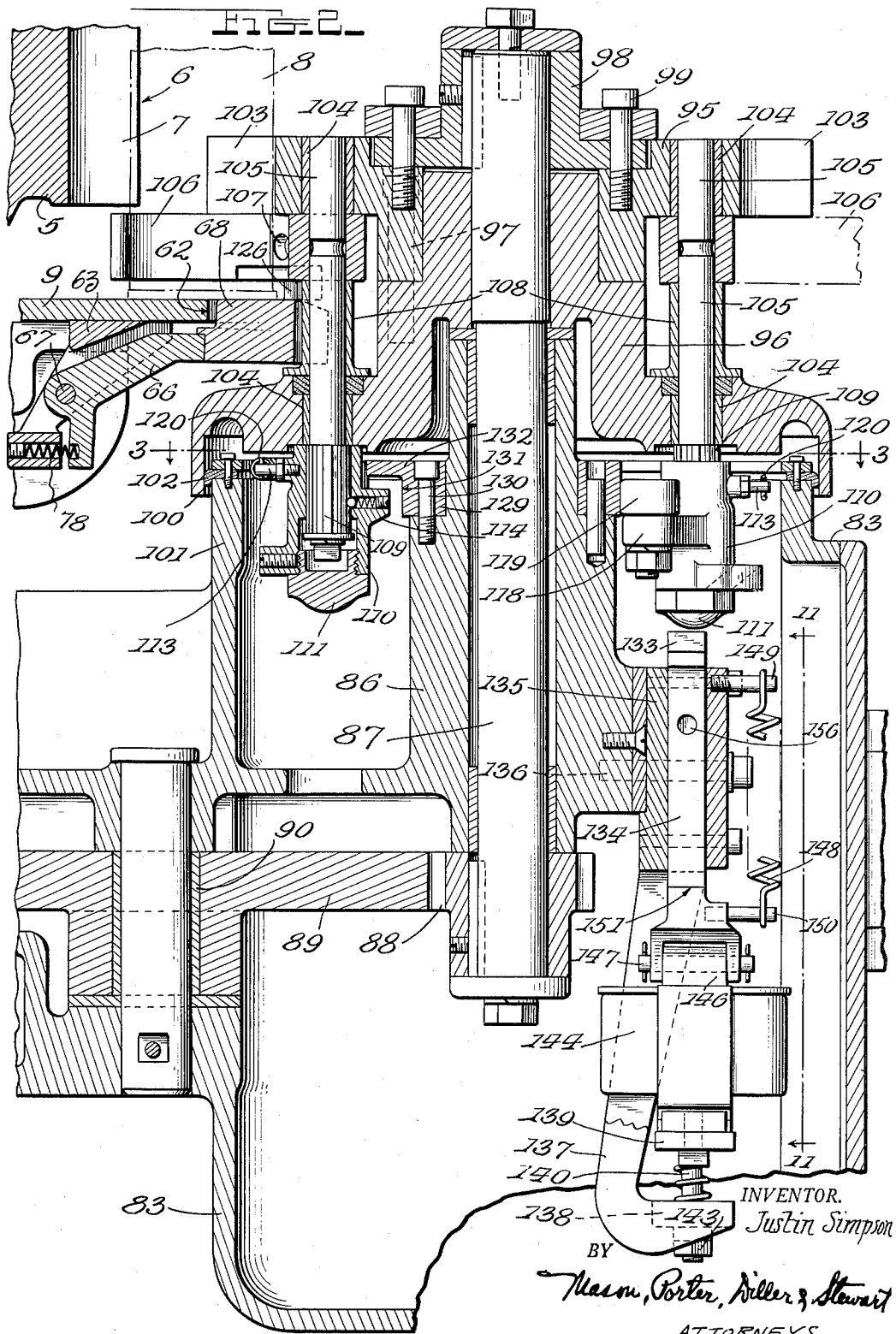
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9 Sheets-Sheet 2



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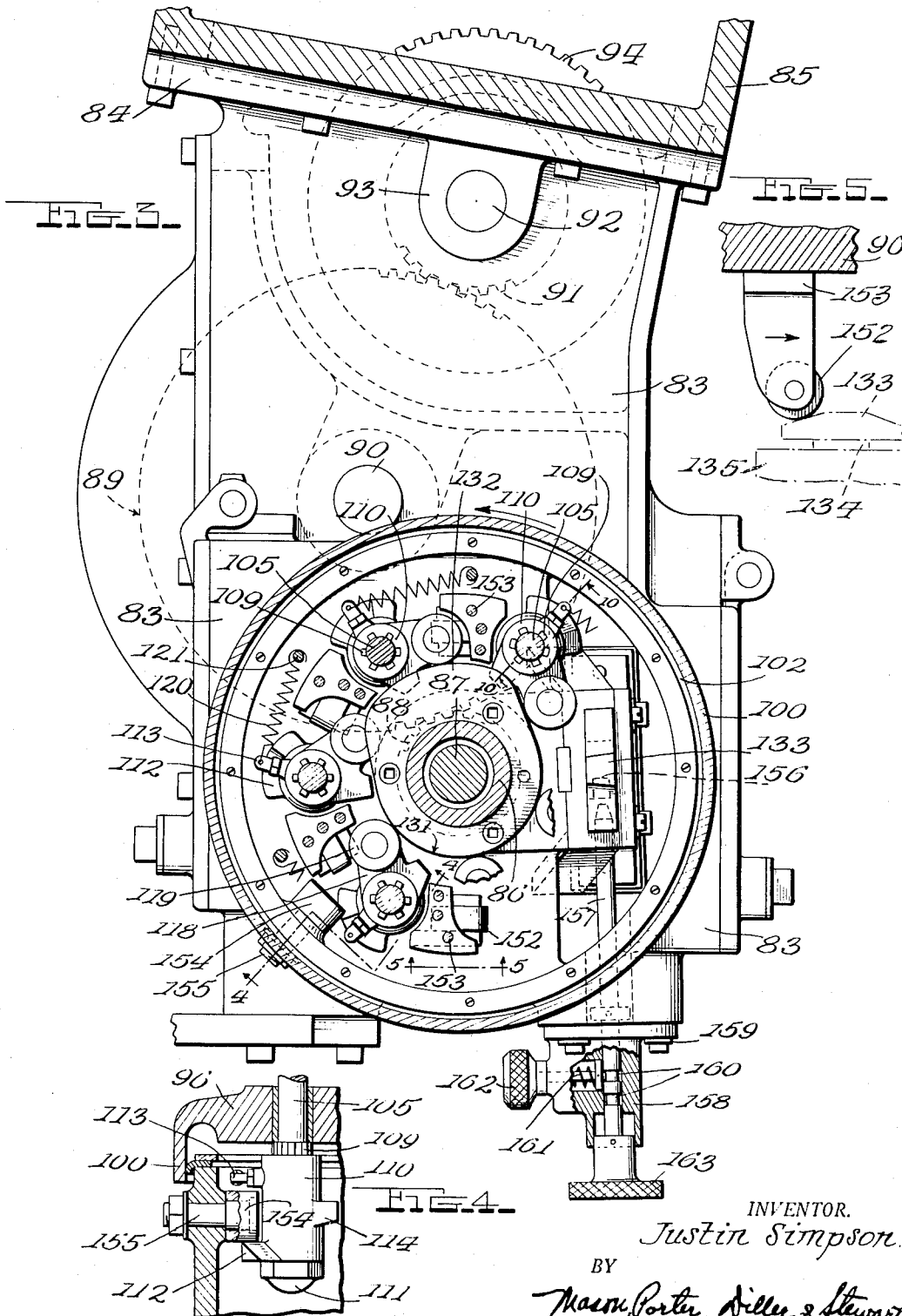
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9 Sheets-Sheet 3



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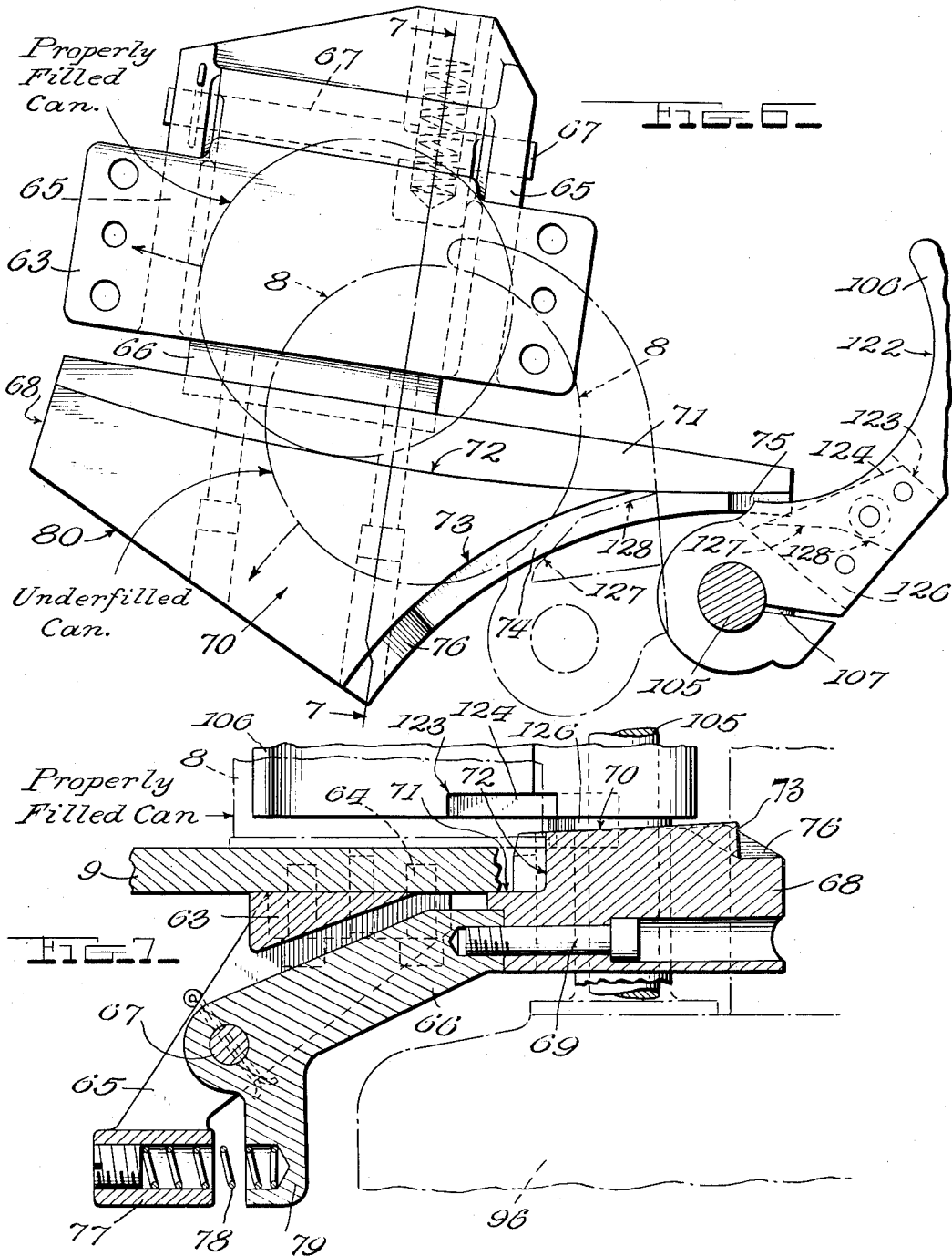
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9 Sheets-Sheet 4



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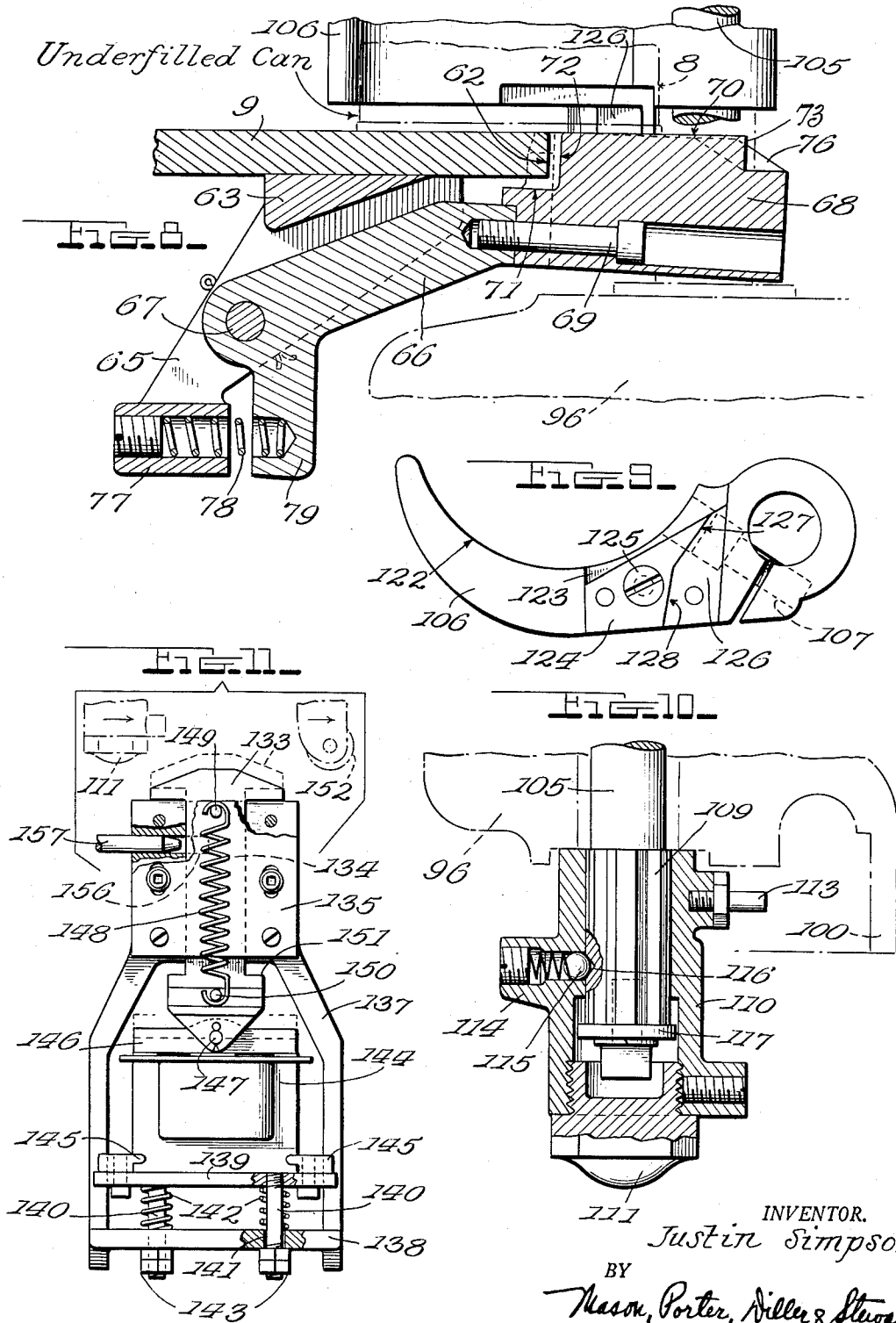
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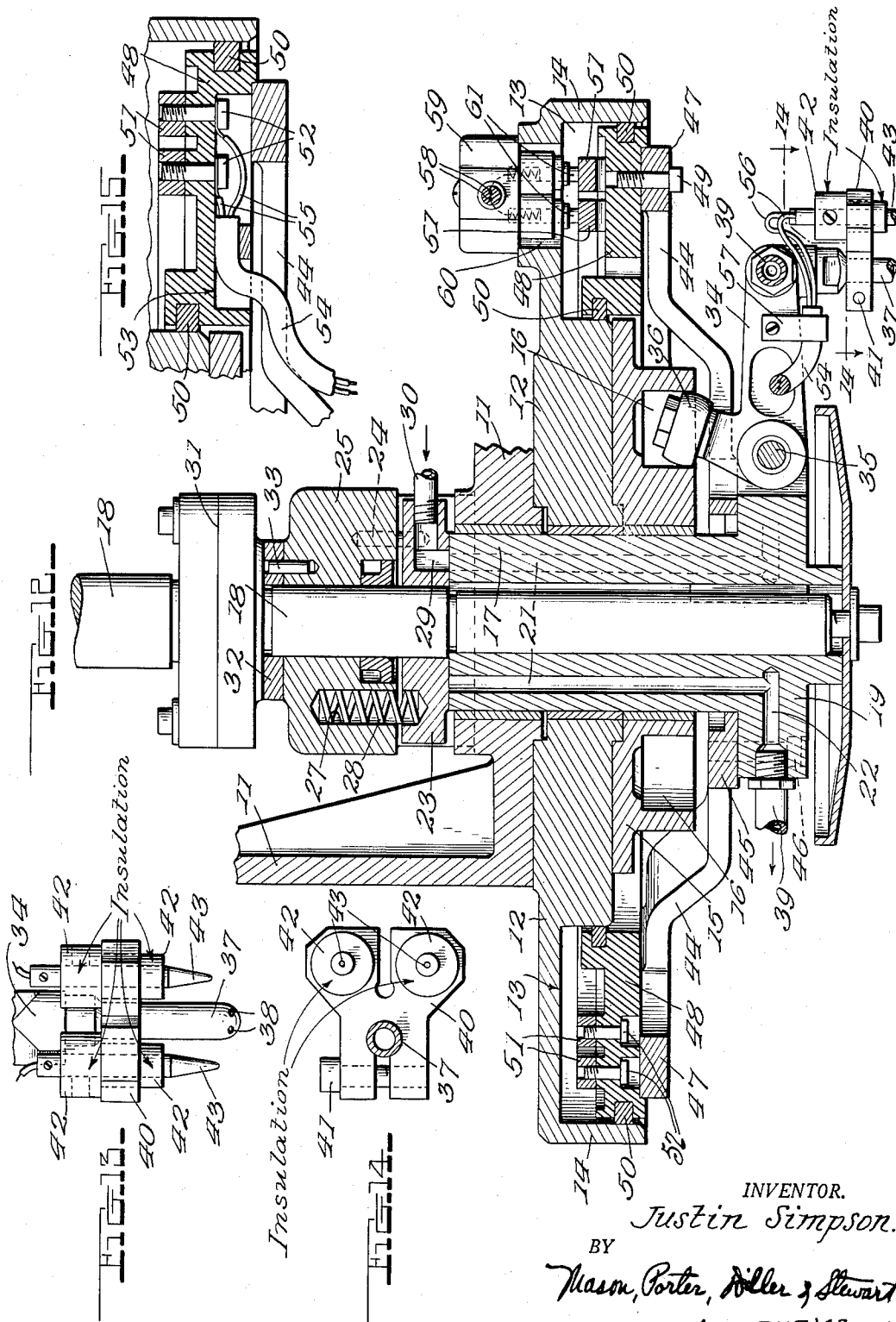
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9 Sheets-Sheet 6



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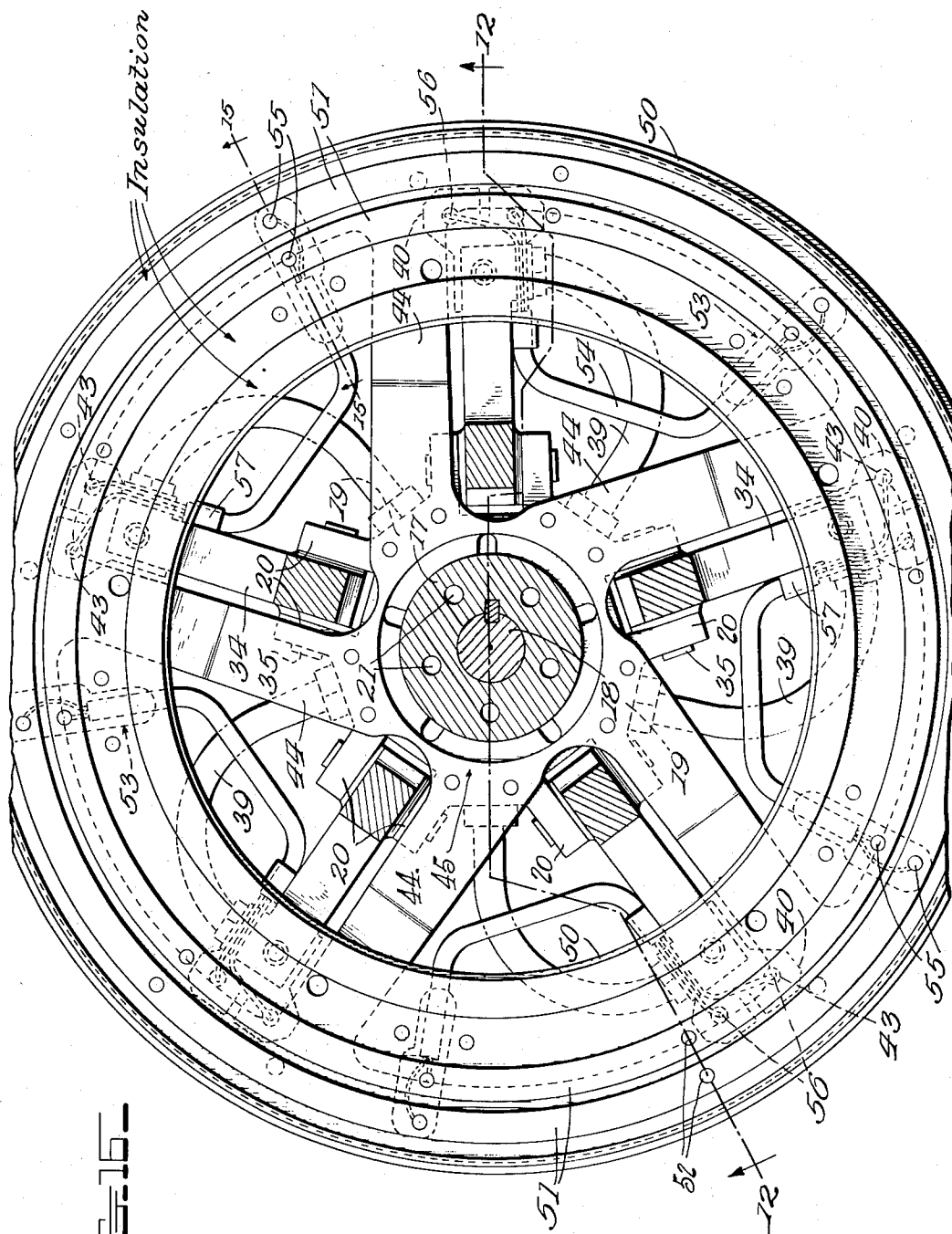


FIG. 15

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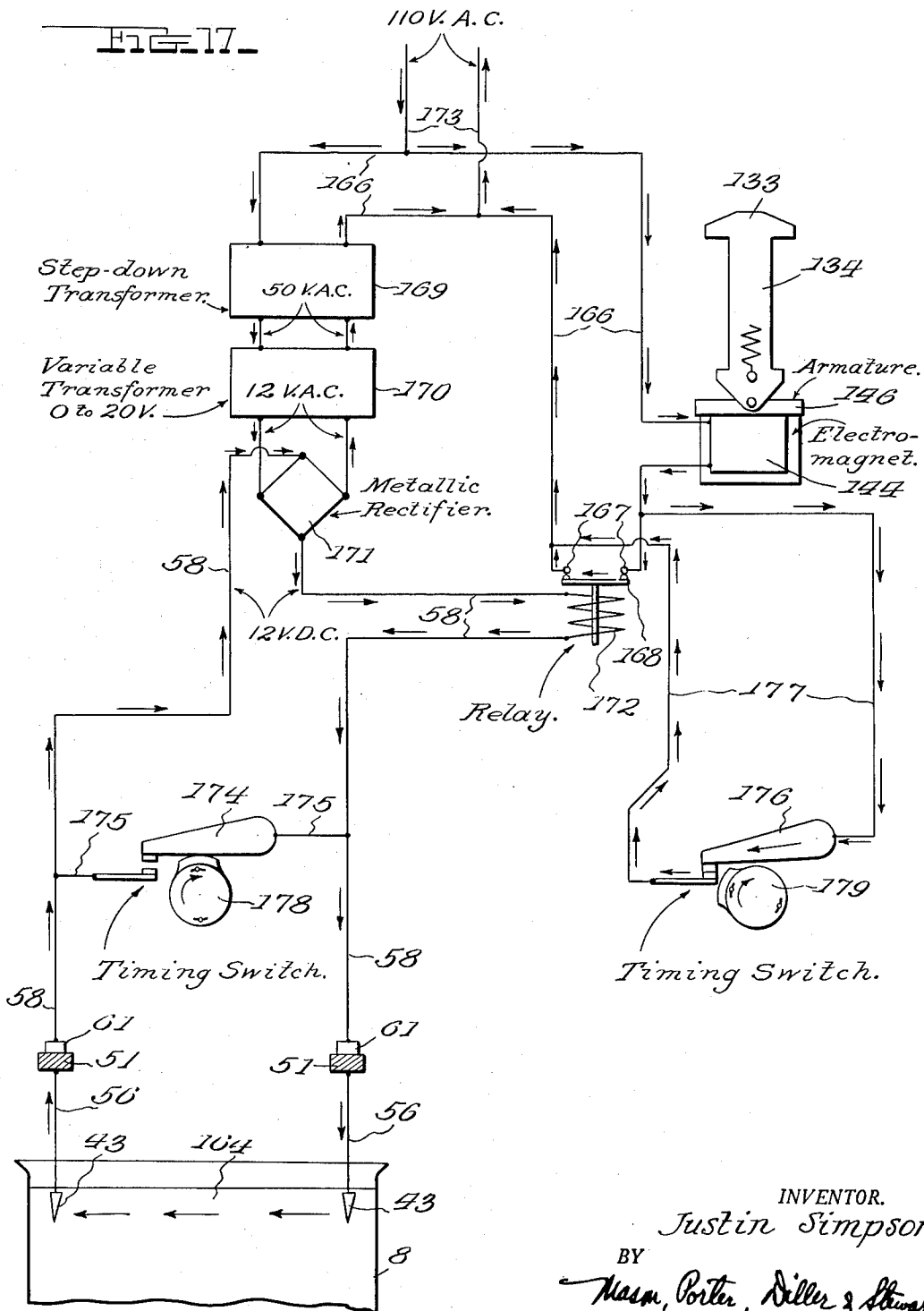
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9 Sheets-Sheet 8



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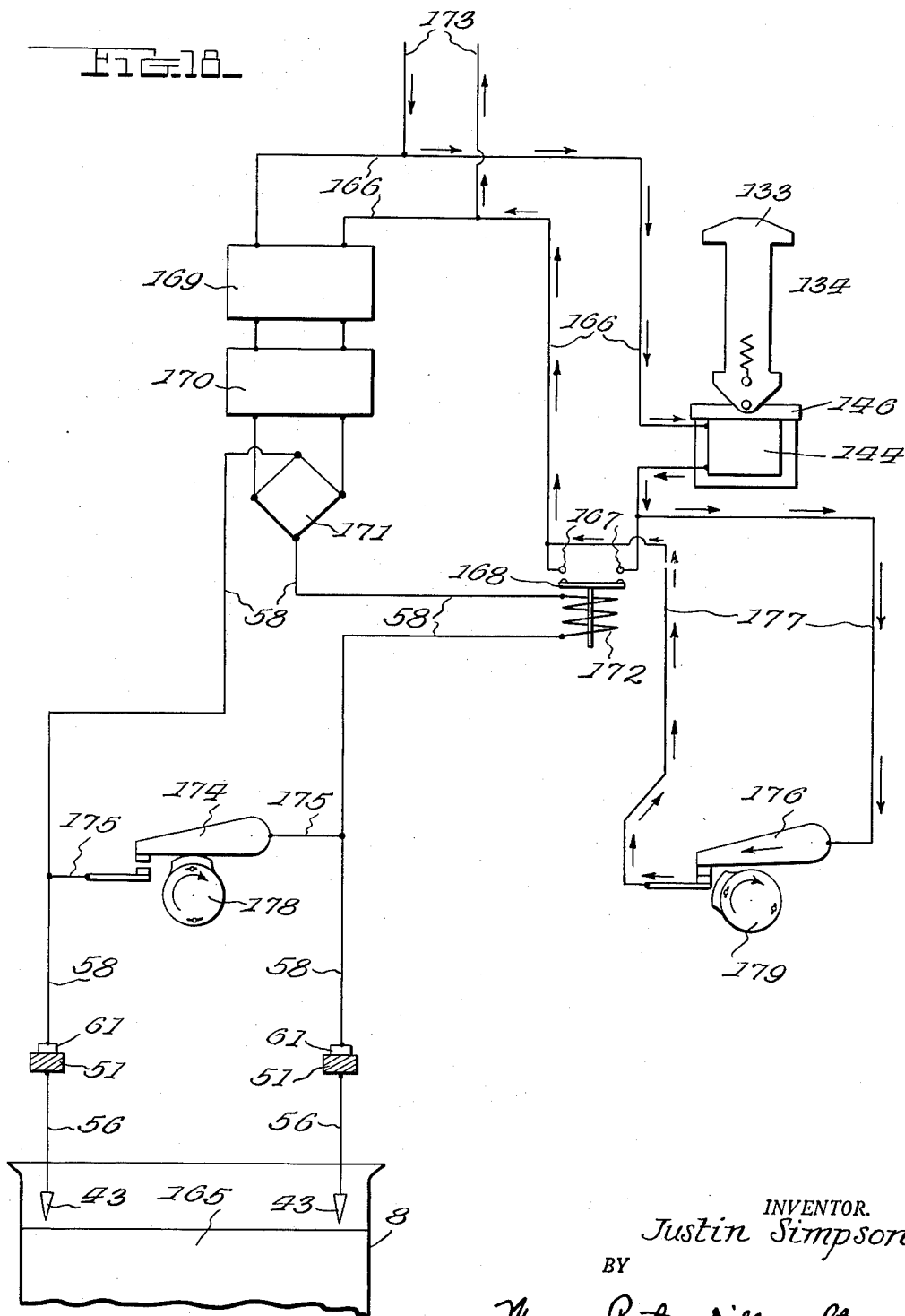
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9 Sheets-Sheet 9



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SLACK FILLED CAN DETECTING AND EJECTING MEANS

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Application April 6, 1950, Serial No. 154,299

25 Claims. (Cl. 209—74)

The invention relates generally to the art of packaging liquids in cans and primarily seeks to provide novel apparatus associated with the means for feeding the filled cans from the filling machine to the closing machine and effective to detect such cans as may be slack filled and eject them from the feeding means so that they will not be delivered to the closing machine and closed therein.

It is conventional practice presently to fill liquids into cans in automatic filling machines which operate with great rapidity and are capable of maintaining fill tolerances with a high degree of accuracy. However, even the best known of such machines will slack fill cans at more or less infrequent intervals, and it is absolutely essential that efficient means be provided for detecting slack filled cans and ejecting them from the feed line so that they will not be closed and distributed to unsuspecting customers. In the filling of some liquids, such as beer, it is desirable to remove air from the head spaces in the cans prior to the closing of the cans, and one manner of accomplishing this has been by way of inert gas jetting and the crowding out of air by the foaming of the beer in the can head spaces. The necessary rapidity of operation of the feeding means, the foaming of gas jetted liquids and the desire to design equipment for operation in a minimum of space have aggravated the problems incidental to the provision of a satisfactory slack filled can detecting and ejecting apparatus, and it is a purpose of the present invention to provide a novel apparatus which will surmount all of said difficulties.

An object of the invention is to provide in combination with the feeding means by which the filled cans are conveyed to the closing machine, a filled can testing station, a slack filled can ejecting station, guide means normally disposed to guide cans past the ejecting station but displaceable to permit ejection of slack filled cans at said ejecting station, means at the detecting station for testing each passing can to ascertain if it is properly filled, and means at the ejecting station operable under control of said testing means for displacing said guide means and ejecting each slack filled can.

Another object of the invention is to provide apparatus of the character stated in which the filled can feeding means, the detecting means and the ejecting means comprise or are mounted on rotary turret structures, the same being operable in timed relation.

Another object of the invention is to provide apparatus of the character stated in which the displaceable guide means is so constructed and arranged as to serve normally as a guiding means for normally filled cans, and also as a part of the means effective to support slack filled cans as they are being ejected.

Another object of the invention is to provide apparatus of the character stated in which the testing means includes a pair of electrodes connected in control circuit means effective to control operation of the ejecting means, devices being included for lowering the electrodes a predetermined distance into each can as it passes in order to determine if it has a proper fill therein and for condition-

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ing the control circuit for effecting a slack filled can ejection only when the electrodes are lowered said predetermined distance.

Another object of the invention is to provide an apparatus of the character stated wherein the fill testing electrodes are carried by and are immersed in the can fill simultaneously with means for jetting said fill.

Another object of the invention is to provide an apparatus of the character stated wherein the ejection of slack filled cans is effected by cam actuated sweep arm means which normally travel in an ineffective condition but which are conditioned for being cam actuated to eject slack filled cans under fill tester means control.

Another object of the invention is to provide an apparatus of the character stated wherein the can guide means and the slack filled can ejecting sweep arms have cooperating camming means thereon which are ineffective when the sweep arms are in ineffectual position but which are cooperatively engageable when each sweep arm starts a slack filled can ejecting sweep to displace the guide means from its normal can guiding position and place it in position for providing partial support for a slack filled can as it is being ejected.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims, and the several views illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a fragmentary plan view illustrating the invention, parts being broken away and in section.

Figure 2 is an enlarged fragmentary vertical cross section taken on the line 2—2 on Figure 1.

Figure 3 is an enlarged fragmentary horizontal section taken on the line 3—3 on Figure 2.

Figure 4 is an enlarged fragmentary vertical cross section taken on the line 4—4 on Figure 3.

Figure 5 is an enlarged fragmentary vertical cross section taken on the line 5—5 on Figure 3, one of the sweep arm conditioning cam depressing rollers being shown in the process of depressing the cam, the latter being shown in dot and dash lines.

Figure 6 is an enlarged detail plan view illustrating the switch plate and its support, a slack filled can ejecting sweep arm being shown in full lines in its normal ineffectual position, and in dot and dash lines in its can ejecting, switch plate displacing or depressing position.

Figure 7 is an enlarged fragmentary vertical cross section taken on the line 7—7 on Figure 6, the can guiding or switch plate being shown in its normally elevated or can guiding position.

Figure 8 is a view similar to Figure 7, the can guiding or switch plate being shown in its displaced or depressed position in which it forms a partial support for a can being ejected by a sweep arm.

Figure 9 is an enlarged detail inverted plan view of one of the slack filled can ejecting sweep arms.

Figure 10 is an enlarged fragmentary vertical cross sectional view taken on the line 10—10 on Figure 3.

Figure 11 is a detail face view taken on line 11—11 on Figure 2, and illustrating the sweep arm conditioner and its mounting, parts being broken away and in section and one of the cam replacer rollers and one of the sweep arm lifter buttons being shown in dot and dash lines.

Figure 12 is an enlarged fragmentary vertical cross section taken on the line 12—12 shown on Figures 1 and 16.

Figure 13 is an enlarged detail face view illustrating the mounting of one pair of tester electrodes.

Figure 14 is a detail horizontal section illustrating the electrode mounting shown in Figure 13, the section being taken on the line 14—14 on Figure 12.

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Figure 15 is an enlarged fragmentary vertical cross section taken on the line 15—15 on Figure 16.

Figure 16 is a horizontal sectional view illustrating the collector ring supporting spider and the arrangement of the tester electrode carrying arms.

Figure 17 is a diagrammatic view illustrating the control circuit connected with a set of electrodes immersed in a normal or proper can fill.

Figure 18 is a view similar to Figure 17, a slack filled condition of a can being illustrated.

In the example of embodiment of the invention herein disclosed, the transfer turret structure by which the filled cans are fed past the fill testing and jetting means and the under filled can ejecting means on the way to the cover feeding means and the can closing means is generally designated A, said testing and jetting means is generally designated B, and said ejecting means is generally designated C. The position at which the testing and jetting takes place is hereinafter called the testing or the testing and jetting station and the position at which slack filled cans are ejected from the filled can feeding means is hereinafter referred to as the ejecting station.

The transfer turret structure A includes a rotor 5 to which rotation may be imparted in any approved manner (not shown) and upon which are mounted equidistantly spaced arms 6, each having a peripheral pocket 7 in which to receive a filled can 8 from the filling machine. Said arms 6 serve to convey the cans over a stationary table or support 9 on which they are confined against outward displacement by a guide rail 10 which is disposed concentrically with respect to the turret center.

The filled can testing and jetting means B overlies the periphery of the turret structure A in the manner clearly illustrated in Figure 1 and is suspended from a bracket or support 11 which is fixed in any approved manner (not shown) on the transfer turret frame structure. See Figures 1 and 12. A support plate 12 is fixed to and depends from the bracket 11, and said plate has an annular recess 13 in its underface defined outwardly by a depending peripheral flange 14. A cam 15 is fixed to the lower face of the plate 12 and has a downwardly opening cam groove 16 therein, the purpose of which will become apparent as this description progresses.

A rotor 17 is rotatable in bearings provided therefor in the bracket 11, the plate 12 and the cam 15, and said rotor is keyed on the lower end of a shaft 18 to which rotation is imparted in any approved manner (not shown) in timed relation to the previously described can feeding or transferring rotor 5. The rotor 17 has a radially extended enlargement 19 at its lower end equipped with five sets of radially projecting pivot ear pairs 20. The rotor also is provided with five upright equidistantly spaced gassing ducts 21 which communicate at their lower ends with radial duct extensions 22 opening out between the pairs of ears 20, and said upright ducts 21 also open through the upper end extremity of the rotor 17 where they are covered by a valve plate 23. The valve plate 23 is pinned as at 24 to a cross head 25 which is adjustably secured as at 26 on the bracket 11 and is thus held stationary by the cross head and against rotation with the rotor 17. A plurality of bores 27 are provided in the bottom face of the cross head 25 in which to receive compression springs 28 which engage with the valve plate 23 and press the same tightly against the upper end extremity of the rotor 17 so as to seal the travelling ducts 21 against free egress of gas. The valve plate 23 has a duct 29 disposed for successive registration with the upright rotor ducts 21 as they move past the same, and the valve plate duct 29 is connected as at 30 with a suitable gas supply (not shown).

The rotor driving shaft 18 is illustrated as formed in sections connected by a suitable couple 31, a thrust ring 32 being provided and pinned to the stationary cross head as at 33.

It will be apparent by reference to Figures 12 and 16 of the drawings that a bell crank carrier 34 is pivoted

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as at 35 between each pair of ears 20, one arm of each bell crank being extended radially outward from its pivotal mounting and the other upwardly in the manner clearly illustrated in said figures. Each upwardly directed bell crank arm is equipped with a roller 36 which is engaged in the previously mentioned cam groove 16, and each outwardly extended bell crank arm carries at its outer end extremity a hollow jetter tube 37 having gas emitting orifices 38 in its lower end extremity in the manner clearly illustrated in Figure 13. A flexible duct 39 connects each jetter tube 37 with the adjacent preceding rotor duct 22, 21 in the manner clearly illustrated in Figure 16 so that each time a given duct 22, 21 passes the stationary duct 29 a charge of gas will be directed through the orifices 38 of the respective jetter tube 37. The rotors A and B are driven in cooperatively timed relation so that one of the jetter tubes 37 will be registered over and travel along with each filled can 8 as it is passing the testing and jetting station, and the cam groove 16 is so shaped that it will act on the bell crank carriers 34 to immerse each jetter tube in the can fill as the can is passing the jetting station. It is the practice to hold the orifices 38 of each jetter tube just beneath the surface of the fill when liquids to be jetted are being packaged so as to cause the gas, preferably CO₂, to agitate and bring about a foaming action at the top surface of the can fill. Beer is a good example of a fill which is jetted in this manner, and the jetting action results in the formation of foam in the head space of the can which is effective to crowd out the air therefrom and fill the head space with foam which will exclude air and result in the closing of the cans without any substantial amount of air in the head spaces thereof.

A clamp 40 is affixed to each jetter tube 37, being secured thereon as at 41, and each clamp carries two insulating blocks 42 in which are supported a pair of tester electrodes 43, the arrangement and mounting of the electrodes being best illustrated in Figures 12 to 14 and 16 of the drawings. The relation of the lower end extremities of the electrodes 43 and the jetter tubes 37 is shown in Figure 13, and it is to be understood that each time a jetter tube is immersed in the liquid comprising a can fill, the electrodes 43 which are movable therewith will similarly be immersed in the liquid. The normal immersion of the electrodes in a liquid fill is illustrated in Figure 17, and in Figure 18 the electrodes are diagrammatically illustrated as fully lowered into a can having a slack fill.

The bell crank carriers oscillate between the arms 44 of a spider 45 which is secured as at 46 to the rotor head 19. See Figures 12 and 16. The spider includes an outer ring portion 47 whereon a Lucite ring 48 is mounted, being removably secured thereon as at 49. The Lucite ring 48 is rotatable in the recess 13 in the undersurface of the bracket plate 12, and packing rings 50 preferably are provided at the peripheral edges of the ring 48 in position for engaging in recess sealing contact with the walls defining the plate recess 13. Two collector rings 51 are secured as at 52 on the Lucite ring 48 within the bracket plate recess 13. The individual inner and outer ring segments are radially aligned, and beneath each set of aligned inner and outer segments the Lucite ring 48 is provided with a recess 53 in which to receive the ends of conductors 54 in the manner clearly illustrated in Figures 15 and 16. The conductors 54 are electrically connected as at 55 with the collector ring sections, and as at 56 to the corresponding pair of electrodes 43. See Figures 12, 13, 15 and 16. The conductors 54 are clamped as at 57 to the respective bell crank carriers 34 so as to be movable therewith without entanglement, and electric current is supplied by conductors 58 leading into a box 59 secured on the top of the bracket plate 12 in the manner illustrated in Figures 1 and 12 over a recess 60 formed in said plate. Spring pressed ring contacts 61 depend through the plate

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recess 60 and make electrical contact with the collector ring segments in the manner illustrated in Figure 12.

At the slack filled can ejecting station the stationary member 9 is recessed at its periphery as at 62 to provide a clearance through which slack filled cans may be ejected, and opposite said recess a bracket 63 is secured as at 64 to the undersurface of the table. See Figures 1, 6 and 7. The bracket 63 has a pair of depending arms 65 between which a support arm 66 is pivoted as at 67. A switch plate generally designated 68 is secured as at 69 to the support arm 66 and has a top or can supporting surface 70 and a depressed ledge 71 which extends under the table 9 and serves as an abutment stop for limiting upward movement of the switch plate at the position illustrated in Figure 7. The ledge 71 is defined at one side by an arcuate wall 72 which is concentric to the transfer turret center, and the switch plate is provided with another arcuate wall 73 which is concentric to the ejector turret center and in part defines a plate holddown track 74 which merges at one end into an upwardly inclined receiving or depressing ramp 75, and at its other end into a downwardly inclined release ramp 76.

The bracket 63 has a socket 77 in which is mounted a compression spring 78. At its outer end the compression spring engages an arm extension 79 depending from the support arm 66 and serves to constantly tend to lift the switch plate to the position illustrated in Figure 7. When the switch plate is so lifted, the arcuate wall 72 thereof will project above the table 9 in the manner illustrated in Figure 7 and serve as a guide for properly filled cans being conveyed over the table 9 by the turret arms 6. The switch plate is so shaped and placed that the top surface 70 thereof will serve as part of the support means for each slack filled can being ejected at the ejecting station in the manner illustrated in Figure 1 and in dot and dash lines in Figures 6 and 8.

It will be apparent by reference to Figure 1 of the drawings that the delivery edge 80 of the switch plate 68 extends approximately radially with respect to the center of the ejector turret structure, and delivers onto an adjacent receiving end 81 of a supporting shelf 82 over which slack filled cans are ejected.

The slack filled can ejecting means includes a housing 83 which is secured as at 84 to a portion 85 of the transfer turret support framing. See Figures 1, 2 and 3 of the drawings. The housing has an upstanding bearing 86 in which is rotatably mounted a turret drive shaft 87 to the lower end of which a spur gear 88 is keyed. The gear 88 is driven by a meshing idler gear 89 which is rotatably mounted as at 90 on the housing and is in turn enmeshed with and driven by a small driver gear 91. The driver gear 91 is mounted on an idler shaft 92 which is rotatably supported as at 93 on the housing and also carries a larger gear 94 which is adapted to be driven by a driver gear (not shown) which rotates with the transfer turret 6.

On the upper end of the shaft 87 is mounted an ejector turret structure composed of an upper section 95 and a lower section 96, said sections being secured together as at 97. A driver cap 98 is keyed to the upper end extremity of the shaft 87 and is adjustably secured as at 99 to the top section 95 of the turret structure.

The lower turret structure section 96 has a depending flange 100 which surrounds a circular portion 101 of the housing 83, engaging with a seal ring 102 secured on the upper end extremity of said housing portion 101. The upper turret section 95 is equipped with peripheral pockets 103 in which to receive slack filled cans being ejected, and the composite turret structure sections 95 and 96 provide bearings at 104 for upright shafts 105 corresponding in number to the peripheral pockets 103 and placed radially inwardly with respect to the centers of said pockets. Each shaft 105 has a sweep arm or ejector 106 clamp-secured thereon as at 107 directly beneath the respective turret pocket in the manner clearly illustrated in Figure 2. A spacer 108 surrounds each shaft

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105 directly beneath the respective sweep arm 106, and said spacers serve to properly place the sweep arms with respect to the turret structure pockets with which they cooperate.

The lower end of each shaft 105 is splined as at 109 and has a sweep-arm actuator 110 slidably mounted thereon. It will be apparent by reference to Figures 2 and 10 of the drawings that each actuator 110 has a lift button 111 threadably mounted at the lower end extremity thereof. A reset cam 112 projects radially from one side adjacent the lower end of each actuator 110, and each actuator also carries a spring anchor pin 113 projecting radially from one side thereof near the top, and a detent mounting lug projecting radially from one side thereof intermediately of its ends. In each spring detent mounting lug 114 there is provided a spring detent 115 which is engageable in a recess 116 formed in the respective splined shaft end, and a stop collar 117 is secured to the lower end extremity of each said spline shaft portion. Each sweep arm actuator 110 is displaceable endwise along the respective splined shaft end 109, the upper limit being illustrated in Figure 10 and at the left in Figure 2, which position is retained by the detent and recess equipment 115, 116, and the lower position of the actuator members 110 is shown at the right in Figure 2 and in Figure 4, this position being determined by engagement of the actuators 110 with the respective stop collars 117.

As shown in Figure 3, and at the right in Figure 2, each sweep arm actuator 110 is equipped with a crank 118 projecting radially from one side thereof intermediately of its ends, and each said crank carries an actuator roller 119, the purpose of which will be described hereinafter. A retractile spring 120 is connected at one end with each radially projecting anchor pin 113 and at its other end with an anchor pin 121 depending from the lower rotor section 96.

Each sweep arm 106 has a finger extension curved as at 122 to conform to the external curvature of the cans 8, and the undersurface of each finger extension is recessed as at 123 to receive a plate 124 which is secured in the recess as at 125. A lug 126 depends from each plate 124 and is shaped in the manner best illustrated in Figures 6 to 9 of the drawings. The finger lugs 126 are so shaped and placed that when the fingers are in the normal, retracted or ineffectual position illustrated in full lines in Figure 6 and in all positions except the uppermost or top center position in Figure 1, the faces 127 of the lugs will clear and not contact with the ledge portions 75, 74 and 76 of the switch plate 68. However, whenever an ejector or sweep finger 106 is in its effective or projected position as shown in dot and dash lines in Figure 6 or at the top center in Figure 1, the face 128 of its lug 126 will closely approximate the arcuate wall 73 of the switch plate 68 so as to first contact the plate ledge portion 75 to depress the switch plate 68 and displace it to the position illustrated in Figure 8, then ride over the ledge portion 74 and hold the plate in this depressed position, and then over the descending ramp 76 to release the plate and allow it to return to its elevated or normal position as illustrated in Figure 7.

Attention is directed to Figures 2 and 3 of the drawings from which it will be apparent that a cam 129 is secured as at 130 on the bearing column 86. The cam has a lower circular wall 131 and an upper cam extension 132 which extends outwardly beyond the circular wall portion and includes a concentric outer limit and crank displacing ramp portions merging into the circular portion of the cam. It is to be understood that so long as the sweep arm actuator rollers 119 are in their lowered position in which they engage only the circular portion of the cam 129 in the manner illustrated in Figure 2, the sweep arms 106 will travel in their retracted or ineffectual position illustrated at all positions except the uppermost or top center position in Figure 1. However,

when a given actuator member 110 is lifted to the position illustrated at the left in Figure 2 its roller 119 will engage with the extended cam portion 132 in the manner illustrated at the top center in Figure 3, and this will serve to place the sweep arm in its effective or can ejecting position illustrated at the top center in Figure 1.

A sweep arm conditioner cam 133 is provided, and it will be apparent by reference to Figures 2, 3 and 11 that said cam is mounted on the upper end of a carrier 134 which is vertically reciprocable in a bearing 135 secured as at 136 on the bearing column 86. A yoke 137 depends from the bearing 135 and carries a horizontal shelf 138. A support plate 139 is mounted in parallel spaced relation above the shelf 138, said plate having plungers 140 depending therefrom through apertures 141 provided in the shelf. Compression springs 142 are interposed between the shelf 138 and the support plate 139 and yieldably retain the plate at its elevated position determined by the plunger carried abutments 143 which engage beneath the shelf 138.

An electro-magnet 144 is removably supported on the plate 139 through the medium of removable clips 145. The electro-magnet is positioned for cooperation with an armature bar 146 which is pivotally attached as at 147 to the lower end extremity of the cam carrier 134, and a retractile spring 148 anchored as at 149 on the bearing 135 and as at 150 on said carrier constantly tends to lift the cam 133 to its elevated or effective, crank engaging and lifting position illustrated in dotted lines in Figure 11. It is to be understood that the electro-magnet 144, when energized, lacks sufficient strength to attract the armature bar 146 from the dotted line position illustrated in Figure 11 to the full line position there illustrated against the action of the spring 148. However, whenever the cam 133 and carrier 134 are depressed to the full line position illustrated in Figure 11 and then the electro-magnet 144 is energized, the armature 146 will be held in the lowered or retracted position so as to maintain the depressed condition of the cam 133 against the action of the spring. It will be apparent that whenever the electro-magnet 144 is de-energized the spring 148 will lift the cam 133 to the position illustrated in dotted lines in Figure 11.

In order to provide for the depressing of the cam 133 after each elevation thereof to the effective, crank actuating position a cam depressing roller 152 is mounted as at 153 to depend from the ejector return rotor between each two sweep arms 106, or in other words, one such cam roller follows each sweep arm so as to depress or replace the cam 133 before each sweep arm and its associated crank button 111 approaches said cam.

A sweep arm actuator replacing roller 154 is mounted at 155 on the housing at the single position illustrated in Figures 3 and 4 of the drawings, it being apparent by reference to Figure 4 that as the rotating ejector turret presents each actuator 110 to the replacing roller 154, said roller will engage the re-set cam 112 projecting radially from the respective actuator 110 in the manner illustrated in Figure 4 so as to shift the actuator from its elevated position illustrated at the left in Figure 2 to the lowered position illustrated at the right in Figure 2 and in Figure 4.

It will be apparent by reference to Figures 3 and 11 that the carrier 134 has a recess 156 in one side thereof in which to receive a manually set lock-out plunger 157. The plunger 157 is engageable in the carrier recess 156 and is slidably mounted in a bearing 158 secured as at 159 to the housing 83. The plunger 157 has two detent receiving grooves 160 therein for selectively receiving a spring pressed detent 161 having a single knob 162 thereon. The plunger 157 has a knob 163 secured thereon through the medium of which said plunger may be manipulated, and by properly manipulating the plunger the same may be engaged in the carrier recess to lock the carrier in the lowered position illustrated in full lines

in Figure 11. This will permit rotation of the turret without any engagement of the cam 133 with the buttons 111 of the actuator members or cranks. The detent 161 may be engaged in one or the other of the plunger grooves 160 to secure the plunger in the carrier locking position or at the normal, carrier released position.

An example of an acceptable electrical control means is shown in Figures 17 and 18. In Figure 17 the can 8 is shown with a proper fill of liquid at 164, and in Figure 18 a slack or under-fill is indicated at 165.

Conductors 166 connect with the coil of the electro-magnet 144 through normally opened contacts 167 of the relay 168, and said conductors also connect through the step-down transformer 169 and the variable transformer 170 with a D. C. rectifier 171. It will also be noted that the rectifier 171 is connected by the conductor lines 58 with the spring pressed contacts 61 which engage the collector rings 51, said collector rings being in turn connected with the electrodes 43 through the conductors 56. It is to be noted that one of the conductors 58 has the relay coil 172 connected therein. The power input lines 173 connect with the conductors 166 in the manner illustrated, and the stepped-down direct current lines 58 connect with a make and break timing switch 174 which is shunted across the lines 58 as at 175. A make and break timing switch 176 is shunted across the conductor lines 166 which connect between the power input lines 173, the relay contacts 167 and the coil of the electro-magnet 144 through the medium of the shunt connector lines 177. A continuously rotating cam 178 controls the switch 174, and a constantly rotating cam 179 controls the switch 176.

It is to be understood that the switch controlling cams 178 and 179 are continuously driven in timed relation to the operating parts previously described, making one revolution for the passage of each can.

It will be apparent by reference to Figures 17 and 18 that as the effective projection of each cam reaches the high point illustrated at the left in each said figure the corresponding switch will be opened regardless of the degree of fill in a can being tested. It will also be apparent that the cam 178 is set to precede the action of the cam 179, and the purpose of this arrangement of the cams will become apparent as the description progresses. It may be said that the control circuit has two branches, one to the left or a pilot circuit connecting with the electrodes 43, and the other to the right or an electro-magnet circuit connected with the electro-magnet 144.

As before stated, the control switch 178 makes one revolution for the passage of each can, and the switch 174 controlled thereby is closed except during the actual test interval, this being when the electrodes 43 have been lowered the full predetermined definite distance into the can under test.

In the operation of the apparatus the feeder turret 6 will move the cans toward the closing machine in equidistantly spaced relation in the manner clearly illustrated in Figure 1, the cans being guided over the supporting table 9 by the arcuate guide 10. As each can is passing the tester station as shown at the upper right in Figure 1 the cam 16 will actuate the respective bell crank 34 so as to lower the orificed jetting tube and the associated electrodes 43 into the passing can. During this jetting and testing interval the CO₂ gas is directed through the porting 29, 21, 39 and tube 37 into the liquid to cause the same to foam and crowd air out of the head space in the can. Since the circuit is controlled to pass current through the electrodes only when they have been lowered the predetermined definite full limit into the can, passage of the testing current through the liquid and not merely foam is assured.

During the test interval, if no can is present or the can under test is slack filled, the condition diagrammatically illustrated in Figure 18 will pertain. In other words, the switch 174 is open and the pilot circuit through

conductors 58 and 56 is open because the current cannot flow through the liquid fill from electrode 43 to electrode 43. Therefore, the coil 172 of the relay is not energized and the relay remains open, no current passing between the contacts 167. However, current flows through the electromagnet 144 and through the timing switch 176 through the conductors 166 and 167 until the high point of the cam 179 effects an opening of the switch 176. In this manner, although the relay 168 is open, it does not prevent passage of current through the coil of the electro-magnet 144 because of the shunt connections 177. However, when the timing cam 179 opens the switch 176 the circuit through the coil of the electro-magnet 144 will be broken. The breaking of the circuit through the coil 144 frees the armature 146 and allows the spring 148 to next lift the cam 133 to the effective position illustrated in dotted lines in Figure 11. It is to be understood that the cam 179 is adjustable, and the delay in the action of releasing the cam 133 in the manner aforesaid can be varied by adjusting the lag of the cam 179.

When elevated to its effective position illustrated in dotted lines in Figure 11, the cam 133 will engage the next passing button 111 of the actuator crank and sweep arm equipment which is to effect the ejection of the can just tested and found to be slack filled. In other words the electrical control devices briefly described condition the ejecting devices for ejecting at the ejecting station the can tested at the testing station and found to be slack filled. The engagement of the cam 133 with the button 111 will lift the actuator or crank 110, 118 from its lowered position illustrated at the right in Figure 2 to the elevated position illustrated at the left in said figure. In this elevated position the roller 119 of the actuator or crank 110, 118 will be in position for engaging the cam projection 132 in the manner illustrated in Figure 3 to move the respective sweep arm from the retracted or ineffective position illustrated at the right in Figure 1 to the extended, effective position illustrated at the top center of the ejector turret in said Figure 1. When the sweep arm 106 is swung into its effective or can ejecting position illustrated in dot and dash lines in Figure 6, it will be positioned for having the lug portion 128 thereof engage with the switch plate or guide plate portions 75, 74 and 76 to displace the arcuate wall 72 of the plate from its can guiding position illustrated in Figure 7 to the position illustrated in Figure 8 in which the top surface portion 70 of the plate 68 will serve as a partial support for the can as it is being ejected from its support on the table 9 and transferred onto the supporting member 82 at the ejector station as illustrated at the left in Figure 1. As the sweep arm lug portion 128 passes over the plate surface 76 the guide plate will be released from its depressed position and the spring 78 will return the same from the depressed position illustrated in Figure 8 to the elevated, can guiding position illustrated in Figure 7. As the ejector turret C continues its rotation, the stationary roller 154 will engage the re-set cam extension 112 of the actuator or crank 110, 118 and return the same to its lowered, ineffective position in the manner illustrated in Figure 4. It should be understood also that the cam 133 will have been returned to its depressed, ineffective position immediately after the previously described elevation thereof and the effective placement thereby of the actuator or crank means 110, 118, and after this mechanical replacement or depression of the cam 133 to the lowered position illustrated in full lines in Figure 11, the coil of the electro-magnet 144 would be energized so as to hold the cam in its lowered position against the action of the spring 148 in the manner previously described. The spring devices 142 cushion the mechanical depression of the cam 133 and the contact of the armature 146 with the electro-magnet 144.

As before described, the switch 174, when closed, short circuits the conductors connecting with the collector rings

51 and therefore current cannot pass through the liquid fill in a can under test until the electrodes have reached their lowest level, the parts being timed so that at this moment the cam 178 will open the switch 174 and allow current to pass between the electrodes 43 through the liquid fill.

During a test period, if the liquid is at the proper level as indicated at 164 in Figure 17, current will flow through the pilot circuit from electrode 43 to electrode 43 through the liquid fill 164 despite the fact that the switch 174 is opened in the manner illustrated in Figure 17. The relay coil 172 is energized in the manner illustrated, keeping closed that portion of the electro-magnet circuit. However, it will be apparent by reference to Figure 17 that the circuit through the coil of the electro-magnet 144 was being completed through the closed switch 176 and the shunting conductors 177. With the relay 168, 167 closed in the manner stated, the opening of the switch 176 by the cam 179 will have no effect on the circuit through the electro-magnet 144 because the same will then be completed through the relay. Thus the electro-magnet will retain the cam 133 in its lowered, ineffective position as each properly filled can is tested and passes, and no sweep arms will be conditioned for the ejection of cans.

While one form of the invention has been shown for purposes of illustration, it is to be clearly understood that various changes in the details of construction and arrangement of parts may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. In apparatus of the character described, a feedway over which to feed filled cans toward a closing machine, a fill testing station and a slack filled can ejecting station past which properly filled cans are fed over said feedway, means for continuously feeding filled cans over said feedway, guide means normally disposed to guide cans past the ejecting station but displaceable to permit ejection of slack filled cans at said ejecting station, means at the testing station for testing each can while it is passing said testing station to ascertain if it is properly filled, and means other than the travelling cans at the ejecting station and operable under control of said testing means for directly engaging and displacing said guide means and also for directly engaging and ejecting each slack filled can.

2. Apparatus as defined in claim 1 in which the means operable at the ejecting station includes a can engaging sweep arm and a part movable with the sweep arm and directly engageable with the guide in a manner for displacing it from its can guiding position as the sweep arm moves to perform its can ejecting function.

3. Apparatus as defined in claim 1 in which the guide includes an upwardly directed surface portion so positioned as to serve when the guide is displaced from its normal guiding position as a horizontal support disposed at the level of the feedway and over which each slack filled can travels as it is being ejected.

4. Apparatus as defined in claim 1 in which the guide includes an upwardly directed surface portion so positioned as to serve when the guide is displaced from its normal guiding position as a horizontal support disposed at the level of the feedway and over which each slack filled can travels as it is being ejected, and in which the means operable at the ejecting station includes a can engaging sweep arm and a part movable with the sweep arm and directly engageable with the guide in a manner for displacing it from its normal can guiding position as the sweep arm moves to perform its can ejecting function.

5. Apparatus as defined in claim 1 in which the testing means includes a pair of electrodes connected in control circuit means effective to control operation of the ejecting means, devices being included for lowering the electrodes a predetermined distance into each can as it

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passes the testing station in order to determine if it has a proper fill therein and for conditioning the control circuit for effecting a slack filled can ejection only when the electrodes are lowered said predetermined distance.

6. Apparatus as defined in claim 1 in which the testing means includes a pair of electrodes connected in control circuit means effective to control operation of the ejecting means, devices being included for lowering the electrodes connected in the control circuit a predetermined distance into each can as it passes the testing station in order to determine if it has a proper fill therein and for permitting passage of control circuit current through the electrodes and the liquid under test in which they are immersed only when the electrodes are fully lowered said predetermined distance.

7. In apparatus of the character described, a feedway over which to feed filled cans toward a closing machine, a continuously rotating turret for feeding said cans, a fill testing station and a slack filled can ejecting station past which properly filled cans are fed by said turret, a tester turret continuously rotatable at said testing station and an ejector turret continuously rotatable at said ejecting station, means for rotating said turrets in cooperatively timed relation, vertically reciprocable means on said tester turret for dipping a predetermined distance into each can passing the testing station to ascertain if the fill therein is proper, ejecting arms equidistantly spaced and swingably mounted on said ejecting turret and normally held in ineffectual position, and means controlled by each dipping of testing means into a slack filled can for effectively placing an ejector arm for ejecting said slack filled can at the ejecting station.

8. Apparatus as defined in claim 7 wherein the proper fill ascertaining means comprises a pair of electrodes adapted to be immersed a predetermined definite distance in a can fill, and wherein the control devices initiate the control function ultimately resulting in placement of the arm which is to eject the slack filled can as the particular pair of electrodes reaches said predetermined definite dip depth in the slack filled can.

9. Apparatus as defined in claim 7 in which there is included guide means normally disposed to guide cans past the ejecting station but displaceable to permit ejection of slack filled cans at said ejecting station, and wherein the ejecting arms have means thereon effective when an arm has been placed for ejecting a can to directly engage and displace said guide means for the purpose stated.

10. Apparatus as defined in claim 7 in which there is included guide means normally disposed to guide cans past the ejecting station but displaceable to permit ejection of slack filled cans at said ejecting station, and wherein the ejecting arms have means thereon effective when an arm has been placed for ejecting a can to engage and displace said guide means for the purpose stated, an upwardly directed surface portion so positioned as to serve when the guide is displaced from its normal guiding position as a horizontal support disposed at the level of the feedway and over which each slack filled can travels and on which said slack filled can is supported as it is being ejected.

11. In apparatus of the character described, a feedway over which to feed filled cans toward a closing machine, a fill testing station and a slack filled can ejecting station past which properly filled cans are fed over said feedway, means for feeding filled cans over said feedway, means at the testing station for testing each passing can to ascertain if it is properly filled and including electrodes adapted to be immersed in container fills of proper depth during each can test and connected in a control circuit, and means at the ejecting station operable under control of said testing means for ejecting each slack filled can, said last named means including an ejector turret rotatable in timed relation to said feeding means and having thereon a plurality of equidistantly spaced swingably mounted

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ejector fingers each shiftable between an ineffective retracted position and an effective or extended can ejecting position, a finger positioning crank member attached to each finger and longitudinally shiftable along the swing center of the finger between a first position in which it holds the finger retracted and a second position in which to effect an extension of said finger, a finger positioning cam engaged by the cranks and having a portion concentric to the turret center to place the fingers in their retracted position when engaged by the cranks in said first position and an eccentric portion to effect a projection of any finger the connected crank of which is in said second position, crank positioning means including a cam shiftable between effective and ineffective positions and a spring device for shifting the cam in one direction and a solenoid for shifting the cam in the opposite direction and connected in the control circuit, said last named means being operable under control of the testing means electrodes upon detection of a slack filled can for shifting the crank attached to a finger placed on the ejector turret in proper position for being selected for ejecting said can into position for extending said finger to its can ejecting position, and means for returning each crank so shifted to its normal finger retracted position following the ejection of a can.

12. Apparatus as defined in claim 11 in which each ejector finger is mounted on a vertically disposed rock shaft and the attached crank is splined on the shaft so as to be slidable therealong while maintaining its driving connection with the shaft, spring detent and stop means being provided for placing each crank in its shifted positions, and spring means being provided for yieldably holding the cranks against the finger positioning cam.

13. Apparatus as defined in claim 11 in which each ejector finger is mounted on a vertically disposed rock shaft and the attached crank is splined on the shaft so as to be slideable therealong while maintaining its driving connection with the shaft, spring detent and stop means being provided for placing each crank in its shifted positions, and spring means being provided for yieldably holding the cranks against the finger positioning cam, each crank also having a reset cam projection thereon and there being included also a fixed cam member engageable by the reset cam as the means for returning each crank to its normal position following the ejection of a can, and wherein the means for returning the cranks comprises crank engaging cam displacing cams one thereof being disposed on the ejector turret following each crank so that the crank engaging cam will be displaced from its crank engaging position after each tester means electrode controlled placement thereof and before the next crank reaches the crank engaging cam position.

14. In apparatus of the character described, a feedway over which to feed filled cans toward a closing machine, a fill testing station and a slack filled can ejecting station past which properly filled cans are fed over said feedway, means for feeding filled cans over said feedway, guide means normally disposed to guide cans past the ejecting station but displaceable to permit ejection of slack filled cans at said ejecting station, means at the testing station for testing each passing can to ascertain if it is properly filled and including electrodes adapted to be immersed in container fills of proper depth during each can test and connected in a control circuit, and means at the ejecting station operable under control of said testing means for displacing said guide means and ejecting each slack filled can, said last named means including an ejector turret rotatable in timed relation to said feeding means and having thereon a plurality of equidistantly spaced swingably mounted ejector fingers each shiftable between an ineffective retracted position and an effective or extended can ejecting position, a finger positioning crank member attached to each finger and longitudinally shiftable along the swing center of the finger between a first position in which it holds the finger retracted and a second position

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in which to effect an extension of said finger, a finger positioning cam engaged by the cranks and having a portion concentric to the turret center to place the fingers in their retracted position when engaged by the cranks in said first position and an eccentric portion to effect a projection of any finger the connected crank of which is in said second position, crank positioning means including a cam shiftable between effective and ineffective positions and a spring device for shifting the cam in one direction and a solenoid for shifting the cam in the opposite direction and connected in the control circuit, said last named means being operable under control of the testing means electrodes upon detection of a slack filled can for shifting the crank attached to a finger placed on the ejector turret in proper position for being selected for ejecting said can into position for extending said finger to its can ejecting position, and means for returning each crank so shifted to its normal finger retracted position following the ejection of a can, said guide displacing means comprising co-operatively engageable camming surfaces carried by the guide means and each ejector finger.

15. Apparatus as defined in claim 14 wherein the guide when displaced from its normal guiding position serves as a support disposed at the level of the feedway and over which each slack filled can travels as it is being ejected.

16. In apparatus of the character described, a feedway over which to feed filled cans toward a closing machine, a continuously rotating turret for feeding said cans, a fill testing station and a slack filled can ejecting station past which properly filled cans are fed by said turret, a tester turret continuously rotatable at said testing station and an ejector turret continuously rotatable at said ejecting station, means for rotating said turrets in cooperatively timed relation, vertically reciprocable means on said tester turret for dipping a predetermined distance into each can passing the testing station to ascertain if the fill therein is proper, ejecting arms equidistantly spaced and swingably mounted on said ejecting turret and normally held in ineffectual position, and means controlled by each dipping of testing means into a slack filled can for effectively placing an ejector arm and including devices for retarding the effective placement of the ejector arms so that a given arm will be selected by the testing at the testing station and effectively placed for ejecting the particular tested and slack filled can after it has travelled from the testing station and arrived at the ejecting station.

17. In apparatus of the character described, a slack filled can ejecting turret comprising a rotor having a plurality of upright rock shafts disposed in equidistantly spaced relation about its periphery and each having a splined lower end portion, a sweep arm secured on and rockable with each shaft between a retracted ineffective position and an extended can ejecting position, and means for normally holding the arms retracted and for extending the arms selectively to the can ejecting position, said last named means including a cam having a circular peripheral portion concentric to the turret center and an outwardly projecting arm extending portion, a crank longitudinally slidable on each splined shaft portion for engagement in one shifted position with the circular cam portion for controlling placement of the arms in their retracted position or for engagement in another shifted position with the outwardly projecting cam portion for effecting an extension of an arm to the can ejecting position, means for shifting the cranks in one direction along said splined shaft portions for selectively placing the cranks in the cam projection engaging position, and means for shifting the cranks in the opposite direction displacing each crank from its cam projection engaging position after it has effected a sweep arm extension.

18. Apparatus as defined in claim 17 in which there is included a spring means for constantly urging each crank against the crank position controlling cam, and wherein the crank placing means comprises a remotely and electrically controlled cam, and the crank displacing means

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comprises a reset cam projecting from each crank and a stationarily supported displacer cam, there being included a cam displacer mounted on the turret following each crank so as to be effective to displace the electrically controlled cam after each engagement thereof by the preceding crank.

19. Apparatus as defined in claim 17 wherein there is included a guide normally effective to guide cans past said turret, and means on each sweep arm engageable with the guide when the sweep arm is extended for displacing the guide from its effective position.

20. Apparatus as defined in claim 17 wherein there is included a guide member having a wall portion normally effective to guide cans past said turret and a top portion disposed to be effective as a can supporting floor for supporting cans being ejected, and means on each sweep arm engageable with the guide means when the sweep arm is extended for depressing said guide means to displace the guide wall portion from its normally effective position and place the top portion in can supporting position.

21. Apparatus as defined in claim 17 in which the means for selectively placing the cranks includes a shiftable cam, cam means movable with the turret for displacing the shiftable cam from its crank engaging position, electromagnetic means for holding the shiftable cam in its displaced position, control circuit means for energizing and deenergizing said electromagnetic means incidental to the testing of a can for slack fill, and spring means for effectively placing the shiftable cam each time the electro-magnetic means is deenergized, said control means being effective to reenergize the electro-magnetic means each time the cam means displaces the shiftable cam from its crank engaging position so that the electro-magnetic means will hold it displaced until the electro-magnetic means is again deenergized.

22. Apparatus as defined in claim 17 in which the means for selectively placing the cranks includes a shiftable cam, cam means movable with the turret for displacing the shiftable cam from its crank engaging position, electro-magnetic means for holding the shiftable cam in its displaced position, control circuit means for energizing and deenergizing said electro-magnetic means incidental to the testing of a can for slack fill, spring means for effectively placing the shiftable cam each time the electro-magnetic means is deenergized, said control means being effective to reenergize the electro-magnetic means each time the cam means displaces the shiftable cam from its crank engaging position so that the electro-magnetic means will hold it displaced until the electro-magnetic means is again deenergized, and means providing a cushion mounting for the electro-magnetic means so that it can yield as the shiftable cam is forced against the same by the displacing cam means.

23. In apparatus of the character described, a feedway over which to feed filled cans toward a closing machine, a fill testing station and a slack filled can ejecting station past which properly filled cans are fed over said feedway, means for feeding filled cans over said feedway, guide means normally disposed to guide cans past the ejecting station but displaceable to permit ejection of slack filled cans at said ejecting station, electrical fill level testing means at the testing station and connected in a control circuit for testing each passing can to ascertain if it is properly filled, and slack filled can ejecting means located at the ejecting station and connected in the control circuit and including devices other than the travelling cans and operable under control of said testing means to first engage and displace said guide means and then engage and eject a can detected at the testing station as being slack filled.

24. In apparatus of the character described, a feedway over which to feed filled cans toward a closing machine, a fill testing station and a slack filled can ejecting station past which properly filled cans are fed over said feedway,

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means for feeding filled cans over said feedway, guide means normally disposed to guide cans past the ejecting station but displaceable to permit ejection of slack filled cans at said ejecting station, means at the testing station for testing each passing can to ascertain if it is properly filled, and means at the ejecting station operable under control of said testing means for directly engaging and displacing said guide means and also for directly engaging and ejecting each slack filled can, said guide comprising a spring lifted plate having an upright wall effective when lifted to engage with and guide cans being fed over the feed way and a top surface effective when depressed to form a horizontal extension of the feedway serving as a support over which slack filled cans travel as they are being ejected.

25. In apparatus of the character described, a feedway over which to feed filled cans toward a closing machine, a fill testing station and a slack filled can ejecting station past which properly filled cans are fed over said feedway, means for feeding filled cans over said feedway, guide means normally disposed to guide cans past the ejecting station but displaceable to permit ejection of slack filled cans at said ejecting station, means at the testing station for testing each passing can to ascertain if it is properly filled, and means at the ejecting station operable under control of said testing means for directly engaging and displacing said guide means and also for directly engaging and ejecting each slack filled can, said guide compris-

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ing a spring lifted plate having an upright wall effective when lifted to engage with and guide cans being fed over the feedway and a top surface effective when depressed to form a horizontal extension of the feedway serving as a support over which slack filled cans travel as they are being ejected, and in which the means operable at the ejecting station includes a can engaging sweep arm and a part movable with the sweep arm and directly engageable with the guide in a manner for depressing the guide to lower the guide wall to an ineffective position and place the top surface at a level for providing a horizontal continuation of the feedway serving as a partial support for a can being ejected as the sweep arm moves to perform its can ejecting function.

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