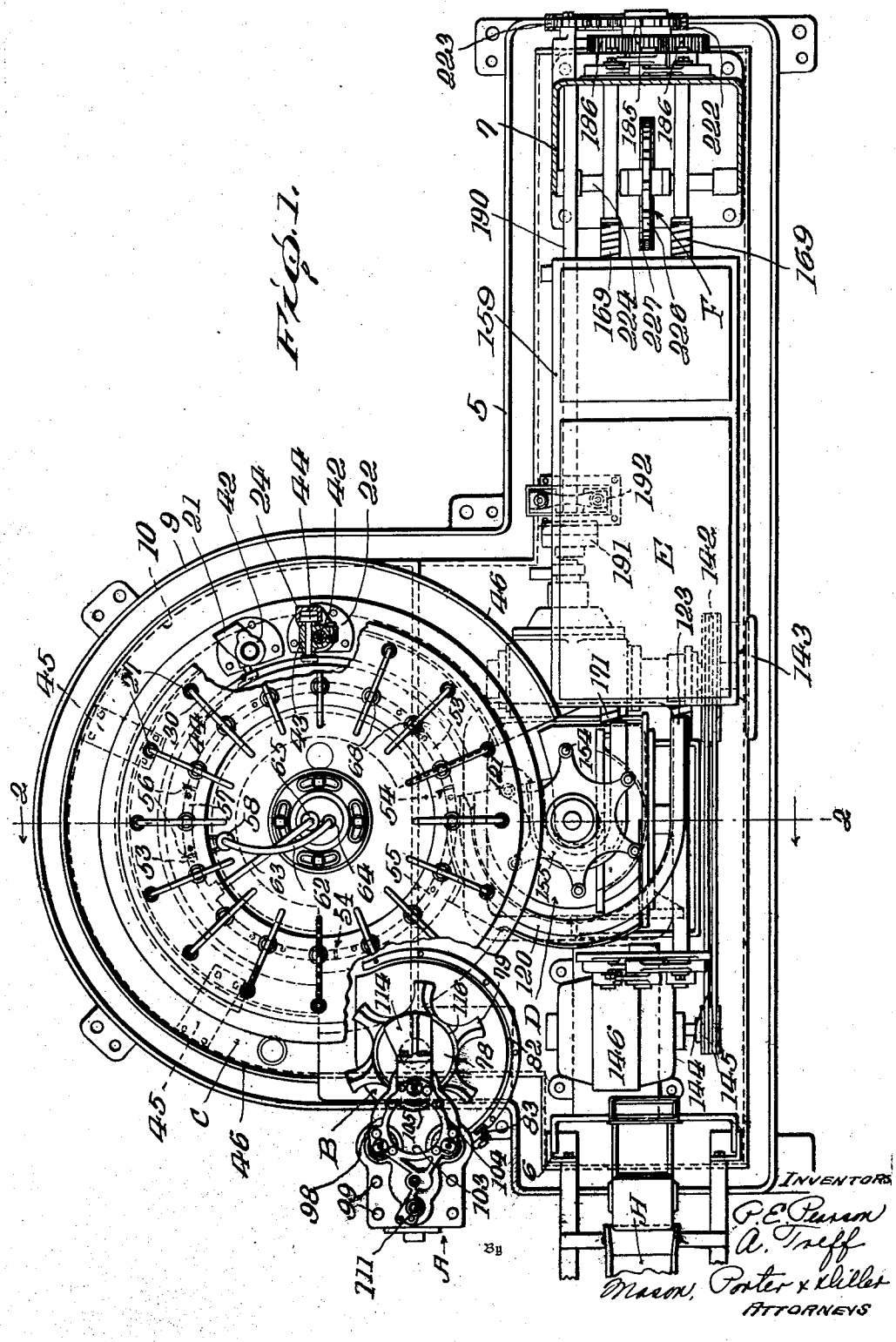
Aug. 31, 1948. P. E. PEARSON ET AL 2,448,116

CAN END TREATING MACHINE

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CAN END TREATING MACHINE

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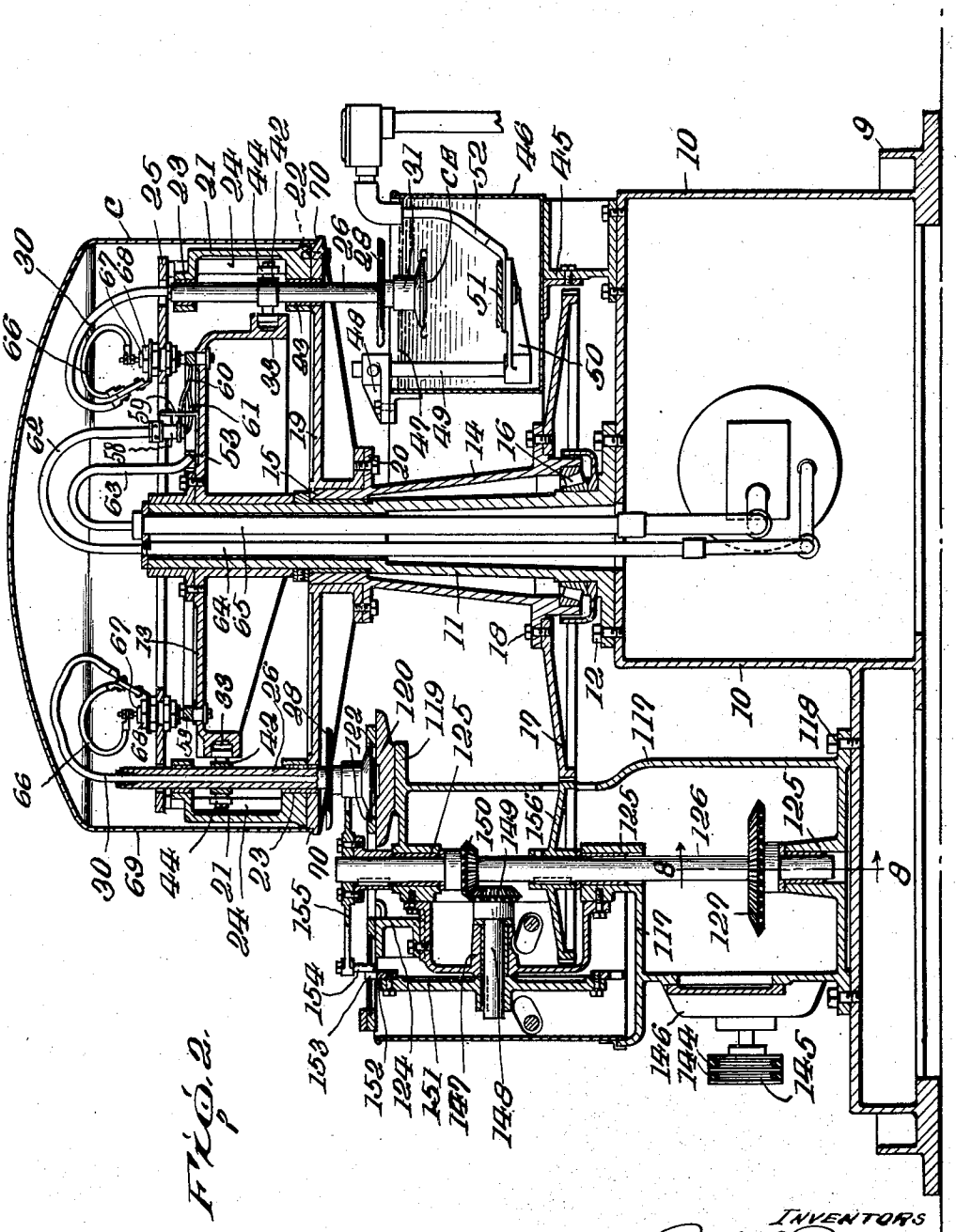


FIG. 2.

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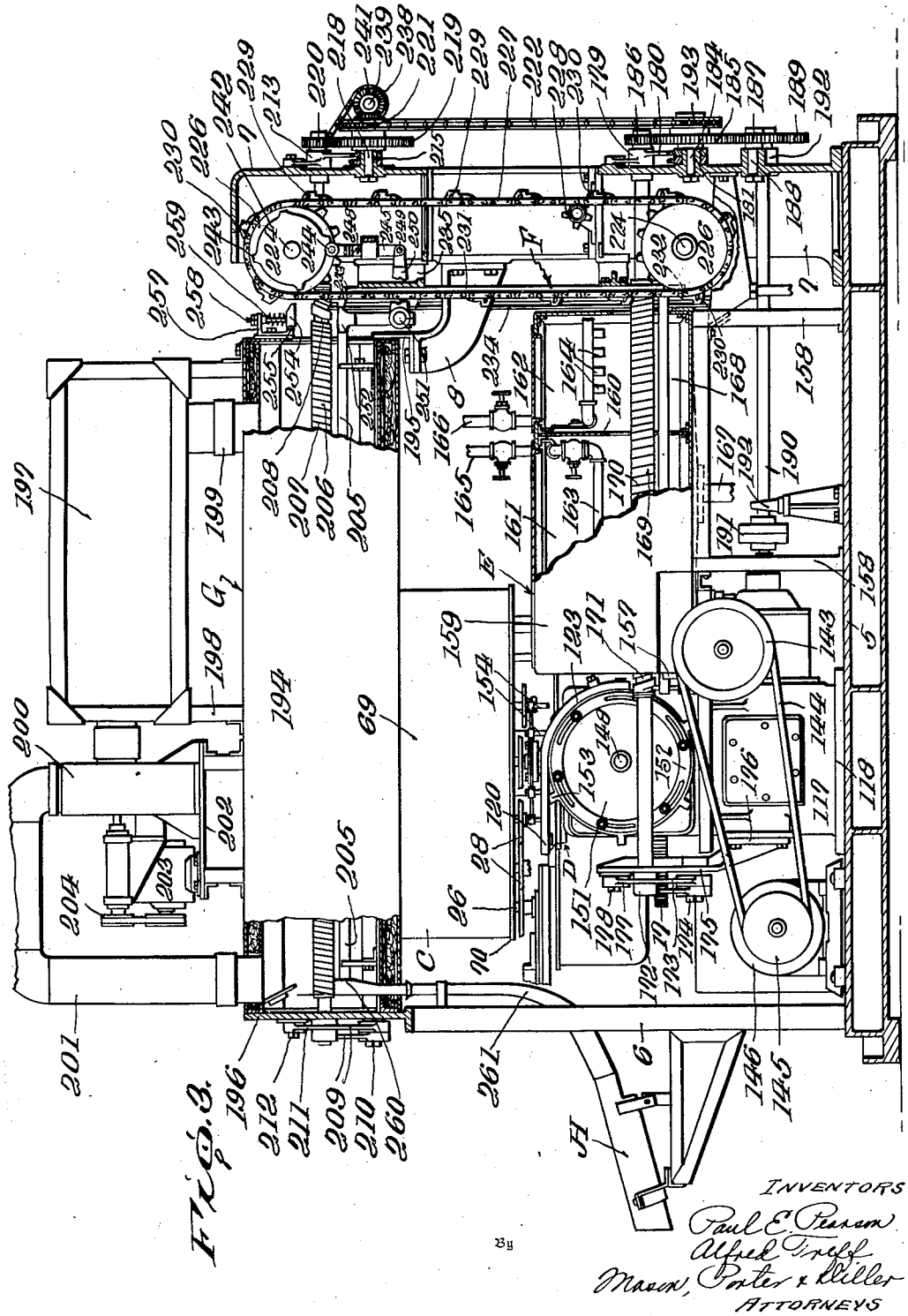


Fig. 3.

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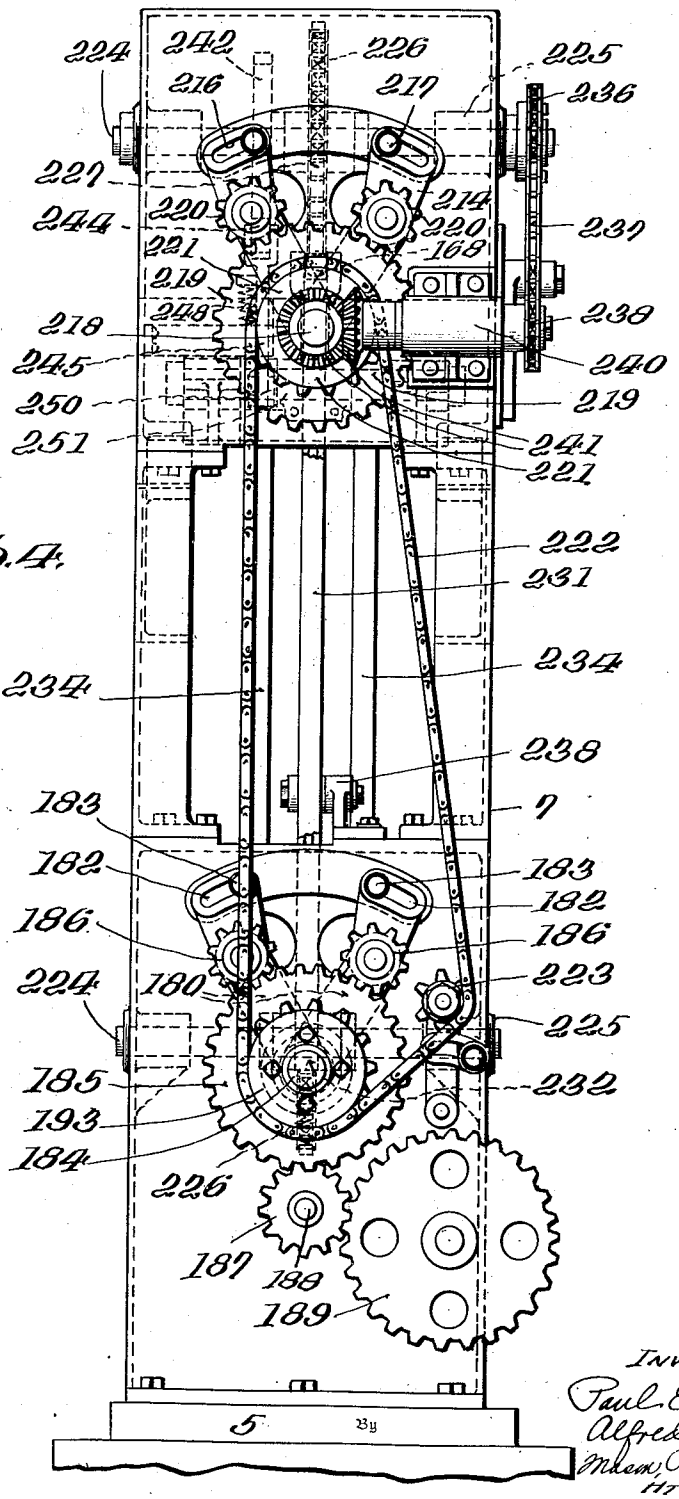


FIG. 4.

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CAN END TREATING MACHINE

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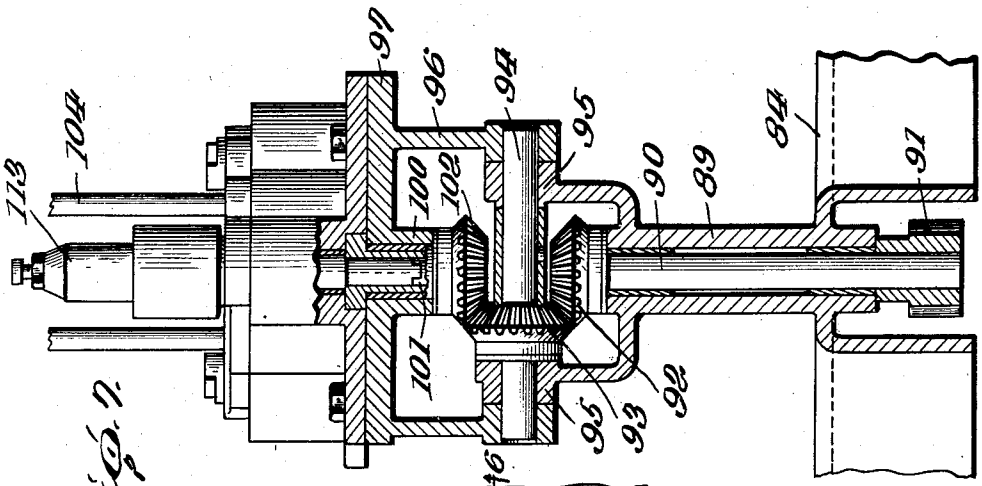


Fig. 2.

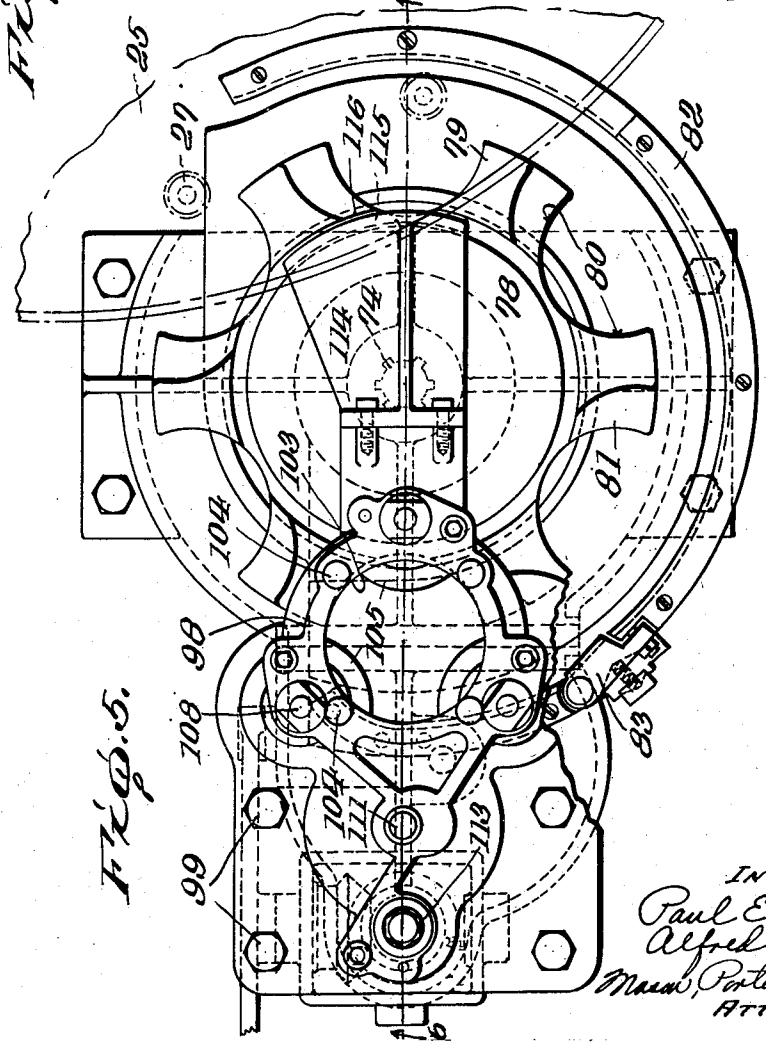


Fig. 5.

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CAN END TREATING MACHINE

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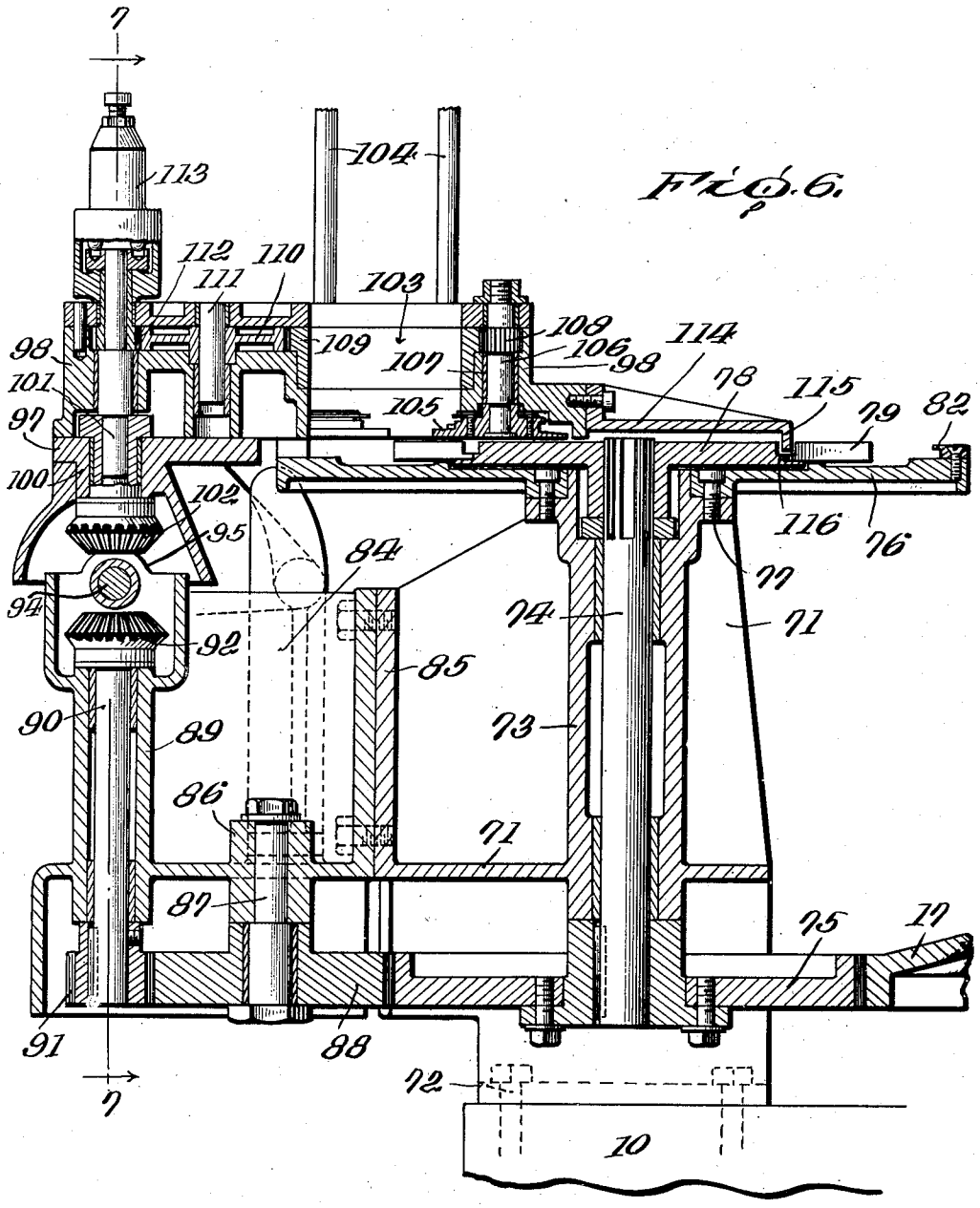


Fig. 6.

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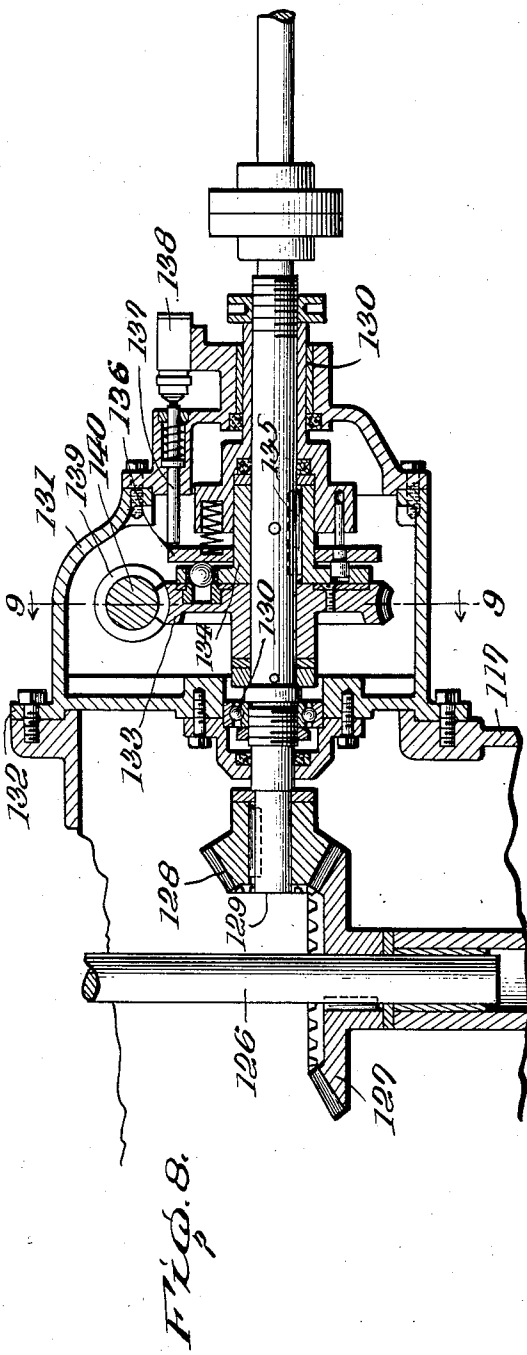


Fig. 8.

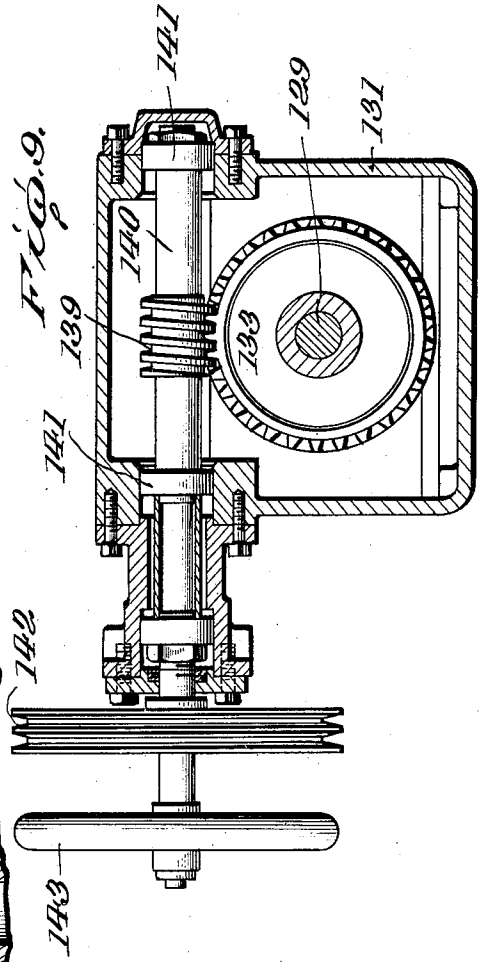


Fig. 9.

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CAN END TREATING MACHINE

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FIG. 11.

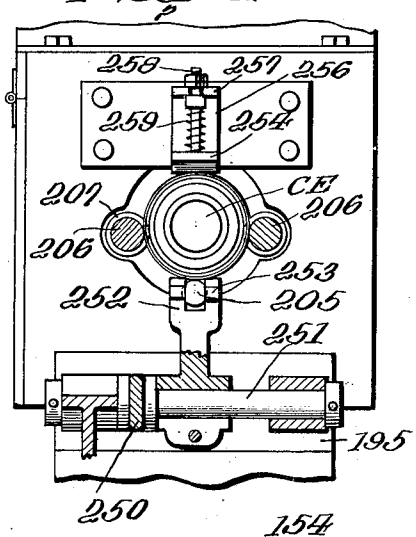
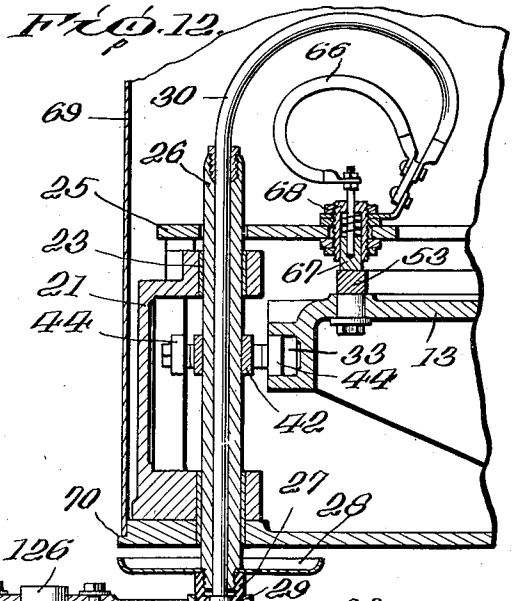
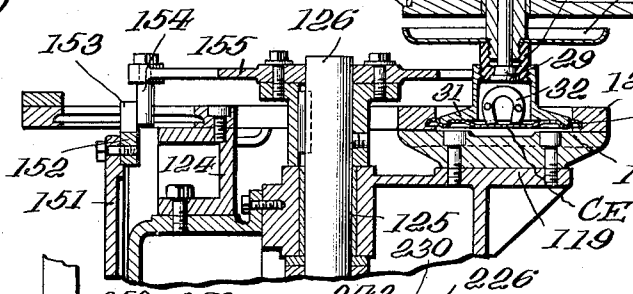


FIG. 12.





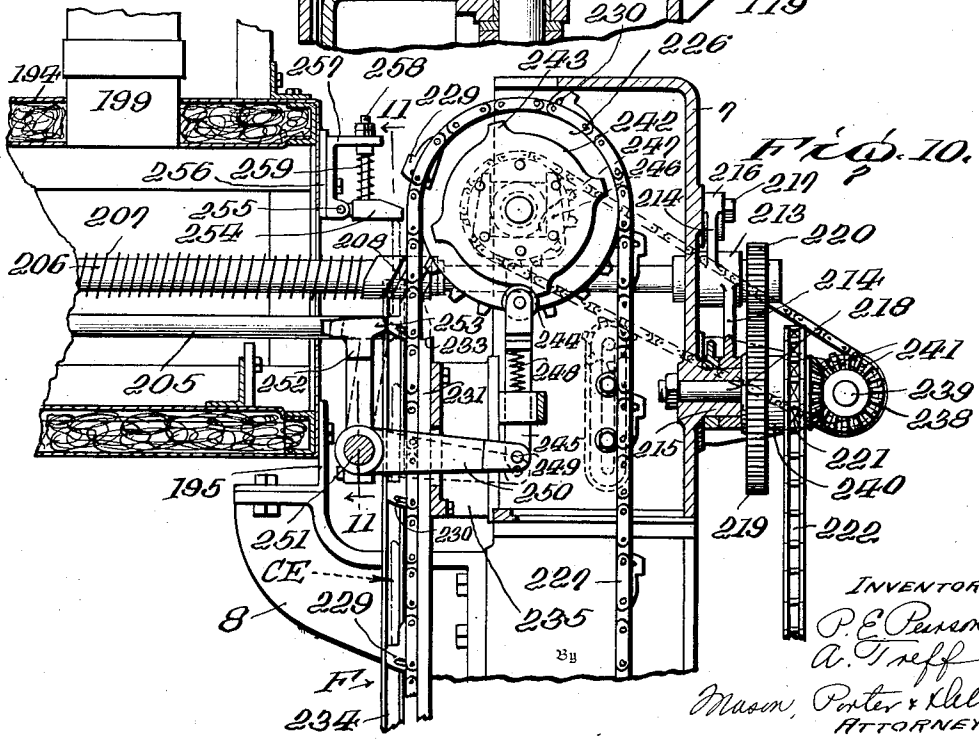


FIG. 10.

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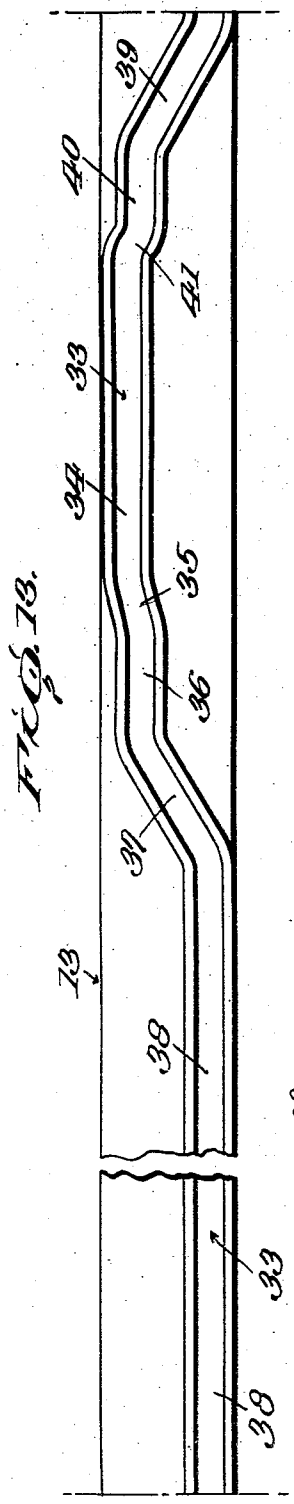


FIG. 13.

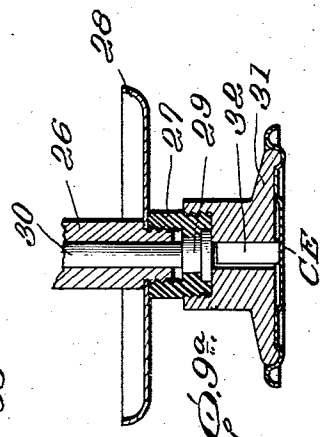


FIG. 9a.

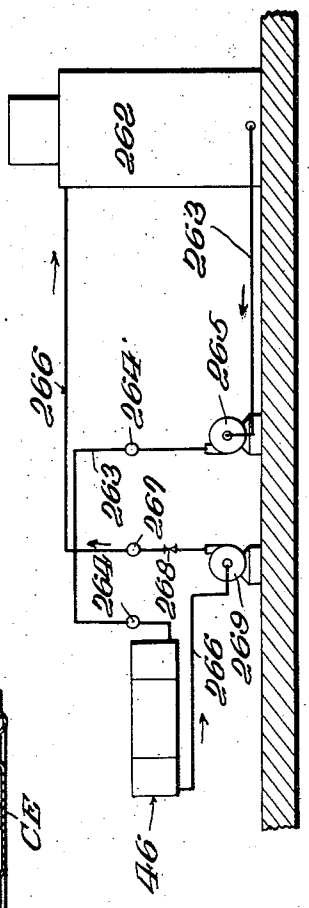


FIG. 14.

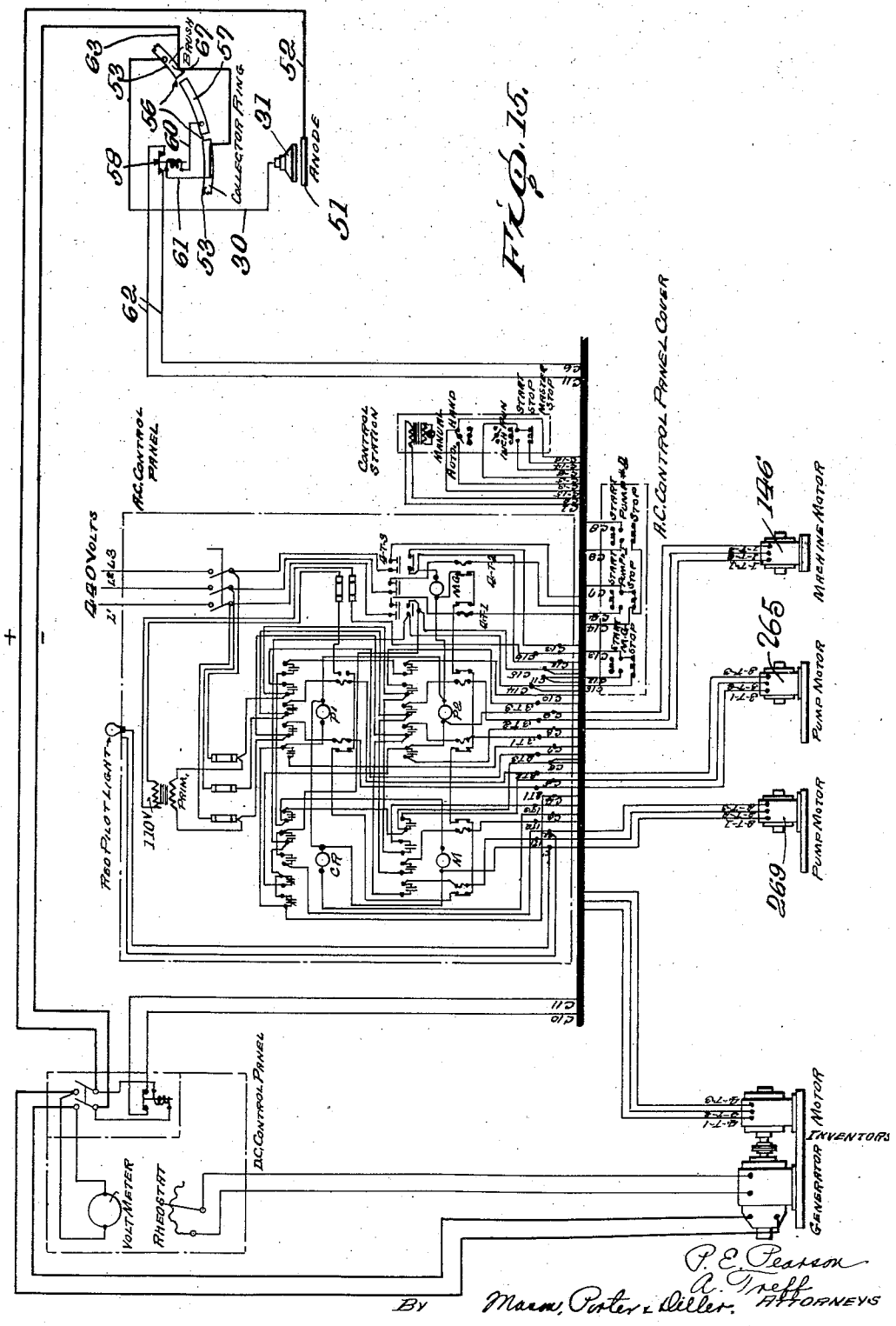
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CAN END TREATING MACHINE

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Patented Aug. 31, 1948

2,448,116

UNITED STATES PATENT OFFICE

2,448,116

CAN END TREATING MACHINE

Paul E. Pearson and Alfred Treff, Chicago, Ill., assignors to Continental Can Company, Inc., New York, N. Y., a corporation of New York

Application August 5, 1942, Serial No. 453,703

17 Claims. (Cl. 204—200)

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The invention relates generally to apparatus in which articles to be treated are immersed in an electrolyte suitable to the treatment intended and an electric current is passed through the articles and the bath in effecting said treatment, and it primarily seeks to provide a novel machine structure adapted for so treating can end closures.

It is well known that in the packaging of certain foodstuffs in metallic receptacles, unsightly and objectionable staining of interior surfaces of the receptacles results during the conventional processing of the filled and sealed receptacles, this objectionable condition being termed sulphur-staining. It has also been discovered that by immersing the receptacles or parts thereof, prior to use, in an electrolyte treating bath comprising a solution of a metallic salt and alkali in water, and passing an electric current through said bath with the receptacles or parts connected as cathode in the circuit, said receptacles or parts can be conditioned so that the objectionable, unsightly sulphur-staining will not occur when the receptacles are filled and later subjected to the usual processing. Therefore, the present invention seeks to provide a novel machine structure peculiarly adapted for the treatment of the end closures of such receptacles, particularly the surface portions thereof to be presented internally. The specific composition of the electrolyte bath forms no part of the present invention, and it should also be stated that while the machine is intended for treatments looking toward elimination of sulphur-staining, as aforesaid, it is also adaptable to other uses, such as electroplating or surface cleaning.

In its more detailed nature the invention resides in providing a machine of the character stated wherein is provided a turret and means for rotating it, a plurality of can end holding chucks on the turret, means for applying can ends individually to the chucks, an electrolyte treating bath, means for immersing the chucks and the can ends thereon in said bath, means for passing current voltage through said immersed ends and bath to treat said ends, said ends being connected as cathode in the current circuit, and means for discharging the treated ends.

Another object of the invention is to provide a machine of the character stated including means for water and steam treating the treated ends to remove from them all clinging electrolyte droplets.

Another object of the invention is to provide a machine of the character stated including means for heat drying the treated ends, and novel means for conveying said ends through the water and steam treating means and through said heat drying means.

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Another object of the invention is to provide a machine of the character stated in which the end conveying means includes spaced rotary conveyor thread shafts, means for imparting rotation thereto, and means for mounting said shafts in a manner for permitting adjustment of the spaced relation of the shafts without disturbing said driving means.

Another object of the invention is to provide a machine of the character stated in which the ends being treated are held on the chucks magnetically, in which an arcuately shaped container for the electrolyte bath is included, and in which is provided cam means for lowering the chucks into the bath, for holding them for a suitable treating interval in the bath, and then for lifting them out of said bath in position for being discharged from the chucks.

Another object of the invention is to provide in a machine of the character stated, novel means for stopping the machine should the treating circuit be open for any reason, such as a broken wire or contact, or low solution level below the chucks.

Another object of the invention is to provide in a machine combination of the character stated, means for generating direct current for the treating circuit, means for circulating the electrolyte through the bath container and through a conditioning means, and novel control means for permitting operation of the machine structure only when the current generating means and the electrolyte circulating means are in operation.

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

In the drawings:

Figure 1 is a plan view of the machine, the drier structure being broken away.

Figure 2 is a vertical cross section taken on the line 2—2 on Figure 1.

Figure 3 is a front elevation, parts being broken away and in section.

Figure 4 is a right hand elevation.

Figure 5 is an enlarged fragmentary plan view illustrating the end feeding unit, the transfer

turret and an adjacent portion of the main turret structure.

Figure 6 is a vertical cross section taken on the line 6—6 on Figure 5.

Figure 7 is a vertical cross section taken on the line 7—7 on Figure 6.

Figure 8 is a fragmentary vertical sectional view taken on the line 8—8 on Figure 2.

Figure 9 is a fragmentary vertical cross section taken on the line 9—9 on Figure 8.

Figure 9a is a fragmentary vertical cross section illustrating one of the chucks and the engagement of the associated contact enlargement therewith.

Figure 10 is an enlarged fragmentary side elevation and part longitudinal section at the receiving end of the drier structure, the receiving portions of the feeder screws and the delivery portions of the end conveying means being illustrated.

Figure 11 is a fragmentary vertical sectional view taken on the line 11—11 on Figure 10.

Figure 12 is an enlarged detail sectional view of one of the chucks at the end stripping position.

Figure 13 is a development of the chuck position determining cam.

Figure 14 is a diagrammatic view illustrating how the circulation of the treating bath or electrolyte through the treating tank is effected.

Figure 15 is a wiring diagram illustrating how the various motors and control devices are connected in the control circuit, and also how the collector ring, the detector, and the anode and chucks are connected with the control circuit and the direct current supply.

The machine herein disclosed as an example of embodiment of the invention includes a can end feeder unit generally designated A, and a transfer turret generally designated B into the pockets of which the can ends are fed from the unit A and by which they are transferred to the receiving chucks of the main turret structure of the treating unit generally designated C. After being treated in the unit C, the can ends are delivered by a feed-out means generally designated D into position for being received in and passed through a washer unit generally designated E wherein the can ends are sprayed with water and also steam cleaned so as to remove therefrom all surplus treating fluid. From the washer unit E the can ends are elevated by a conveying means generally designated F into position for being received in and passed through a drier unit generally designated G wherein they are subjected to a countercurrent of hot air and thereby thoroughly dried. From the drier unit G the can ends are delivered into a chute structure generally designated H by which they are delivered from the machine. See Figures 1, 3 and 4.

In its more detailed nature, the machine includes a base 5 having supporting standards 6 projecting upwardly from one end thereof into position for supporting an end of the drier unit G and the delivery chute H. Frame standards 7 also are provided at the other end of the base and serve to support the can end feeder screws and drive connections therefor, the conveying means F, and also the other end of the drier unit G, suitable bracket extensions 8 being provided for thus supporting the drier unit.

The base includes a lateral extension 9 which serves as a support for the treating unit base structure 10 whereon is rigidly supported a hollow column 11, the latter being flange-secured, as

at 12, on said base structure. See Figures 1 and 2.

A control cam 13 is fixed to the upper end of the column 11 and a turret rotor 14 is rotatable about said column on upper and lower bearings 15 and 16. A spur gear 17 is flange-secured, as at 18, to the rotor 14, and a turret plate 19 is flange-secured, as at 20, to said rotor in the manner best illustrated in Figure 2.

A plurality of guide and bearing units 21 are flange-secured, as at 22, on the turret plate 19, and each of these units is equipped with upper and lower bearings 23 and a vertical guide groove 24. In this particular illustration, sixteen of the units 21 are mounted in equidistantly spaced relation about the turret plate 19, but it is to be understood that a greater or lesser number may be provided if desired. A top plate 25 is secured to the upper ends of the units 21 in parallel spaced relation above the main turret plate 19.

A sleeve 26 is vertically reciprocable in the bearings 23 of each unit 21, and a mounting sleeve 27 is threadably secured to the lower end of each sleeve 26 and serves to removably clamp thereon a drip or dust collar plate 28. Each sleeve 27 is recessed to receive a contact enlargement 29 formed on the lower end of a contact element 30 which extends vertically through and above the respective sleeve 26 in the manner clearly illustrated in Figure 2. It will be observed by reference to Figure 12 of the drawings that each contact enlargement engages and makes electrical contact with the respective chuck 31.

A chuck 31 is threadably attached to the lower end of each sleeve 27 and each chuck includes a recess in which is mounted a permanent magnet 32, and it will be observed by reference to Figures 9a and 12 of the drawings that each magnet 32 engages with the respective chuck and extends slightly below the bottom face of the chuck. It will also be observed that the chucks conform generally to the shape of the can ends which are to be carried thereon and immersed thereby in the treating bath, and by this means only the under surface, or, in other words, that surface of the can end which is to be presented interiorly in the completed receptacle, is exposed for treatment. The can ends are designated CE. By reason of the provision of the chucks 31 and magnets 32 the can ends are individually held on the respective carriers in predetermined orientation with respect thereto. That is to say, they are held in definite position and under complete control while they are being treated, as distinguished from being tumbled about in a manner likely to damage the edge portions thereof and make it difficult if not impossible to form an efficient sealing seam during the attachment of the end closures on the cans being sealed thereby.

The stationarily mounted cam 13 is equipped with a peripheral control groove generally designated 33 and disposed within the circle of units 21 and opposed to the vertical guide grooves 24 therein. This cam structure is clearly illustrated in Figure 2 of the drawings, and a development of the peripheral cam groove is illustrated in Figure 13. It will be observed by reference to Figure 13 that the control groove includes a high dwell portion 34, a slight lowering portion 35 followed by a dwell portion 36, said dwell portion 36 being in turn followed by a sharp lowering portion 37 merging into a low dwell portion 38 which leads to a sharp rise portion 39 followed by a dwell portion 40 and then a slight lift portion 41 which merges into the previously mentioned high dwell portion 34. The first mentioned lowering

portion 35 positions the chucks for initially picking up the can ends from the pockets of the transfer turret B, the lowering portion 37 serves to move the chucks downwardly to immerse them in the treating bath, the sharp rise 39 serves to lift the chucks out of the bath, and the dwell and lift portions 40, 41 serve to feed the can end edges into a receiving grooveway later to be described and then to slightly lift the chucks so as to strip the treated can ends from the chucks.

In order to cause the chucks 31 and the carrying sleeves 26, 27 to be raised and lowered under the control of the cam groove just above described, each sleeve 26 has a yoke 42 securely clamped thereon opposite said cam groove. A cross pin 43 is mounted in each yoke and carries a roller 44 at each end thereof, one said roller being engaged in the cam groove 33 and the other in the respective vertical guide groove 24.

A plurality of supporting pedestals 45 are mounted on the base structure 10 and serve to support an arcuately shaped tank 46 wherein is contained the electrolyte treating bath 47. This bath is maintained at a level approximately one inch from the top of the tank, or high enough to assure that each chuck will be immersed therein for the required treating interval. The position of the tank is best illustrated in Figures 1 and 2 of the drawings. Brackets 48 are secured in spaced relation about the upper inner edge of the tank structure and serve to support rods 49 which depend in the treating bath in the manner clearly illustrated in Figure 2 and serve as supports for a plurality of brackets 50 whereon is mounted an arcuately shaped anode plate 51. The anode plate is connected, as at 52, in the electrical treating circuit means diagrammatically illustrated in Figure 15 and is disposed in spaced relation directly beneath the ring of chucks in the manner illustrated in said Figure 2. When the chucks are in their fully lowered position they are disposed approximately five inches above the anode plate.

A collector ring 53 is secured to the upper surface of the cam 13 in the manner best illustrated in Figures 1 and 2 of the drawings, and this ring is split as at 54—54 to provide a long dead section 55, and as at 56—56 to provide a short test section 57. A complete circuit detector 58 is mounted, as at 59, on the cam 13 and includes therein a circuit making and breaking relay, the coil of which is connected by a lead 60 to the test section 57 and by a lead 61 to the live section of said ring, said leads 60 and 61 and the coil of the relay forming a holding circuit in a manner and for a purpose that will later become apparent. The relay circuit controlling contacts are connected in the control circuit by leads 62, and the control circuit including the live sections of the collector ring are connected in this circuit, as at 63, the connections 62 and 63 passing through suitable conduits 64 and 65 respectively extending through the hollow turret supporting column 11 in the manner clearly illustrated in Figure 2. See Figures 2 and 15.

Each of the contact elements 30 is flexibly connected, as at 66, to a spring pressed contact block 67 which slides over the collector ring 53 and is mounted in a suitable mounting block 68 secured upon the top plate 25, thus electrically connecting the individual chucks in the control circuit.

All of the electrical connections and the mechanical elements on the main turret structure are protected within a hood 69 which is removably supported, as at 70, on the main turret plate

19, and the individual plates 28 additionally function to collect oil drip or foreign particles which might otherwise contaminate the treating bath 47.

Attention is now directed to Figures 1, 3 and 5 to 7 of the drawings from which it will be observed that a frame column 71 is rigidly secured, as at 72, upon the base structure 10. This column is provided with a vertical bearing 73 which rotatably supports a shaft 74 having a spur gear 75 fixed to its lower end in position for meshing with and being driven by the turret gear 17. A supporting plate 76 is secured, as at 77, at the upper end of the column 71, and just above this plate a transfer turret 78 is secured on the shaft 74 for rotation therewith. The turret 78 is provided with a plurality of circumferentially spaced feeder fingers or arms 79 which provide can end receiving pockets 80, and each arm has its upper trailing edge portion provided with a clearance 81 which serves to facilitate entrance of the can ends into said pockets. As the can ends are individually dropped into the pockets they may engage portions of the clearances 81 and gradually float into proper position in the transfer turret pockets. While being moved about the transfer turret the can ends are suitably confined by a confining rail 82, and this rail includes a short yieldable section 83 which serves to facilitate ultimate settling of the individual can ends into the turret pockets 80.

A frame extension 84 is flange-secured, as at 85, to the column 71 and is equipped with a bearing 86 for a stud shaft 87 on which is mounted an idler spur gear 88 to which rotation is imparted by the hereinbefore mentioned spur gear 75. See Figure 6. The extension 84 also includes a bearing 89 for a shaft 90 having a spur pinion 91 fixed to its lower end in position for having rotation imparted thereto by the idler gear 88. The shaft 90 carries a bevel gear 92 at its upper end which serves to impart rotation to an idler bevel gear 93 mounted on a cross shaft 94 which is rockably supported in frame arms 95 in the manner best illustrated in Figures 6 and 7 of the drawings. The shaft 94 extends beyond the arms 95 and is secured in a pair of arms 96 which depend from the can end feeder unit mounting base 97 upon which the feeder casing generally designated 98 is removably secured as at 99.

By reason of the provision of the cross shaft 94 and the particular mounting thereof in the arms 95 and 96, the base plate 97 and the whole can end feeder unit supported thereon can be swung upwardly about the axis of the shaft 94 so as to displace the feeder unit from the operative position thereof over the transfer turret 78 as illustrated in Figure 6.

The base 97 is provided with a bearing 100 for a driver shaft 101, and a bevel pinion 102 is secured to the lower end of this shaft in position for meshing with and being driven by the previously mentioned idler bevel gear 93.

The feeder unit casing 98 is provided with a well 103 through which the can ends are fed, said ends being stacked within the well between upstanding pins or columns 104. The stack of can ends rests upon a plurality of feeder screw disks 105 secured to the lower ends of feeder shafts 106 which are rotatably supported in casing bearings 107 and include spur gear portions 108. A ring gear 109 meshes with and imparts rotation to all of the spur gear portions 108, and it will be observed by reference to Figure 6 of the drawings that this ring gear partially defines the well 103,

The ring gear is in turn driven by an idler gear 110 which is rotatably mounted, as at 111, in the casing and is driven by a gear sleeve 112 which is freely rotatable about the shaft 101 but which is driven by said shaft through the overload release head generally designated 113, a portion of the head being keyed to the shaft and another portion thereof being keyed to the gear sleeve in the well known manner.

An extension bracket 114 is secured to the feeder casing in the manner clearly illustrated in Figure 6 and overlies the central portion of the transfer turret. This extension includes a depending annular flange portion 115 which projects into the annular groove 116 formed in the upper surfaces of the turret arms.

It will be observed by reference to Figures 1, 2 and 3 of the drawings that a bearing frame structure generally designated 117 is secured, as at 118, on the base 5. This frame structure includes a table portion 119 whereon is secured a horizontally disposed, arcuate, treated can end supporting and guiding track 120, the entrance portion 121 at least of which is undercut, as at 122, for receiving edge portions of the can ends as they are carried onto the track by the supporting chucks. See Figures 2 and 12. This entrance portion of the track is disposed opposite the dwell portion 40 in the control groove 33 of the cam 13 so that the can ends will be properly delivered into the undercut portions at said entrance. It will, therefore, be obvious that as the slight lift portion 41 of the cam groove next effects a slight lifting of the chucks, the treated can ends magnetically attracted thereto will be stripped from the chucks and left resting upon the supporting and guiding track 120.

The arcuate can end supporting and guiding trackway 120 merges into two arcuate guide rails 123 which are supported, as at 124, on the frame structure 117, and it will be observed by reference to Figure 3 of the drawings that these guide rails turn downwardly through approximately 90° so as to alter the position of the can ends fed thereover from the horizontal to the vertical.

The frame structure 117 is equipped with aligned vertical bearings 125 in which is supported a rotary shaft 126, said shaft having a bevel gear 127 fixed thereon adjacent its lower end to which rotation is imparted by a bevel pinion 128. See Figures 2 and 8. The pinion 128 is mounted on a drive shaft 129 which is rotatable in bearings 130 in a drive housing 131 which is secured, as at 132, to the frame structure 117. A worm wheel 133 is loosely mounted on the shaft 129 within the housing 131 and serves to drive said shaft through an overload release head 134 which is keyed, as at 135, to the shaft. The overload release head includes a longitudinally shiftable ring 136 which is longitudinally shifted whenever a jam occurs, which shifting is effective to break the driving relation between the head and the worm wheel 133. The longitudinal movement of the ring 136 also serves to impart longitudinal movement to a spring-pressed pin 137 which is effective to actuate a cutout switch 138 and thus break the machine motor driving circuit and discontinue operation of the machine.

A driver worm gear 139 imparts rotation to the worm wheel 133 and is mounted on a driver shaft 140 which is rotatable in bearings 141 provided in the housing 131. See Figures 8, 9, 1 and 3 of the drawings. Externally of the housing the shaft is provided with a driven pulley 142 and a handwheel 143. The machine may be turned over manually by manipulation of the handwheel, but it is normally driven by a transmission belt 144 from the driver pulley 145 mounted on the shaft of the machine motor 146. It will be observed by reference to Figures 1 and 3 of the drawings that the motor 136 is supported on the base 5.

It will be observed by reference to Figures 1, 2 and 3 of the drawings that the frame structure 117 also is equipped with a horizontal bearing 147 wherein a driver shaft 148 is rotatably mounted. The shaft 148 is equipped with a bevel gear 149 to which rotation is imparted by a bevel gear 150 fixed upon the previously mentioned shaft 126. At its outer end the shaft 148 carries a timer disk 151 to the periphery of which is adjustably secured a ring 152 having timer fingers 153 projecting therefrom, radially and in equidistantly spaced relation.

The timer fingers 153 cooperate with feeder pins 154 which depend vertically and in equidistantly spaced relation from a feeder disk 155 which is adjustably secured to the upper end of the shaft 126. The shaft 126 is also equipped with a spur gear 156 which meshes with and drives the main turret gear 17. The pins 154 of the disk 155 serve to move the treated can ends over the horizontal trackway 120 and to feed them onto the arcuate, downwardly turned rails 123. As the can ends are fed over the rails 123 they fall away from the pins 154 and engage behind and have their fall timed and controlled by the timer fingers 153.

Supported, as at 157, on the frame structure 117, and, as at 158, on sub-framing mounted on the base 5, is the washer unit hereinbefore generally designated E. This unit includes a casing 159 which is divided by a partition 160 into a water spray cleaning compartment 161 and a steam jet cleaning compartment 162. A water spray 163 is provided in the compartment 161, and a series of steam jets 164 are provided in the compartment 162, water for the spray being supplied through the valve controlled pipe line 165, and steam for the jets being supplied through the valve controlled supply pipe 166. Suitable draining equipment may be provided as indicated at 167.

In order to support and feed the can ends through the washer unit there is provided a support rail 168 extending lengthwise through the unit in the manner clearly illustrated in Figure 3. Two feeder shafts 169 are disposed in laterally spaced relation and centered over the rail 168, and each shaft is equipped with a spirally grooved exterior 170, a quick pitch groove portion 171 being provided at the receiving ends of the screws where the treated can ends are received on the rail and between the shafts 169 from the downwardly turned guide rails 123. It will be obvious that as the shafts 169 are rotated, the properly positioned spiral grooving on the shafts in which lateral edge portions of the treated can ends are received will serve to move said ends longitudinally over the rail 168, and while the ends are moving along through the unit E all surplus of treating fluid will be removed therefrom by the water spray and any remaining droplets will be removed by the steam jets.

The receiving ends of the shafts 169 are rotatably supported in bearings 172 in individual arms 173 which are swingably mounted at their lower ends on a common pivot bolt 174 secured to a supporting bracket 175 which is in turn secured, as at 176, to the frame structure 117. The upper

ends of the arms 173 are arcuately slotted and are adjustably secured, as at 178, to the bracket 175. It will be obvious that by varying the spaced relation of the upper ends of the arms 173, the spaced relation of the shafts 169 can be altered so as to receive therebetween can ends of different diameters. Suitable arcuate clearances are provided in the bracket 175 and in the ends of the washer unit casing 159 to permit this variation of the spacing of the shafts.

At their delivery ends the shafts 169 are mounted in bearings 179 in individual arms 180 which are swingably mounted at their lower ends on a common hub 181 projecting from the standard structure 7 in the manner illustrated in Figure 3. Like the arms 173 the arms 180 are arcuately slotted, as at 182, at their upper ends and are adjustably secured, as at 183, to the frame standard structure 7. A stud shaft 184 is fixed in the hub 181 and has an idler gear 185 rotatably mounted thereon. The gear 185 meshes with driver pinions 186 mounted on the shafts 169 for imparting rotation to said shafts, and the idler gear 185 is in turn driven by an idler gear 187 which is rotatable about a stud shaft 188 fixed to the frame structure 7. The idler gear 187 is driven by a spur gear 189 mounted on a shaft 190 which is coupled, as at 191, with the before-mentioned shaft 129 and is rotatable in frame bearings 192. The idler gear 185 has a driver sprocket 193 affixed thereto, and this sprocket performs a movement transmitting function later to be described.

The drier unit G includes an elongated casing 194 which is supported, as at 195, at its receiving end on the brackets 8 and is secured at its delivery end to a mounting plate 196 which is supported upon the standards 6. A heater unit 197 having therein a heating means of any approved form (not shown) is supported, as at 198, upon the casing 194. The heating unit receives air from the casing 194 through a duct 199 and delivers heated air into the center intake of an air circulating pump 200 which in turn delivers the heated air through a duct 201 into the delivery end of the casing 194. By thus arranging the ducts 199 and 201, the heated air supplied to the drier casing 194 is caused to travel in a direction opposite that in which the can ends are fed through the drier unit. The pump 200 is supported on a table 202 which is mounted on the casing 194, and the table also supports a motor 203 which serves to drive the pump through a pulley and belt couple 204.

As in the case of the washer unit, the can ends are fed through the drier unit by feeder screw shafts. A can end supporting rail 205 is disposed longitudinally in the lower portion of the casing 194 and above it and in centered relation thereto are mounted two laterally spaced feeder shafts 206 each provided with a spirally grooved external surface. The feeder grooving is equipped with a quick pitch portion 208 at the receiving ends of the screws, and at the delivery ends the screw shafts are mounted in bearings in arms 209 which are swingably mounted at their lower ends on a common pivot bolt 210 secured to the plate 196. At their upper ends 211 the arms are arcuately slotted and are adjustably secured, as at 212, to the plate 196. The adjustable mounting of the arms 209 permits variation in the spaced relation of the feeder screws in the manner hereinbefore described. See Figure 3.

At their receiving ends the feeder shafts 206 are mounted in bearings 213 in individual arms 214 which are swingably mounted at their lower ends on a common hub 215 projecting from the

frame structure 7. The upper ends of the arms are arcuately slotted, as at 216, and are adjustably secured, as at 217, to said frame structure. A stud shaft 218 is fixed in the hub 215 and rotatably supports an idler gear 219 which meshes with and imparts rotation to driver pinions 220 mounted on the ends of the respective feeder shafts 206. The idler gear 219 is equipped with a sprocket 221 to which rotation is imparted from the previously mentioned sprocket 193 through the medium of a driver chain 222, said chain passing over an adjustably mounted tightener sprocket 223 in the manner best illustrated in Figures 3 and 4 of the drawings.

The can end elevating equipment hereinbefore generally designated F includes a pair of upper and lower cross shafts 224 mounted in bearings 225 provided in the frame structure 7. A sprocket 226 is mounted on each of the shafts, and a conveyor chain 227 passes over these sprockets and over an adjustably mounted tightener sprocket 228 and is equipped with pivotally mounted can end carrier lugs 229. It will be observed by reference to Figure 10 that the carrier lugs are equipped with clearances 230 which permit them to swing inwardly about their pivotal mountings so as to be displaced from their normal operative or can end elevating positions. The effective flight of the chain 227 travels upwardly and is guided by a rail 231 having a lug projecting extremity 232 at its lower end and a lug freeing extremity 233 at its upper end. The effective flight of the chain is flanked by grooved can end edge guides 234 for holding the can ends in upright position while they are being elevated by the chain, and these guides and the rail 231 are supported, as at 235, on the frame structure 7. A sprocket 236 is mounted on the upper shaft 224, and rotation is imparted thereto by a chain 237 which passes over a sprocket 238 fixed on a cross shaft 239 rotatable in a bearing 240 secured to the frame structure 7 and driven by a bevel couple 241 with the upper gear and sprocket equipment 219 and 221.

An actuator cam 242 is mounted on and rotatable with the upper cross shaft 224 and is equipped with four equidistantly spaced humps 243 which are engageable with a roller 244 projecting laterally from a vertically reciprocable thrust member 245. See Figures 10 and 11. The thrust member is disposed with its forked upper end 246 straddling a block 247 on the upper cross shaft 224, and spring means 248 constantly urges the member 245 upwardly so as to hold its roller against the peripheral surface of the cam 242. The bottom end of the member 245 is pivotally connected, at at 249, to one arm 250 of a bell crank lever which is pivoted at 251 on the frame structure 7. The other arm of the bell crank lever is vertically disposed and is bifurcated at the top, as at 252, to straddle the receiving end of the can end supporting rail 205. The bifurcated arm top 252 is provided with two extensions 253 which are engageable with the chain lugs 229 for the purpose of displacing them from their operative, can end elevating position. The parts are so proportioned and arranged that the lever extensions 253 are moved against each set of chain lugs 229 just as they bring a can end to the level of the upper extremity of the bifurcated portion 252 of the lever and in position for being received between and fed along by the screw shafts 206, 207. This timed displacement of the chain lugs is permitted by termination of the guide rail 231 at 233, the rail previously

having served to hold the lugs in the normal, can end elevating position, and serves to transfer each can end from the respective chain lugs 229 onto the upper end of the arm or lever portion 252, from whence they are fed by the screw shafts onto and along the rail 205.

A yieldable resister finger 254 is disposed just above the screw shafts 206 in the path of travel of the can ends being elevated, said finger being pivoted, as at 255, to a bracket 256 which is secured to the adjacent end of the casing 194 and equipped with a bifurcated extension 257 through which passes a pin 258 secured to the finger. A compression spring 259 is coiled about the pin between the finger 254 and the extension 257 and yieldably holds the finger in the normal position illustrated in Figure 3. By reason of the provision of the yieldable finger, the displacement of the chain lugs and the transfer of the can ends from the lugs onto the bifurcated end 252 of the bell crank lever and the transfer of the can ends from the elevating chain to the feeder screws 206 is facilitated, and non-yielding, damaging contact of the chain lugs with the can end edge portions is assured against.

The can end supporting rail 205 terminates within the drier casing 194, as at 260, and at this point the treated and dried can ends fall into the delivery chute 261 by which they are delivered from the machine. See Figure 3.

Operation

In the operation of the machine, can ends to be treated are delivered one-by-one from the feeder unit A, by operation of the screw disks 105, and are deposited into the receiving pockets 80 of the transfer turret B.

As each transfer turret pocket comes opposite the slight lowering portion 35 of the groove in the cam 13, one of the chucks 31 will be lowered slightly so that the magnet 32 thereof will pick up a can end. As each chuck moves over the receiving end of the treating bath containing tank 46, it will be lowered by the lowering portion 37 of the cam groove so as to immerse the magnetically held can end in the treating bath 47. While each chuck unit contact block 67 is moving clockwise, as viewed in Figure 1, in contact with the collector ring 53 from the first ring split 54 around to the second ring split 54, a voltage will be established across each chuck supported can end to the anode plate 51 and the desired treatment of the under surfaces of the can ends will be effected. As previously stated, the detector 58 will serve to shut down the operation of the machine at any time when the treating circuit may be broken in the machine, as by the breakage of a control circuit wire, the failure to maintain a proper level of treating fluid 47 in the tank 46, or for any other reason. In the machine herein illustrated, the speed of movement of the parts is controlled so as to provide a treatment of each can end in the bath for a period of approximately three seconds, but it is to be understood that this period may be varied to suit the demands of different installations or different desired treatments.

At approximately the terminus of the tank 46, the chucks and the treated can ends carried thereby are lifted by the lift portion 39 of the cam groove, and then the dwell portion 40 and the slight lift portion 41 of the cam groove serve first to feed the treated end edge portions into the supporting track undercuts 122, and then to lift the chucks slightly so as to strip the can ends therefrom in the manner hereinbefore described. See Figures 2 and 12.

After each treated can end is stripped from the supporting chuck, it is moved about the supporting trackway 120 by one of the fingers 154 and delivered over the downwardly turned guide rails 123, being timed in its fall by one of the timing fingers 153 so as to be properly presented in position for being fed longitudinally through the washer unit by the feeder screws 169. While passing through the washer unit E, the treated can ends are first sprayed with water and then by steam jets so as to completely cleanse the ends and assure that no treating solution or water drops remain thereon.

The feeder screws 169 deliver the can ends from the washer unit E in position for being picked up and elevated by the chain lugs 229 into position for being fed through the drier unit G by the feeder screws 206. When the can ends are elevated so as to be engaged by the feeder screws 206, proper engagement thereof with the feeder screws is assured by displacement of the chain lugs and the transfer of the can ends onto the upper extremity of the bell crank portion 252 and from thence onto the receiving end of the rail 205 under the yieldable finger 254 in the manner hereinbefore described.

While being fed through the drier unit G on the supporting rail 205 and by the feeder screws 206, the can ends are subjected to a counter current of heated air and are thoroughly dried. At the discharge end of the feeder screws 206, the treated and dried can ends are delivered into the chute structure 261 by which they are delivered from the machine.

It is to be understood that the electrolyte or treating bath is constantly circulated through the treating tank 46. It is also important that this treating bath be maintained approximately at 68° F. The manner in which this is accomplished is diagrammatically illustrated in Figure 14. In this figure is illustrated a treating bath cooling and storing tank 262 in which the treating bath is maintained approximately at 68° F. by any approved cooling equipment. The tank 262 is connected through a flow line 263 with the treating tank 46, and this flow line includes control valve equipment 264 and has a motor driven circulating pump 265 connected therein. The circulation of the treating bath is completed through a return line 266 leading from the treating tank 46 to the cooling and storing tank 262. The return line 266 includes control valve equipment 267 and a check valve 268 and also has a motor driven circulating pump 269 connected therein.

In Figure 15 of the drawings, there is shown a wiring diagram illustrating how the various motors and control devices are connected in the control circuit, and also how the collector ring 53, 57, the detector unit 58, and the anode 51 and chucks 31, are connected with the control circuit and the direct current supply.

It will be apparent from the diagrammatic illustration in Figure 15 that current for the treatment of the can ends is supplied by a motor-generator set shown at the lower left hand corner of the diagrammatic illustration. Should the treating circuit be broken for any reason, such as a broken wire or contact, or low solution level in the treating tank 46, this deficient circuit condition will be detected by the detector unit 58 hereinbefore described and which is shown diagrammatically in the upper right hand corner

of Figure 15, and the detector will act to stop the machine.

It should be understood that the length of the test section 57 in the collector ring 53 is so related to the spacing of the individual brushes or contact blocks 67 that one of said blocks always is in contact with the ring section 57. It will be apparent by reference to the diagrammatic designation of the detector installation at the upper right hand portion of Figure 15 that the detector unit 58 is so connected in the circuit that the path of treating current must go through the coil of this unit, and if that current is not sufficient, the unit relay will act to open the contacts in the unit and thus break the control circuit and cause the machine to stop.

The machine has a total of four motors, one being a 15 H. P. motor operating the motor-generator set, two three-quarter H. P. centrifugal pump motors 265 and 269, and one machine motor 146. The motors operate on 440 volt, 3 phase, 60 cycle, but the control circuit of the motor starters and push button units are operated from a 110 volt source secured from the control circuit transformer which reduces the voltage from 440 to 110 volts.

The operation of the motors is controlled from starters and a control relay which is located on the A. C. control panel and in turn controlled by start-stop push buttons and a selector switch. The motor starters include the usual overload relays, and the overload relays on all four motor starters are connected in series in the common control line so that occurrence of any overload will automatically shut down the entire machine.

The control circuit is so arranged that the machine may be operated on an automatic cycle or on a manual or hand cycle, the latter ordinarily being used only for testing or initial set up purposes.

With the selector switch in the automatic position, it is necessary that the generator be operating before the pumps can operate. By means of an additional, normally open, interlocked contact on the motor generator starter, operation of the motor-generator starter causes pumps 265 and 269 to start. With the motor-generator operating, and the pumps operating, it is then possible to operate the machine motor 146, providing the test relay and the clutch overload limit switch control circuits are closed, the machine motor being started and stopped from its own start and stop bases.

Additional normally open interlocks on the two pump motor starters are in series with the machine motor control and so interlock it that the pumps 265 and 269 must be running, and the generator must be running, before it is possible to operate the machine motor. Failure of any of these three units will automatically stop the machine motor.

For testing or initial setting up purposes, the selector switch may be turned from the "Auto" position to "Hand." Operation of this selector switch causes control relay CR to operate. This control relay has three normally open and two normally closed contacts. In operating, the two normally closed contacts which were closed in the two pump motor starters, open to keep the pumps 265 and 269 from starting when the motor-generator is started up. This then allows starting of the pumps 265 and 269 by means of their own start and stop stations. These pump starters have their own holding circuit interlocks which provide three wire control on the pump motors. One of the normally open contacts on the control relay CR provides a circuit from the master stop station to the control circuit of the pumps 265 and 269 as well as the machine motor 146 so that even though the motor generator is not operating, it is possible to start any of these three units by their own operating start-stop stations on the control panel cover. Another of the normally open poles of relay CR is used to bridge the interlock circuits so that the machine motor 146 may be started irrespective of whether the pumps 265 and 269 are opertaing. The fifth and last control contact which is normally open on this control relay CR is used to energize two pilot lights, one of which is located in the control station at the operator's point and the other at the top of the A. C. control panel. This last mentioned pilot light is a red light and its purpose is to notify all concerned that the panel is set up for a hand operating cycle. On the A. C. control panel are located three sets of start and stop stations which are intended for operating the motor-generator set and pumps 265 and 269 for manual operation. In the control station there are included a hand or automatic position selector switch for cycle selection, a pilot light to indicate to the operator when he is in the manual cycle position, a start button and a stop button for the control of the machine motor 146, and also an inch run selector switch so that the machine motor control may be set for inching purposes. In addition, a master start button is provided to enable an operator to shut down the entire machine.

After the machine has been properly tested and a test run made to ascertain that the can ends are properly fed through the machine without having edges thereof dented or being otherwise mutilated, and tests have been made to assure that the treating solution temperature is approximately 68° F. and the drier oven temperature is approximately 325° F., the machine is ready to be placed in normal operation. This is accomplished by turning the selector switch marked "Auto-Hand" to "Auto." The selector switch marked "Inch-Run" is then turned to "Run." The motor-generator set is started at the A. C. control panel, and the D. C. control panel rheostat is adjusted so that the voltage is 45 and the switch is opened to direct the D. C. to the machine. The water and steam flow controlling valves 165 and 166 are, of course, opened and the flow control valves 264, 267 are controlled to maintain a level of the electrolyte bath in the tank 46 approximately one inch from the top of the tank. The starter button at the control station is then actuated and normal operation is thus initiated.

It is, of course, to be understood that the details of structure and arrangement of parts may be variously changed and modified without departing from the spirit and scope of the invention.

We claim:

1. In a machine of the character described, a can end treating bath, a traveling carrier having a plurality of vertically reciprocatory individual can end carrier elements thereon, means for feeding can ends individually to said elements to be supported thereon, means for holding the can ends individually on the respective carrier elements in predetermined orientation with respect thereto, means for lowering the elements to immerse can ends thereon in the bath then hold them lowered throughout a treating interval and then lift them out of the bath, an electrode in the bath conforming in shape to the path of travel

of the elements in the bath, treating circuit means for passing an electrical treating current through the bath and the electrode with each immersed can end connected in the circuit as a second electrode, and means for discharging the treated can ends from the carrier elements.

2. In a machine of the character described, a can end treating bath, a traveling carrier having a plurality of vertically reciprocatory individual can end carrier elements thereon, means for feeding can ends individually to said elements to be supported thereon, means for holding the can ends individually on the respective carrier elements in predetermined orientation with respect thereto, means for lowering the elements to immerse can ends thereon in the bath then hold them lowered throughout a treating interval and then lift them out of the bath, an electrode in the bath conforming in shape to the path of travel of the elements in the bath, treating circuit means for passing an electrical treating current through the bath and the electrode with each immersed can end connected in the circuit as a second electrode, means for washing treating bath fluid from the treated can ends, means for forwarding treated can ends from the treating bath to the washing means, means for drying the treated and washed can ends, means for forwarding the treated and washed can ends from the washing means to the drying means, and means for discharging the treated washed and dried can ends from the machine.

3. In a machine of the character described, a can end treating bath, a traveling carrier having a plurality of vertically reciprocatory individual can end carrier elements thereon, means for feeding can ends individually to said elements to be supported thereon, means for holding the can ends individually on the respective carrier elements in predetermined orientation with respect thereto, means for lowering the elements to immerse can ends thereon in the bath then hold them lowered throughout a treating interval and then lift them out of the bath, an electrode in the bath conforming in shape to the path of travel of the elements in the bath, treating circuit means for passing an electrical treating current through the bath and the electrode with each immersed can end connected in the circuit as a second electrode, means for directing water spray on the treated can ends for washing treating bath fluid therefrom, means for directing steam onto the washed can ends for removing droplets therefrom, means for forwarding treated can ends from said treating bath to said water spray directing means and thence to said steam directing means, means for drying the treated and washed can ends, means for forwarding treated and washed can ends from said steam directing means to said drying means, and means for discharging the treated washed and dried can ends from the machine.

4. In a machine of the character described, a rotating turret having a plurality of vertically reciprocatory carrier elements disposed in equidistantly spaced relation about the circumference thereof, a can end supporting chuck mounted on the lower end of each carrier element, an arcuately shaped can end treating bath disposed beneath the traveling chucks, means for feeding can ends individually to said chucks, means for holding can ends on said chucks, means for lowering the carrier elements to immerse held can ends in the bath then hold them lowered throughout a treating interval and then lift them out of the bath, a horizontally arcuate anode in the bath in spaced relation to chucks lowered and traveling therein and conforming in shape to the path of travel of the elements in the bath, treating circuit means for passing an electrical treating current through the bath and the anode with each immersed can end connected as cathode in the circuit, and means for discharging the treated can ends from the chucks.

5. A machine as defined in claim 1 in which the means for holding the can ends on the carrier elements includes means for magnetically attracting the can ends to said carrier elements.

6. A machine as defined in claim 4 in which the means for holding the can ends on the chucks comprises a permanent magnet mounted on each chuck.

7. A machine as defined in claim 1 in which the means for holding the can ends on the carrier elements includes means for magnetically attracting the can ends to said carrier elements, and in which the treated can end discharging means comprises means for engaging the magnetically attracted can ends above and below the edge portions thereof and stripping them from the carrier elements and maintaining control of said can ends in a manner for preventing free falling thereof.

8. In a machine of the character described, a rotating turret having a plurality of vertically reciprocatory carrier elements disposed in equidistantly spaced relation about the circumference thereof, a can end supporting chuck mounted on the lower end of each carrier element, an arcuately shaped can end treating bath disposed beneath the traveling chucks, means for feeding can ends individually to said chucks, means for holding can ends on said chucks, an actuator element projecting laterally from each carrier element, a stationary grooved cam engaged by all said actuator elements and effective for lowering the carrier elements to immerse held can ends in the bath then hold them lowered throughout a treating interval and then lift them out of the bath, a horizontally arcuate anode in the bath in spaced relation to chucks lowered and traveling therein and conforming in shape to the path of travel of the elements in the bath, treating circuit means for passing an electrical treating current through the bath and the electrode with each immersed can end connected as cathode in the circuit, and means for discharging the treated can ends from the chucks.

9. A machine as defined in claim 8 in which the means for holding the can ends on the chucks comprises means for magnetically attracting the can ends to the chucks, and in which the treated can end discharging means comprises stripping means placed to engage over portions of the can ends as they are being lifted on the chucks and strip them from said chucks.

10. A machine as defined in claim 4 in which said treating circuit means includes a stationary collector ring and individual contacts connected to the chucks and slidably engaging said ring.

11. A machine as defined in claim 8 in which said treating circuit means includes a stationary collector ring supported on said cam and individual contacts connected to the chucks and slidably engaging said ring.

12. A machine as defined in claim 4 in which said treating circuit means includes a stationary collector ring and individual contacts connected to the chucks and slidably engaging said ring, and means for stopping the machine whenever

a break occurs in the flow of current through said collector ring.

13. In a machine of the character described, a lower longitudinal can end treating housing, an upper longitudinal can end treating housing disposed above and parallel said lower housing, a supporting rail extending longitudinally through each housing, a pair of rotary spiral conveyor screws disposed in cooperative relation one at each side of and above the rail in each housing and together effective to convey can ends in vertical spaced relation along said rail, an elevator chain having a flight passing upwardly between the lower and upper pairs of screws and having mounted thereon in spaced relation swingable can end supporting and elevating lugs effective to take can ends one by one from the lower screws and elevate them to the upper screws, and means for displacing the chain lugs from their can end supporting and elevating position just as an elevated can end comes into position for being conveyed by the upper screws.

14. A structure as defined in claim 13 in which there is included means for yieldably opposing further upward movement of each can end as it comes into position for being conveyed by the upper screws.

15. A structure as defined in claim 13 in which said displacing means includes a shiftably mounted head portion disposed at the level of the upper rail, and means for shifting said head each time a chain lug comes opposite it to engage and displace said lug and take over the support of the can end previously supported by the displaced lug while the conveying of the can end by the upper screws is being initiated.

16. In a can end immersion treating machine, a rotating turret having a plurality of vertically reciprocable carrier elements disposed in equidistantly spaced relation about the circumference thereof, a can end supporting chuck mounted on the lower end of each carrier element, a horizontally arcuately shaped can end treating bath of electrolyte disposed beneath the traveling chucks and conforming in shape to the path of travel of said chucks in said bath, means for feeding can ends individually to said chucks, means for individually holding can ends on said chucks, an actuator element projecting laterally from each carrier element, a stationary grooved cam engaged by all said actuator elements and effective for lowering the carrier elements to immerse held can ends in the bath then hold them lowered throughout a treating interval and then lift them out of the bath, means for discharging the treated can ends from the chucks, said holding means comprising a permanent magnet carried by each chuck in position for magnetically attracting and holding thereagainst can ends fed individually to said chucks, said can end feeding means including a supply stack supporting means, means for dropping the can ends one by one from the bottom of the stack, and a transfer rotor having radially projected circumferentially spaced arms providing peripheral pockets therebetween in which the individually fed can ends are moved around into position for being individually picked up by the chucks, the upper trailing edge portion of each transfer rotor arm being recessed and sloped downwardly to provide a can end dropping clearance effective to facilitate movement of the can ends into said peripheral pockets.

17. In a machine of the character described, a can end treating bath of electrolyte, a traveling carrier having provision thereon for individually supporting can ends and for immersing them in the bath for a treating interval and then lifting them out, means for discharging treated can ends individually from the carrier, means for removing surplus treating bath fluid from the discharged can ends, said last named means comprising a longitudinal housing and washing means therein, a treated and washed can end drying means comprising a longitudinal housing disposed above and in parallel spaced relation to the first mentioned housing and having drying means therein, means for feeding the can ends in vertical spaced relation through the first mentioned housing, means for feeding the can ends in vertical spaced relation and in the opposite direction in the second mentioned housing, and means for elevating the can ends from the first mentioned feeding means to the second mentioned feeding means, each said feeding means including a supporting rail extending longitudinally through the respective housing, and a pair of rotary spiral conveyor screws disposed in cooperative relation one at each side of and above the respective rail and together effective to convey can ends in vertical spaced relation along said rail, said elevating means including an endless conveyor having a vertically disposed elevating flight and can end supporting and elevating lugs affixed thereon in spaced relation.

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