Dec. 28, 1943. P. E. PEARSON ET AL 2,338,055

CONVEYER ORGANIZATION FOR CAN END DRYING MACHINES

Filed April 16, 1942 9 Sheets-Sheet 1

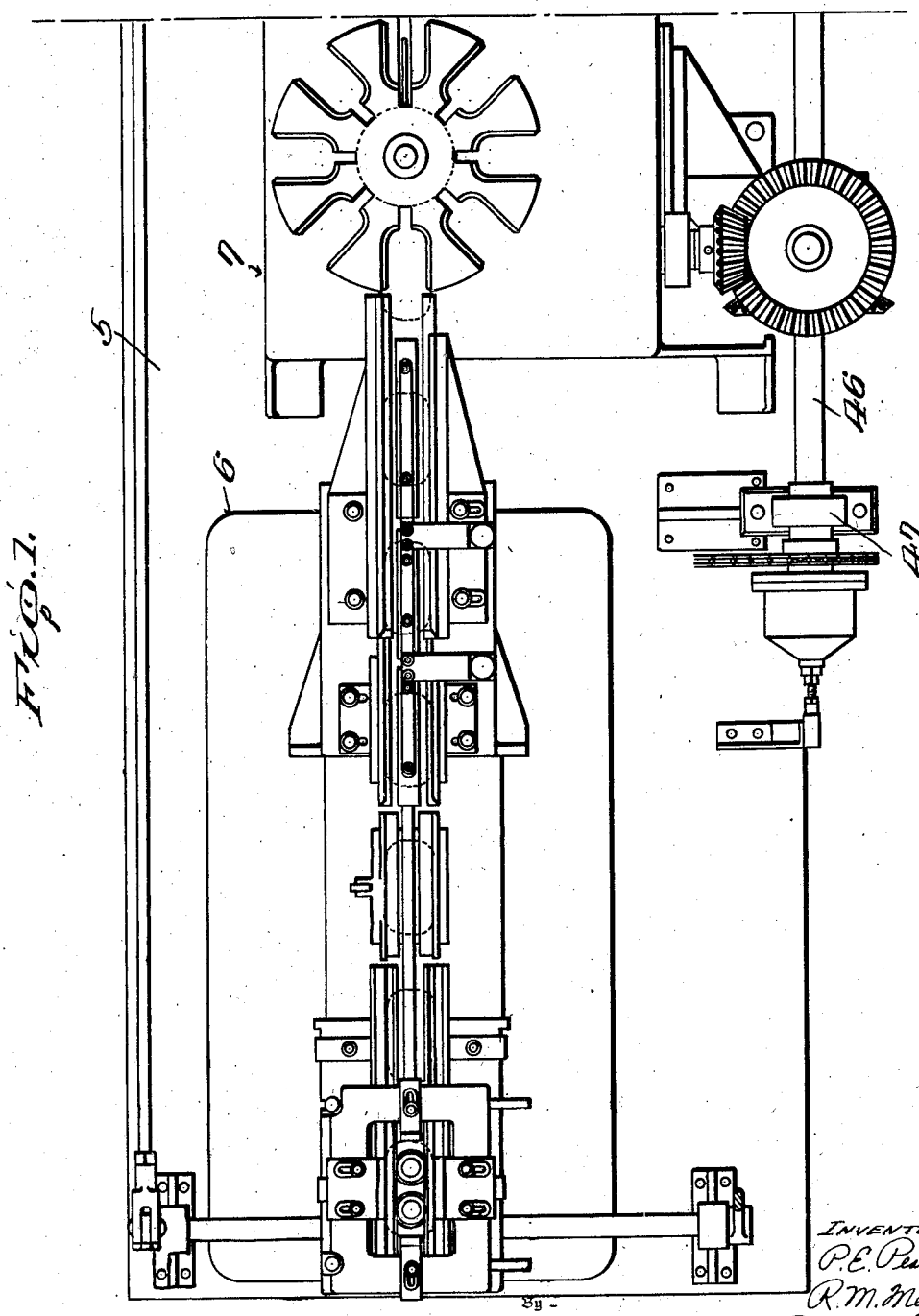


FIG. 1.

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CONVEYER ORGANIZATION FOR CAN END DRYING MACHINES

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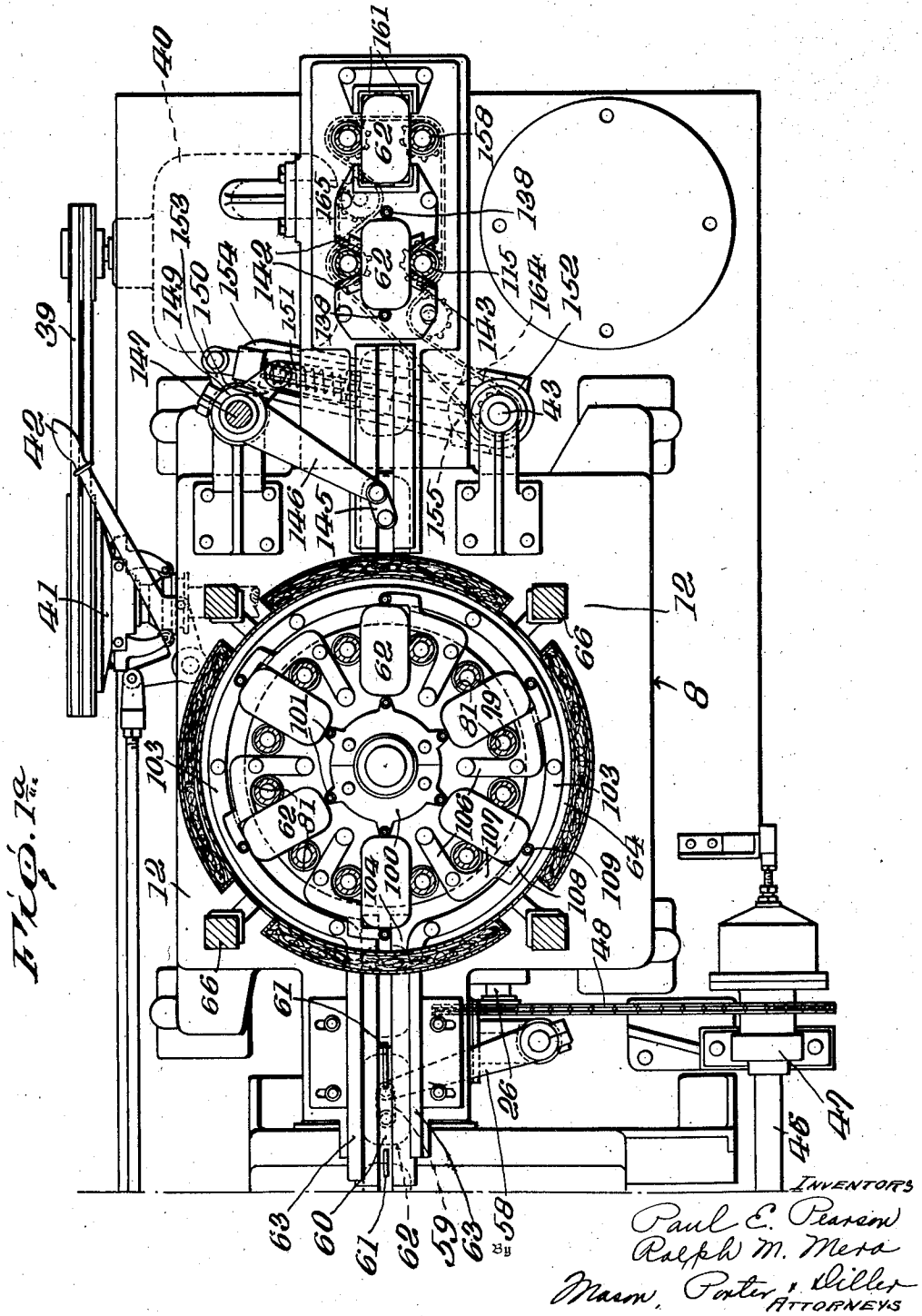


Fig. 12a.

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CONVEYER ORGANIZATION FOR CAN END DRYING MACHINES

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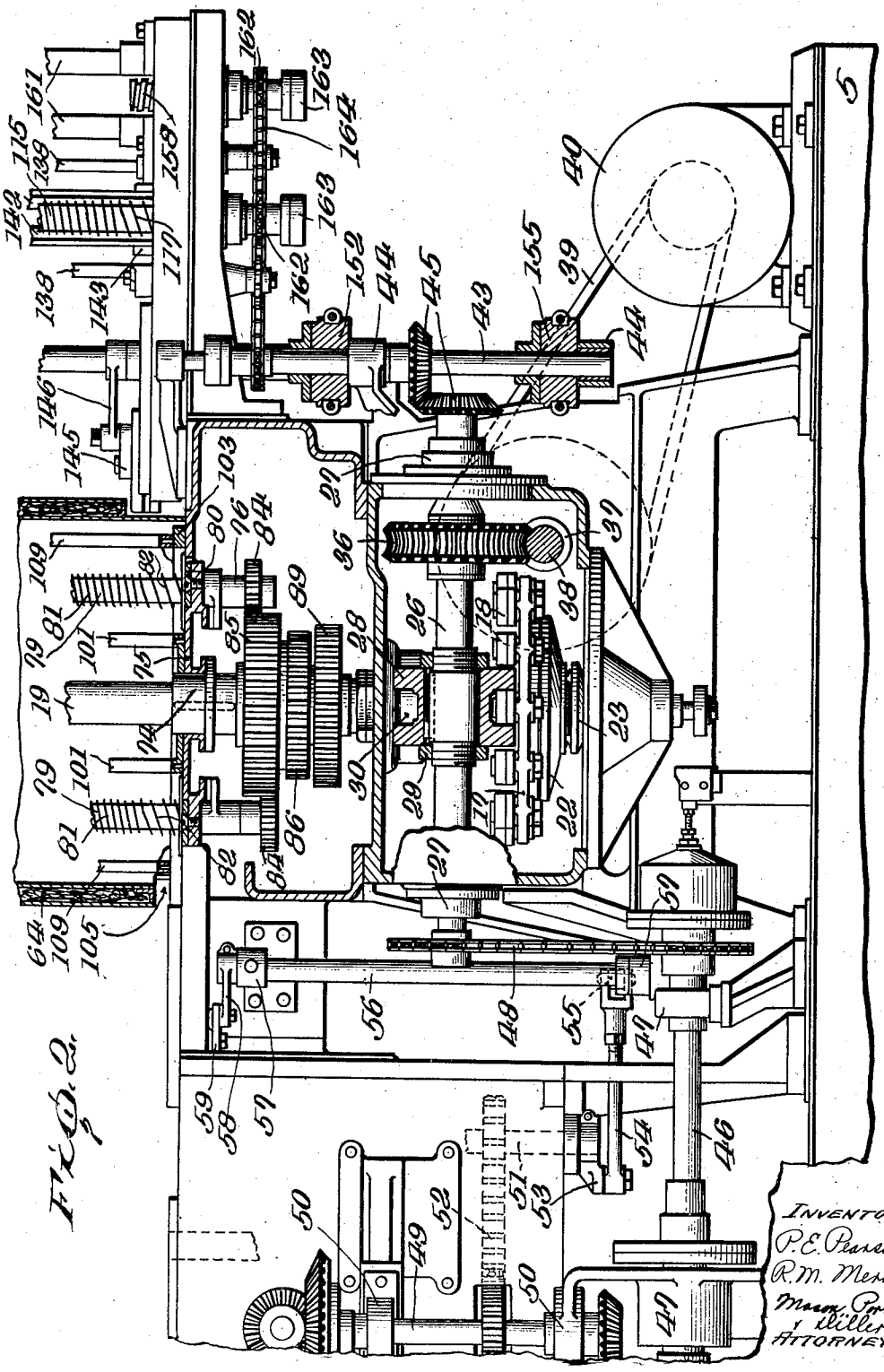


FIG. 2.

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CONVEYER ORGANIZATION FOR CAN END DRYING MACHINES

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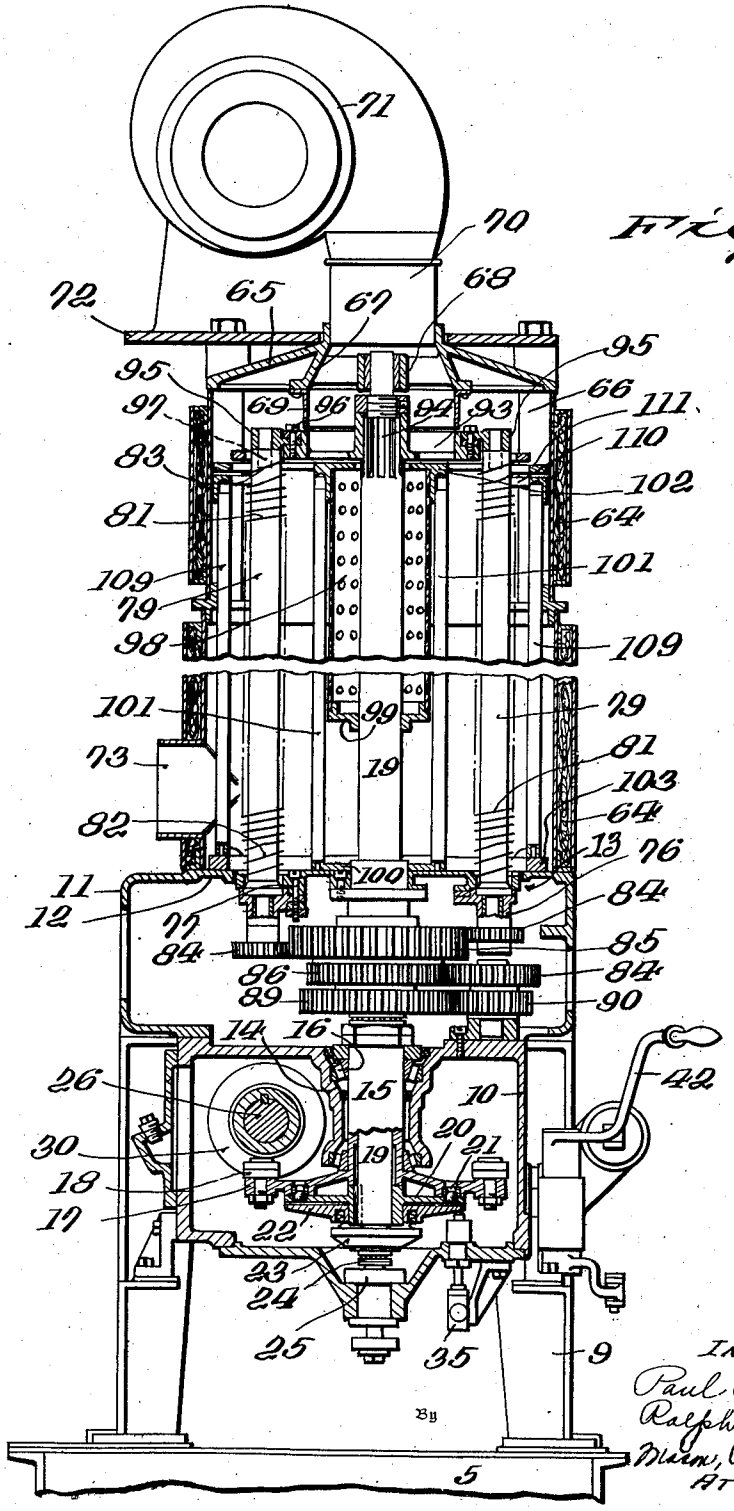


FIG. 3.

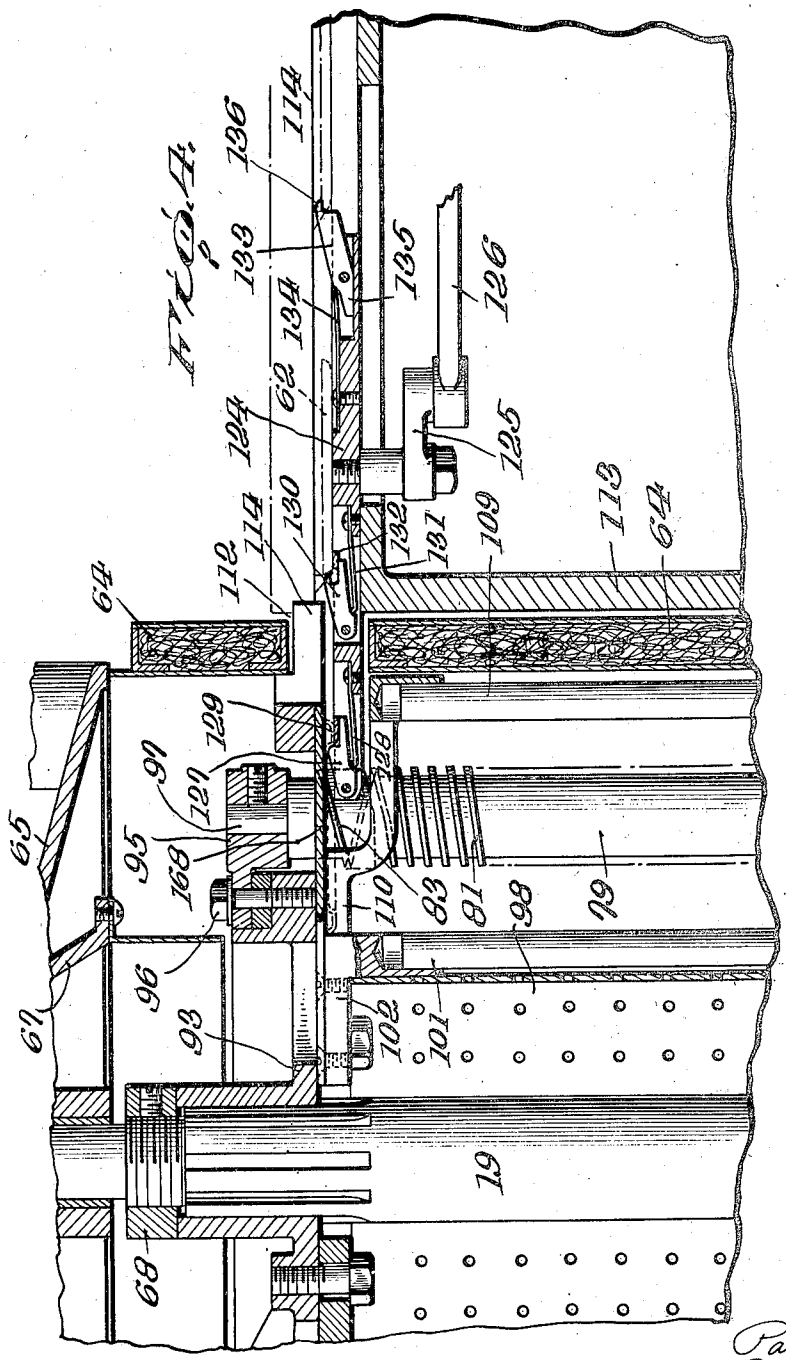
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CONVEYER ORGANIZATION FOR CAN END DRYING MACHINES

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FIG. 14.



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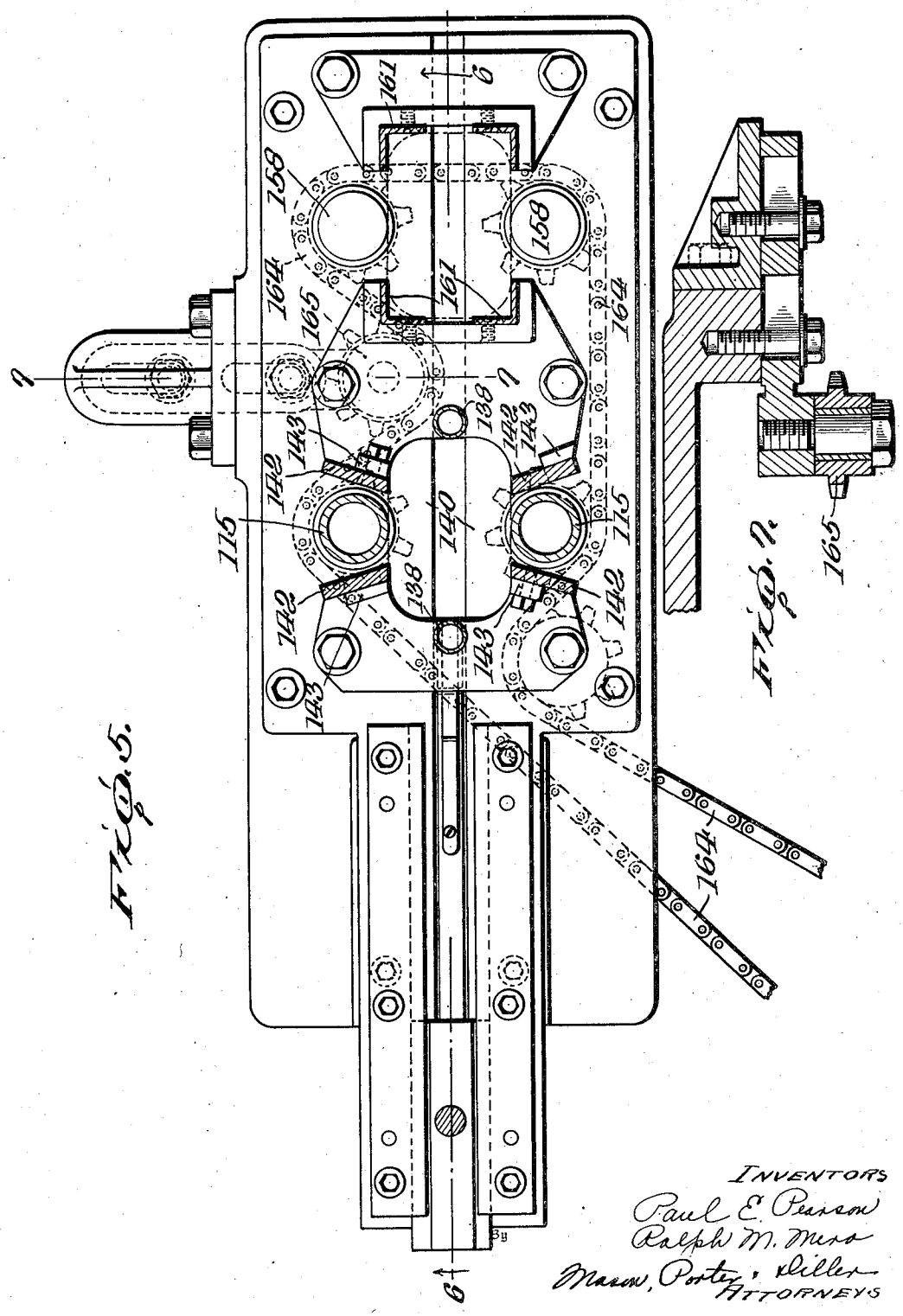


Fig. 5.

Fig. 7.

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CONVEYER ORGANIZATION FOR CAN END DRYING MACHINES

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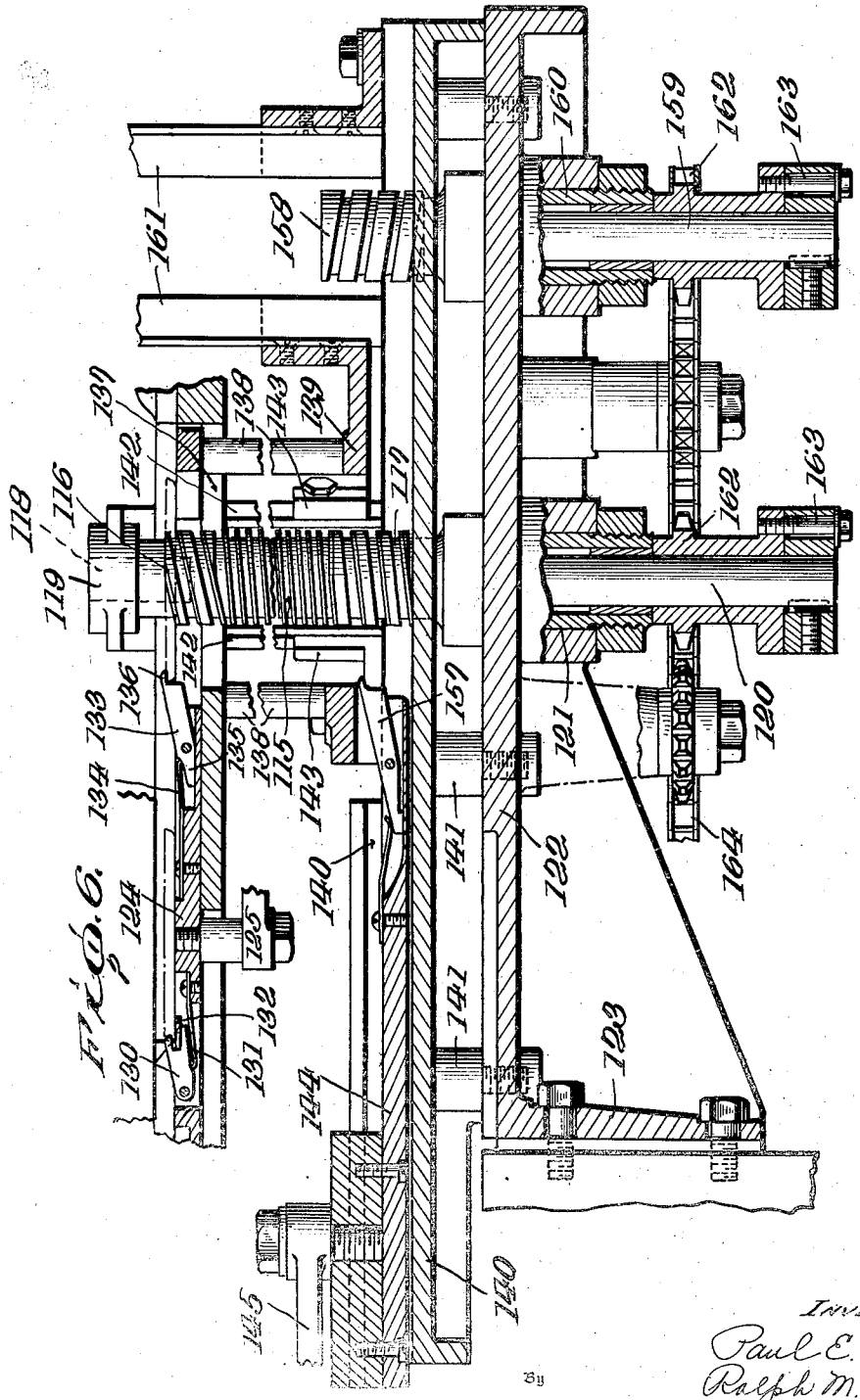


FIG. 6.

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CONVEYER ORGANIZATION FOR CAN END DRYING MACHINES

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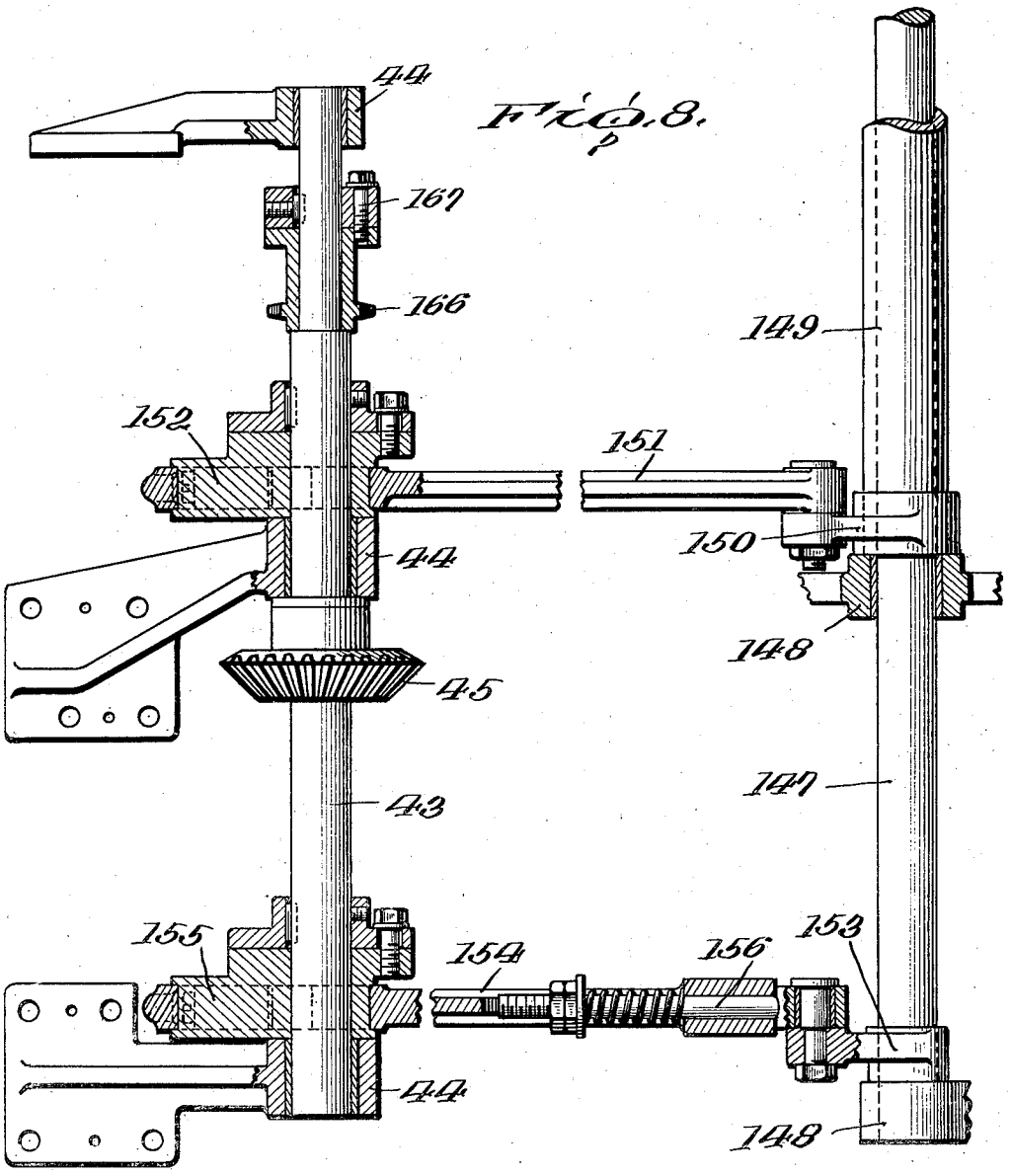


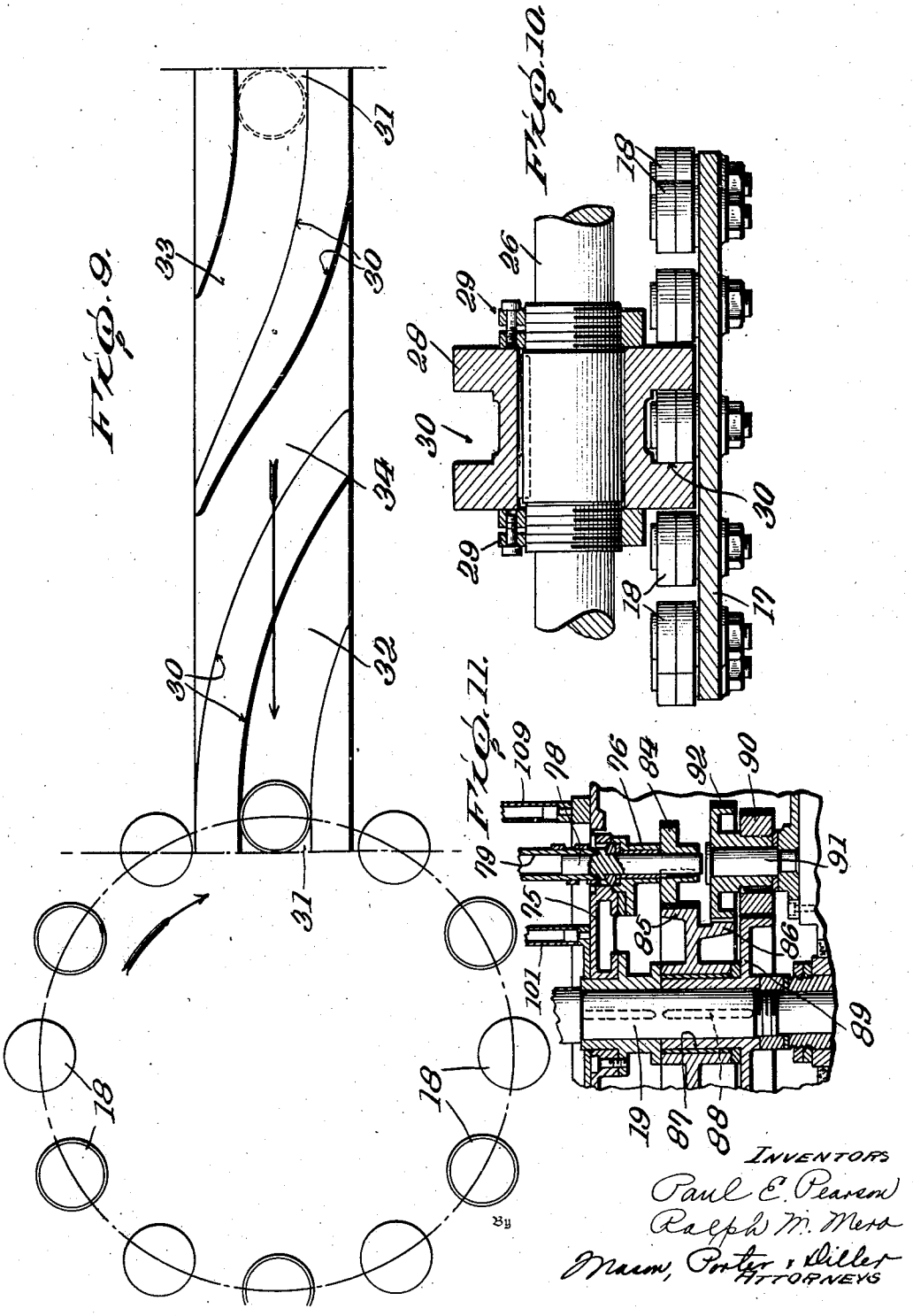
Fig. 8.

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CONVEYER ORGANIZATION FOR CAN END DRYING MACHINES

Filed April 16, 1942 9 Sheets-Sheet 9



Patented Dec. 28, 1943 2,338,055

UNITED STATES PATENT OFFICE

2,338,055

CONVEYER ORGANIZATION FOR CAN END DRYING MACHINES

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Application April 16, 1942, Serial No. 439,280

17 Claims. (Cl. 198—82)

The invention relates generally to drying apparatus and primarily seeks to provide a novel machine structure adapted for efficiently drying the protective or sealing compound coatings usually applied to can end closure units.

Machines for drying can ends have been provided heretofore, and an approved type thereof includes sets or pairs of elevator screws between which the can ends are fed and which are rotated in a manner for elevating the can ends in spaced relation within a casing in which drying air is passed between the spaced ends, the screws being mounted on a rotor which is indexed station-by-station about a vertical axis, and the can ends being fed between the screw pairs at a receiving station at the bottom of the rotor and discharged at a discharging station at the upper end of the rotor after a suitable drying interval. These machines have been adaptable for the drying of circular can ends only and it is the purpose of the present invention to provide certain new and useful improvements in machines of this type designed to adapt them for drying sealing compound or protective coatings on can ends of irregular or oblong shape, efficiently and without danger of damaging the same by jamming.

An object of the invention is to provide a machine of the character stated, in which is provided a rotor and means for indexing the same about a vertical axis within a drying casing, can end elevating screw pairs on said rotor, and means cooperating with the screws for receiving and holding the can ends with their longitudinal axes disposed radially, there also being included novel indexing means for assuring accurate reception and delivery of the can ends without jamming.

Another object of the invention is to provide an improved machine structure of the character stated, in which the can ends are individually received at the bottom of the rotor and are gradually fed upwardly in a plurality of individual columns on the screw pairs within the casing while having drying air passed therebetween, and means for removing the dried can ends one-by-one from the serially presented columns at the top of the casing and delivering them to a pair of lowering screws which are located outside the casing and which serve to gradually lower the can ends in spaced relation through a cooling interval, means also being provided for transferring the cooled ends to a stacking means.

Another object of the invention is to provide an improved machine structure of the character stated, in which the stacking means includes stacking guides and a pair of cooperating short length lifting screws which elevate the can ends individually, initially in spaced relation, and then support the stack of ends.

Another object of the invention is to provide an improved machine structure of the character stated, in which are included an upper feeder mechanism effective to deliver can ends from the drying casing to the lowering or cooling screws, and a lower feeder mechanism for transferring the can ends from the cooling screws to the stacking screws, both said mechanisms being driven from a common shaft.

Another object of the invention is to provide in a machine of the character described, can end feeding and transferring means of the character stated including an upper reciprocating feeder and a lower reciprocating feeder, a shaft and crank arm for reciprocating one said feeder, and a sleeve and crank arm for reciprocating the other feeder, said sleeve being rockable about said shaft, and there being included means for preventing jamming of at least one of said feeders.

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:

Figures 1 and 1a together comprise a plan view of a machine structure embodying the invention, the drier casing being shown in horizontal section.

Figure 2 is an enlarged part side elevation and part vertical longitudinal section, the sectioned portion being viewed principally at the axis of the drier casing.

Figure 3 is a vertical cross section of the machine taken through the axis of the drier casing.

Figure 4 is an enlarged fragmentary vertical longitudinal section taken at the position of the dried can end delivery station.

Figure 5 is an enlarged detail horizontal section taken through the can end cooling and stacking equipments.

Figure 6 is an enlarged fragmentary vertical longitudinal section taken on the line 6—6 on Figure 5.

Figure 7 is a detail vertical cross section taken on the line 7—7 on Figure 5.

Figure 8 is a fragmentary vertical cross section illustrating the driving mechanism for the can end delivering and transferring feeders.

Figure 9 is a diagrammatic development of the indexing cam and illustrates the relation thereof to the rotor indexing rollers.

Figure 10 is an enlarged fragmentary section illustrating the relation of the indexing cam and the roller-equipped rotor driving disk.

Figure 11 is an enlarged fragmentary sectional view illustrating the mounting and manner of driving of one of the lifter screws.

In the example of embodiment of the invention herein illustrated, the drier embodying the herein disclosed invention is illustrated in combination with a sealing compound applying unit in which the sealing compound intended to assure the sealing of the joint between the can body ends and the can bodies on which they are applied is deposited on the flange portions of the can ends, and a curler unit in which the edges of the can ends are curled in a manner well known in the art. In this diagrammatic illustration in Figures 1 and 1*a* of the drawings, a common base 5 is shown, and on this base the sealing compound applying unit generally designated 6, the can end edge curling unit generally designated 7, and the drier unit generally designated 8 are mounted. Since the structural details of the sealing compound applying unit and the curling unit form no part of the present invention, further detail description of these units is deemed unnecessary herein.

The drier unit includes a base frame 9 upon which is mounted a drive housing 10, and on the drive housing is supported a gear housing 11 including a top or table portion 12 equipped with a circular opening 13 therein for accommodating the positioning of the drier rotor to be described in detail hereinafter.

A bearing well 14 is formed in the drive housing 10, and in this well a rotor sleeve 15 is mounted to rotate about a vertical axis in suitable anti-friction bearings 16. The sleeve is equipped with a disk enlargement 17 provided with twelve upstanding, equi-distantly spaced indexing rollers 18. The drying rotor herein disclosed is a six station rotor, and it is to be understood that one of the indexing rollers is provided for each station, and that one such roller is disposed intermediately of each two station-associated rollers. In other words, the indexing disk 17 is equipped with six main indexing rollers and six intermediate or auxiliary indexing rollers in the particular illustration herein made, it being understood that the number of rollers will vary according to the number of stations provided on the rotor.

A rotor shaft 19 is freely mounted within the sleeve 15 and has a driver disk 20 keyed to the lower end thereof beneath the indexing disk 17, and this driver disk has overload release drive cooperation with the disk 17 through ball and recess equipments 21 opposed by a disk 22 longitudinally-slidably mounted on the hub of the disk 20 and yieldably pressed against the overload release balls by an abutment ring 23 and compression springs interposed between it and said disk 22. The ring 23 is opposed by anti-friction bearings 24, and the center shaft 19 is supported upon an adjustable end thrust bearing 25. See Figures 2 and 3.

A driver shaft 26 is horizontally rotatable in bearings 27 provided in the drive housing 10 and has an indexing cam 28 longitudinally-adjustably secured thereon as at 29. See Figures 2, 3, 9 and 10. The indexing cam is equipped with indexing grooving generally designated 30 and which includes a central dwell portion 31 which extends a limited number of degrees about the circumference of the cam depending upon the rest or dwell interval intervening indexing movements of the rotor and merges at one end into a movement imparting groove portion 32 opening through one side of the cam and at its other end into a roller receiving groove portion 33 opening through the other side of the cam. Between the side opening grooving portions 32 and 33, the cam is provided with a movement imparting groove portion 34 which opens through both sides of the cam and is engageable only with the intermediate or auxiliary indexing rollers disposed between each adjacent pair of station-associated indexing rollers. In the diagrammatic illustration in Figure 9, the intermediate or auxiliary indexing rollers which engage in the cam grooving 34 alone are illustrated by a single circle whereas the remaining or station-associated rollers are indicated by double circles.

By reason of the provision of the particular form of indexing cam indicated in Figures 9 and 10, very accurate indexing of the drying rotor is effected, and jamming of parts because of inaccurate registry of parts during normal functioning of the machine is thus avoided. During a period in which rotation or indexing movement is being imparted to the rotor, one of the auxiliary rollers indicated by a single circle in Figure 9 is engaged in the cam grooving 34 and one of the main indexing rollers indicated in Figure 9 by a double circle is engaged in the main grooving 31, 32, but during the idle or dwell period, only said main indexing roller is engaged in the main grooving 31. Thus the intermediate or auxiliary rollers do not function to hold the rotor during dwell periods, but merely serve to accurately control positioning of the rotor during turning. This particular arrangement of indexing rollers is found very advantageous because the individual stations on the drying rotor have to be placed quite a distance apart, and without the intermediate or auxiliary rollers the necessary accurate control of the indexing movements of the turret would be difficult, and objectionable overthrowing or misalignment of parts might result.

Should it be attempted to operate the machine with any moving part thereof jammed by interpositioning of any obstructing object, the indexing of the sleeve 15 could go on without imparting rotation to the jammed shaft 19. Under these conditions the disk 22 would be displaced longitudinally by movement of the balls 21 out of their driving recesses in the manner well known in the art. This movement of the disk along the axis of the shaft can be utilized to actuate any conventional form of circuit controlling switch 35 for the purpose of discontinuing the supply of power to the driving motor and stopping the machine.

In order to provide for the driving of parts hereinbefore described, the shaft 26 is equipped with a worm wheel 36 to which rotation is imparted by a worm gear 37 mounted on a drive shaft 38 rotatably mounted in supporting bearings provided in the drive housing 10, said shaft 38 being driven through belt and pulley connections 39 from the motor 40 supported on the base 5. A control clutch 41 preferably is included in the power transmitting connections and may be actuated by a suitable hand lever equipment 42. See Figures 1*a*, 2 and 3.

The shaft 26 also drives a cam shaft 43 which

is vertically disposed and rotatable in bearings 44 suitably supported on the machine framing in the manner best illustrated in Figures 1a, 2 and 8 of the drawings, said shaft being driven through a bevel gear couple 45. The purpose of this cam shaft will be described hereinafter.

The driver shaft 26 also imparts rotation to a unit driving shaft 46 which is horizontally rotatable in bearings 47 mounted on the base 5, the drive being effected through sprocket and chain connections 48 in the manner clearly illustrated in Figures 1a and 2 of the drawings. The shaft 46 drives the curler unit driving shaft 49 through a bevel gear couple, said shaft being mounted in suitable bearings 50 and being coupled in driving relation in any suitable manner with an actuator shaft 51 within and extending below the curler unit. The coupling between the shafts 49 and 51 may be any approved driving connection and in this particular illustration takes the form of a gear couple generally designated 52. See Figure 2.

The actuator shaft 51 is provided with a crank 53 at its lower end, and this crank is connected by a pitman 54 with a crank 55 secured to the lower end of an actuator shaft 56 which is rockably mounted in vertical position in suitable bearings 57. The shaft 56 is equipped with a crank 58 at its upper end which is link-connected, as at 59, to a reciprocating feeder 60 including feeder fingers 61 which are engageable with can ends 62 which have been curled on the curler unit 7 for the purpose of feeding them one-by-one over the feedways 63 into the drying machine. The can ends 62 are oblong in shape, as is clearly illustrated in Figures 1 and 1a of the drawings, and one of the features of the present machine is that of providing novel equipments for accurately handling and positioning irregularly shaped can ends of this type, as distinguished from the usually handled round can end units.

On the table 12 surrounding the rotor opening 14 is mounted an insulated casing or shell 64 which is closed at the top by a cover 65 supported on standards 66 extending upwardly from the table. See Figures 1a, 2 and 3. The cover member 64 is provided with a central throat 67 equipped with a spider-mounted bearing 68 positioned for providing an upper support for the rotor shaft 19, and the central throat 67 also supports a depending air sleeve 69. Heated air is directed downwardly through the throat 67 and sleeve 69 from the outlet throat 70 of a circulating fan 71 which is supported upon a plate 72 mounted on the upper ends of the previously mentioned standards 66. The heated air passing downwardly through the casing 64, or at least some thereof, passes out through a casing outlet 73. Since the particular heating means for the air and the means for directing the heated air constitute a separate invention and are covered in a separate application, further detailed description of these features is deemed unnecessary herein.

A rotor head 74 is keyed to the shaft 19 and has a rotor 75 affixed thereto. See Figures 1a, 2, 3 and 11. Individual bearings 76 are secured, as at 77, to the rotor 75, and each bearing rotatably supports a screw shaft 78 to which is affixed a lifter screw sleeve 79. Each screw sleeve extends upwardly through the ring 80 recessed in the top of the rotor 75 and is equipped with a spiral screw rib 81 secured in a spiral groove in the sleeve and formed to provide a quick pitch screw portion 82 at the lower end and a quick pitch screw portion 83 at the upper end. These screw sleeves are arranged in cooperating pairs in the manner clearly illustrated in Figure 1a, the can ends 62 being delivered between individual associated pairs of the screw sleeves as they are presented serially at the receiving station by the indexing of the rotor 75 by operation of the reciprocating feeder equipment 58, 60, 61 hereinbefore referred to.

A driving pinion 84 is keyed to the lower end of each shaft 78 beneath the respective bearing 76, and all of the pinions 84 mesh with and have rotation imparted thereto by a large diameter driver gear 85. See Figures 2, 3 and 11. The gear 85 has a smaller diameter gear 86 formed integrally therewith or attached thereto, and these gears freely rotate together about a hub 87 keyed as at 88, to the shaft 19, said hub having affixed thereto a large diameter gear 89. As is best illustrated in Figure 11 of the drawings, the gear 89, being rotated with the rotor shaft 19 each time it is indexed, imparts rotation to an idler gear 90 which is rotatable about a stub shaft 91 supported in the drive housing 10, and the idler gear 90 has formed integrally therewith or attached thereto a larger diameter gear 92 which meshes with and imparts rotation to the gear 86, the attached gear 85 and the individual pinions 84 meshing therewith.

A full rotation is imparted to each pinion 84 and the attached lifter screw sleeve 79 during each full turn of the rotor 75 and its shaft 19 about their axis. At each full rotation of the lifter screw sleeve 79 of each cooperating pair, the can ends supported on the spiral groove rib thereof will each be lifted one space or pitch distance. In this manner, additional room is made at the bottom of the screw sleeves for receiving additional can ends, and drying can ends are progressively lifted into position for being removed at the top of the screw sleeves. The quick pitch spiral rib portions 82 and 83 respectively provided at the bottoms and tops of the lifter screw sleeves serve to suitably space the can ends for proper cooperation, without interference, with the devices which serve to feed the can ends into and from the casing.

A headpiece 93 is secured, as at 94, to the upper end of the rotor shaft 19 for rotation therewith, and this headpiece has individual bearings 95 affixed thereto, as at 96, for rotatably supporting the upper ends of the screw sleeves 79. Each individual bearing supports a depending stud 97 which provides a rotatable bearing for the upper end of one of the screw sleeves.

The headpiece 93 is suitably skeletonized or equipped with openings for permitting entry of air from the air sleeve 69 into the open upper end of a perforated distributor sleeve 98 which surrounds the shaft 19 in spaced relation in the manner clearly illustrated in Figure 3 of the drawings, and is supported at its lower end on a head 99 secured to said shaft. The perforated sleeve 98 extends down between the lifter screw feeds throughout approximately two-thirds of the depth of the casing and terminates just above the outlet 73 in the manner illustrated in Figure 3.

A two-piece supporting plate 100 is affixed to the upper surface of the rotor 75 about the shaft 19 in the manner illustrated in Figures 1a and 3 of the drawings, and this plate serves as a support for the lower ends of six stop and guide rods 101 which extend upwardly from the plate and serve as center stops and guides for the oblong can ends being elevated by the lifter screw sleeves. The six stop and guide rods 101 are

rigidly supported, as at 102, at their upper ends beneath the headpiece 93. A ring 103 surrounds the table opening 13 and is equipped with a receiving opening 104 registering with the previously described feedways 63, and the individual can ends fed into the drier casing by the feeding equipments 58, 60, 61 are fed between the individual pairs of lifter screw sleeves through this opening and through the receiving opening 105 provided in said casing.

Supporting brackets 106 are disposed radially between the pairs of lifter screw sleeves in the manner illustrated in Figure 1*a* of the drawings, and these brackets include angled portions 107 which are stepped over the ring 103, as at 108, said stepped over portions serving as bottom supports for outer guide rods 109 which cooperate with the stop and guide rods 101 in accurately guiding upward movement of the can ends in the manner clearly illustrated in Figures 1*a* and 3 of the drawings. The rods 109 are supported at their upper ends in angled brackets 110 which are similarly stepped over the upper stationary ring 111, said ring also being broken at the side opposite the bottom receiving opening 104 to permit outfeeding of the dried can ends through the delivery outlet 112 in the casing. See Figure 4.

Upon a bracket 113, suitably supported on the upper portion of the machine framing, are provided dried can end delivering feedways 114 disposed to receive can ends fed through the delivery outlet 112. The dried can ends fed over these ways are fed into receiving position between a pair of parallel spaced lowering screws generally designated 115. Like the feeder screws hereinbefore described, these lowering screws include quick pitch thread portions 116 at the top or receiving ends thereof, and quick pitch thread portions 117 at the delivery or bottom ends thereof.

Each of the sleeves of the screws generally designated 115 includes a stud 118 extending upwardly into a supporting bearing 119 mounted on the bracket 113, and a depending stud 120 rotatably mounted in a bearing 121 supported in a bracket 122 which is secured, as at 123, to the framing. See Figures 1*a*, 2, 5 and 6.

A slide 124 is horizontally reciprocable between the feedways 114 and is link-connected, as at 125, to a reciprocating crank arm 126. The slide carries a pivoted finger equipment 127 which is lifted by a spring 128 against a limiting stop 129 and which is shaped to engage over the heel of a can end at the near side thereof each time the slide is moved to the position illustrated in Figure 4 to engage a can end indexed to the discharging station and lifted into the discharging position as illustrated in that figure. This manner of causing the finger equipment to engage at the near side of the can ends minimizes the necessary travel of the slide toward and between the lifted screws and facilitates the discharging of the dried can ends. The slide also includes an intermediate finger equipment 130 which is lifted by spring means 131 against a limiting stop 132, and it will be noted by reference to Figure 4 of the drawings that this finger equipment is shaped to engage behind the can ends and yet is free to move under them on the retraction of the slide without damaging contact therewith. The slide also carries an end feeder finger equipment 133 which is yieldably elevated by spring means 134 engageable with a heel 135 which also serves as a stop limiting upward movement of the finger equipment with the nose portions 136 overlying the can end edge portions in the manner illustrated in Figure 4.

Each time the slide 128 moves to its limit in the feeding direction, it delivers a dried can end between the pair of lowering screws and over an opening 137 in the feedways through which the can ends can be lowered by said screws. While being lowered, the cans are guided at the ends by guide rods 138 which are supported at their lower ends on a bracket 139 which is mounted over the bracket 122. See Figures 5 and 6. The bracket 139 extends over lower feed or transfer ways 140 which are supported, as at 141, on the bracket 122 on which the can ends are lowered by the lowering screw 115. While being lowered, the can ends are guided at the sides by bars 142, a pair of which straddle each screw in the manner clearly illustrated in Figure 5, and these bars are secured, as at 143, on the bracket 139.

A slide 144 is reciprocable in the ways 140 and is link-connected, as at 145, to a reciprocating crank 146 in the manner clearly illustrated in Figures 1*a*, 2 and 6 of the drawings.

The previously mentioned reciprocating crank 146 is secured to an actuator shaft 147 which is vertically disposed and rockable in bearings 148 attached to the machine framing, and the reciprocating crank 146 is secured to a sleeve 149 which is rockable about the shaft 147 in the manner illustrated in Figures 1*a* and 8 of the drawings. The sleeve has a crank 150 secured thereto, and this crank is connected by a pitman and strap 151 with an eccentric 152 adjustably secured upon the cam shaft 43. The shaft 147 is equipped at its lower end with a crank 153 which is connected by a pitman and strap 154 to an eccentric 155 adjustably mounted on the cam shaft 43, and this pitman and strap connection includes a yieldable telescopic section 156 which is yieldable in the direction of movement thereof effective to move the slide 124 toward the elevating screws so that should the rotor in any manner be turned so as to present a lifter screw in the path of movement of the slide, the slide driving connections can yield without damaging the parts.

While they are being lowered by the lowering screws 115, guided by the rods 138 and bars 142, the can ends are cooled, and, as each can end is spaced from the remaining can ends a greater distance by the quick pitch screw portions 117, the slide 144 serves to transfer it from the lowering screws to a stacking equipment soon to be described. For this purpose, the slide is equipped with a single spring-lifted feeder 157. See Figures 5 and 6.

Each time the slide 144 moves forwardly, the feeder finger 157 thereon engages a dried and cooled can end and transfers it into position between two short lifter screws 158 forming a part of the stacking mechanism. These screws 158 include depending stub shaft portions 159 which are rotatably mounted in bearings 160 supported by the bracket 122. The short length lifter screws 158 lift the transferred can ends between corner guides 161 supported on the bracket 139, and, as the can ends are thus stacked, they are supported by the rotating screws 158.

Each of the stub shafts 159 and 120 has a sprocket 162 adjustably secured, as at 163, and all of the sprockets are driven by a common chain 164 which passes about them, about an adjustable idler sprocket 165, and about a sprocket 166 adjustably secured, as at 167, on the previously described cam shaft 43.

Operation

The various reciprocating feeders and the indexing mechanism are accurately coordinated in the manner hereinbefore described so that the can ends are fed to and from the drying rotor without danger of being damaged by jamming. Each time the rotor is indexed so as to present a pair of lifter screws 79, 81 at the receiving station opposite the casing opening 105, the reciprocating feeder 60, 61 will feed a can between said screws and against the respective stop rod 101 and beneath the cooperating guide rod 109. As the rotor is successively indexed and the lifter screws thereon rotated, the individual can ends will be lifted in spaced relation by the screws and guided by the rods 101, 109 in the manner hereinbefore described, having the sealing compound or other coating thereon thoroughly dried in this upward movement through the casing.

As each can end ultimately reaches the discharging position and is lifted an additional distance above the underlying can ends in the manner illustrated in Figure 4, this space lifting is effected in such timed relation with the operation of the feeder slide 124 that the end finger equipment 124 thereon will move under the can end and engage the heel thereof at the near side in the manner illustrated in Figure 4. It will be observed by reference to this figure that an abutment plate 168 projects radially from the headpiece 93 between each cooperating pair of lifter screws so as to hold each can end being discharged stable and against tilting while the slide finger equipment is engaging under and moving the same way. On successive reciprocations of the slide 124 the can ends are engaged next by the finger equipment 130 and finally are placed between the lowering screws 115 as indicated in Figure 6 by the end finger equipment 133.

The dried can ends are next lowered by the lowering screws 115 and are cooled during this process by lowering, after which they are transferred one-by-one from the lowering screws to the stacking screws 158 by the slide and feeder finger equipment 144, 157.

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 indexing means, a rotor adapted to be indexed through a succession of stations, an indexing disk secured to the rotor and having a plurality of equidistantly spaced indexing rollers projecting therefrom, there being one main roller associated with each station and an auxiliary roller disposed intermediately of every two adjacent main rollers, and a rotary indexing cam comprising a drum having indexing grooving in its periphery in which to receive said rollers, said grooving including a dwell portion merging at its ends into main roller inlet and exit end portions opening through respective ends of the drum in circumferentially spaced relation and an auxiliary groove traversing the drum angularly between the inlet and exit groove end portions and effective to receive and act upon only the auxiliary rollers.

2. In a machine of the character described, a supporting frame, a rotor, a casing surrounding said rotor and upstanding on said frame, a can end receiving station, a can end delivery station, a plurality of pairs of spaced parallel vertical can end lifter screws disposed with their axes in circular relation on the rotor, means for indexing the rotor to present the pairs of screws serially at said stations, means at said receiving station to feed oblong can ends endwise to the rotor with their major axes radially disposed with respect to the rotor and centered between the screws of the pairs as they are presented at said receiving station to be engaged by the screws at edges across the minor axes of the can ends and lifted by said screws in spaced relation, means for rotating the lifter screws, guide means cooperating with each pair of screws and disposed to engage can end edges across the major axes thereof, and means for discharging can ends at said delivery station, said indexing means including an indexing disk secured to the rotor and having a plurality of equidistantly spaced indexing rollers projecting therefrom, there being one main roller associated with each pair of lifter screws and an auxiliary roller disposed intermediately of every two adjacent main rollers, and a rotary indexing cam comprising a drum having indexing grooving in its periphery in which to receive said rollers, said grooving including a dwell portion merging at its ends into main roller inlet and exit end portions opening through respective ends of the drum in circumferentially spaced relations and an auxiliary groove traversing the drum angularly between the inlet and exit groove end portions and effective to receive and act upon only the auxiliary rollers.

3. In a machine of the character described, a supporting frame, a rotor, a casing surrounding said rotor and upstanding on said frame, a can end receiving station, a can end delivery station, a plurality of pairs of spaced parallel vertical can end lifter screws disposed with their axes in circular relation on the rotor, means for indexing the rotor to present the pairs of screws serially at said stations, means at said receiving station to feed oblong can ends endwise to the rotor with their major axes radially disposed with respect to the rotor and centered between the screws of the pairs as they are presented at said receiving station to be engaged by the screws at edges across the minor axes of the can ends and lifted by said screws in spaced relation, means for rotating the lifter screws, guide means cooperating with each pair of screws and disposed to engage can end edges across the major axes thereof, a stationary ring disposed in the casing and having a guide opening therein through which the can ends are fed between the screw pairs as they are presented at the receiving station, said rotor being disposed to rotate within said stationary ring, and a bracket radially disposed between each adjacent pair of screws, each said bracket including an angular portion stepped over said ring and forming a bottom support for an outwardly located vertical can end guide at a level above the level at which the can ends are fed in at the receiving station, and means for discharging can ends at said delivery station.

4. In a machine of the character described, a supporting frame, a rotor, a casing surrounding said rotor and upstanding on said frame, a can end receiving station, a can end delivery station, a plurality of pairs of spaced parallel vertical can end lifter screws disposed with their axes in circular relation on the rotor, means for indexing the rotor to present the pairs of screws serially at said stations, means at said receiving station to feed oblong can ends endwise to the rotor with their major axes radially disposed with respect to the rotor and centered between the screws of the

pairs as they are presented at said receiving station to be engaged by the screws at edges across the minor axes of the can ends and lifted by said screws in spaced relation, means for rotating the lifter screws, guide means cooperating with each pair of screws and disposed to engage can end edges across the major axes thereof, means for discharging can ends at said delivery station, said delivery station being located at the top of the casing, a pair of parellel vertical can end lowering screws disposed outside the casing and between which the can ends are fed by the discharging means, means for guiding the can ends while they are being lowered by said lowering screws, and means for discharging the can ends from the lowering screws.

5. In a machine of the character described, a supporting frame, a rotor, a casing surrounding said rotor and upstanding on said frame, a can end receiving station, a can end delivery station, a plurality of pairs of spaced parallel vertical can end lifter screws disposed with their axes in circular relation on the rotor, means for indexing the rotor to present the pairs of screws serially at said stations, means at said receiving station to feed oblong can ends endwise to the rotor with their major axes radially disposed with respect to the rotor and centered between the screws of the pairs as they are presented at said receiving station to be engaged by the screws at edges across the minor axes of the can ends and lifted by said screws in spaced relation, means for rotating the lifter screws, guide means cooperating with each pair of screws and disposed to engage can end edges across the major axes thereof, means for discharging can ends at said delivery station, said delivery station being located at the top of the casing, a pair of parallel vertical can end lowering screws disposed outside the casing and between which the can ends are fed by the discharging means, means for guiding the can ends while they are being lowered by said lowering screws, a pair of stacking screws disposed in parallel relation a distance from the lowering screws, and means for feeding the can ends one by one from the bottom of the lowering screws to the stacking screws to be stacked thereby.

6. In a machine of the character described, a supporting frame, a rotor, a casing surrounding said rotor and upstanding on said frame, a can end receiving station, a can end delivery station, a plurality of pairs of spaced parallel vertical can end lifter screws disposed with their axes in circular relation on the rotor, means for indexing the rotor to present the pairs of screws serially at said stations, means at said receiving station to feed oblong can ends endwise to the rotor with their major axes radially disposed with respect to the rotor and centered between the screws of the pairs as they are presented at said receiving station to be engaged by the screws at edges across the minor axes of the can ends and lifted by said screws in spaced relation, means for rotating the lifter screws, guide means cooperating with each pair of screws and disposed to engage can end edges across the major axes thereof, means for discharging can ends at said delivery station, said delivery station being located at the top of the casing, a pair of parallel vertical can end lowering screws disposed outside the casing and between which the can ends are fed by the discharging means, means for guiding the can ends while they are being lowered by said lowering screws, a pair of short length stacking screws disposed in parallel relation a distance from the lowering screws, stack guides extending above the stacking screws for confining and guiding the can end stack as it is formed on the stacking screws, and means for feeding the can ends one by one from the bottom of the lowering screws to the stacking screws.

7. In a machine of the character described, a supporting frame, a rotor, a casing surrounding said rotor and upstanding on said frame, a can end receiving station, a can end delivery station, a plurality of pairs of spaced parallel vertical can end lifter screws disposed with their axes in circular relation on the rotor, means for indexing the rotor to present the pairs of screws serially at said stations, means at said receiving station to feed oblong can ends endwise to the rotor with their major axes radially disposed with respect to the rotor and centered between the screws of the pairs as they are presented at said receiving station to be engaged by the screws at edges across the minor axes of the can ends and lifted by said screws in spaced relation, means for rotating the lifter screws, guide means cooperating with each pair of screws and disposed to engage can end edges across the major axes thereof, means for discharging can ends at said delivery station, said delivery station being located at the top of the casing, a pair of parallel vertical can end lowering screws disposed outside the casing and between which the can ends are fed by the discharging means, means for guiding the can ends while they are being lowered by said lowering screws, a pair of stacking screws disposed in parallel relation a distance from the lowering screws, means for feeding the can ends one by one from the bottom of the lowering screws to the stacking screws to be stacked thereby, said lowering and stacking screws each having a driving sprocket on its lower end, and means including a single driver chain engaging all said sprockets for driving the lowering and stacking screws.

8. In a machine of the character described, a supporting frame, a rotor, a casing surrounding said rotor and upstanding on said frame, a can end receiving station, a can end delivery station, a plurality of pairs of spaced parallel vertical can end lifter screws disposed with their axes in circular relation on the rotor, means for indexing the rotor to present the pairs of screws serially at said stations, means at said receiving station to feed oblong can ends endwise to the rotor with their major axes radially disposed with respect to the rotor and centered between the screws of the pairs as they are presented at said receiving station to be engaged by the screws at edges across the minor axes of the can ends and lifted by said screws in spaced relation, means for rotating the lifter screws, guide means cooperating with each pair of screws and disposed to engage can end edges across the major axes thereof, means for discharging can ends at said delivery station, said lifter screws including quick pitch portions at their upper ends effective to widely space the can ends at the delivery station, and said discharging means comprising a reciprocable feeder slide including an end portion projectible into the space provided between can ends at the delivery station by said quick pitch portions and having thereon a feeder finger engageable under and with the can end end portions outermost on the rotor or nearest to said slide.

9. In a machine of the character described, a supporting frame, a rotor, a casing surrounding

said rotor and upstanding on said frame, a can end receiving station, a can end delivery station, a plurality of pairs of spaced parallel vertical can end lifter screws disposed with their axes in circular relation on the rotor, means for indexing the rotor to present the pairs of screws serially at said stations, means at said receiving station to feed oblong can ends endwise to the rotor with their major axes radially disposed with respect to the rotor and centered between the screws of the pairs as they are presented at said receiving station to be engaged by the screws at edges across the minor axes of the can ends and lifted by said screws in spaced relation, means for rotating the lifter screws, guide means cooperating with each pair of screws and disposed to engage can end edges across the major axes thereof, means for discharging can ends at said delivery station, said lifter screws including quick pitch portions at their upper ends effective to widely space the can ends at the delivery station, said discharging means comprising a reciprocable feeder slide including an end portion projectible into the space provided between can ends at the delivery station by said quick pitch portions and having thereon a feeder finger engageable under and with the can end end portions outermost on the rotor or nearest to said slide, said delivery station being located at the top of the casing, a pair of parallel vertical can end lowering screws disposed outside the casing and between which the can ends are fed by the discharging means, means for guiding the can ends while they are being lowered by said lowering screws, and means for discharging the can ends from the lowering screws.

10. In a machine of the character described, a supporting frame, a rotor, a casing surrounding said rotor and upstanding on said frame, a can end receiving station, a can end delivery station, a plurality of pairs of spaced parallel vertical can end lifter screws disposed with their axes in circular relation on the rotor, means for indexing the rotor to present the pairs of screws serially at said stations, means at said receiving station to feed oblong can ends endwise to the rotor with their major axes radially disposed with respect to the rotor and centered between the screws of the pairs as they are presented at said receiving station to be engaged by the screws at edges across the minor axes of the can ends and lifted by said screws in spaced relation, means for rotating the lifter screws, guide means cooperating with each pair of screws and disposed to engage can end edges across the major axes thereof, means for discharging can ends at said delivery station, said lifter screws including quick pitch portions at their upper ends effective to widely space the can ends at the delivery station, said discharging means comprising a reciprocable feeder slide including an end portion projectible into the space provided between can ends at the delivery station by said quick pitch portions and having thereon a feeder finger engageable under and with the can end end portions outermost on the rotor or nearest to said slide, said delivery station being located at the top of the casing, a pair of parallel vertical can end lowering screws disposed outside the casing and between which the can ends are fed by the discharging means, means for guiding the can ends while they are being lowered by said lowering screws, a pair of stacking screws disposed in parallel relation a distance from the lowering screws, and means for feeding the can ends one by one from the bottom of the lowering screws to the stacking screws to be stacked thereby.

11. In a machine of the character described, a supporting frame, a rotor, a casing surrounding said rotor and upstanding on said frame, a can end receiving station, a can end delivery station, a plurality of pairs of spaced parallel vertical can end lifter screws disposed with their axes in circular relation on the rotor, means for indexing the rotor to present the pairs of screws serially at said stations, means at said receiving station to feed oblong can ends endwise to the rotor with their major axes radially disposed with respect to the rotor and centered between the screws of the pairs as they are presented at said receiving station to be engaged by the screws at edges across the minor axes of the can ends and lifted by said screws in spaced relation, means for rotating the lifter screws, guide means cooperating with each pair of screws and disposed to engage can end edges across the major axes thereof, means for discharging can ends at said delivery station, said lifter screws including quick pitch portions at their upper ends effective to widely space the can ends at the delivery station, said discharging means comprising a reciprocable feeder slide including an end portion projectible into the space provided between can ends at the delivery station by said quick pitch portions and having thereon a feeder finger engageable under and with the can end end portions outermost on the rotor or nearest to said slide, said delivery station being located at the top of the casing, a pair of parallel vertical can end lowering screws disposed outside the casing and between which the can ends are fed by the discharging means, means for guiding the can ends while they are being lowered by said lowering screws, a pair of short length stacking screws disposed in parallel relation a distance from the lowering screws, stack guides extending above the stacking screws for confining and guiding the can end stack as it is formed on the stacking screws, and means for feeding the can ends one by one from the bottom of the lowering screws to the stacking screws.

12. In a machine of the character described, a supporting frame, a rotor, a casing surrounding said rotor and upstanding on said frame, a can end receiving station, a can end delivery station, a plurality of pairs of spaced parallel vertical can end lifter screws disposed with their axes in circular relation on the rotor, means for indexing the rotor to present the pairs of screws serially at said stations, means at said receiving station to feed oblong can ends endwise to the rotor with their major axes radially disposed with respect to the rotor and centered between the screws of the pairs as they are presented at said receiving station to be engaged by the screws at edges across the minor axes of the can ends and lifted by said screws in spaced relation, means for rotating the lifter screws, guide means cooperating with each pair of screws and disposed to engage can end edges across the major axes thereof, means for discharging can ends at said delivery station, said delivery station being located at the top of the casing, a pair of parallel vertical can end lowering screws disposed outside the casing and between which the can ends are fed by the discharging means, means for guiding the can ends while they are being lowered by said lowering screws, a pairs of stacking screws disposed in parallel relation a distance from the lowering screws, means for feeding the can ends one by one from the bottom of the lowering screws to the stacking

screws to be stacked thereby, and a common means for driving the means for discharging the can ends at the delivery station and also the means for feeding the can ends from the lowering screws to the stacking screws.

13. In a machine of the character described, a supporting frame, a rotor, a casing surrounding said rotor and upstanding on said frame, a can end receiving station, a can end delivery station, a plurality of pairs of spaced parallel vertical can end lifter screws disposed with their axes in circular relation on the rotor, means for indexing the rotor to present the pairs of screws serially at said station, means at said receiving station to feed oblong can ends endwise to the rotor with their major axes radially disposed with respect to the rotor and centered between the screws of the pairs as they are presented at said receiving station to be engaged by the screws at edges across the minor axes of the can ends and lifted by said screws in spaced relation, means for rotating the lifter screws, guide means cooperating with each pair of screws and disposed to engage can end edges across the major axes thereof, means for discharging can ends at said delivery station, said delivery station being located at the top of the casing, a pair of parallel vertical can end lowering screws disposed outside the casing and between which the can ends are fed by the discharging means, means for guiding the can ends while they are being lowered by said lowering screws, a pair of stacking screws disposed in parallel relation a distance from the lowering screws, means for feeding the can ends one by one from the bottom of the lowering screws to the stacking screws to be stacked thereby, each of said means for discharging can ends at the delivery station and for feeding can ends from the bottom of the lowering screws comprising a reciprocatory feeder and there being included a crank arm for imparting movement to each reciprocatory feeder, a rock shaft to which one said crank arm is affixed, a sleeve rockable about the rock shaft and to which the other crank arm is affixed, and means for rocking the rock shaft and the rockable sleeve.

14. In a machine of the character described, a supporting frame, a rotor, a casing surrounding said rotor and upstanding on said frame, a can end receiving station, a can end delivery station, a plurality of pairs of spaced parallel vertical can end lifter screws disposed with their axes in circular relation on the rotor, means for indexing the rotor to present the pairs of screws serially at said stations, means at said receiving station to feed oblong can ends endwise to the rotor with their major axes radially disposed with respect to the rotor and centered between the screws of the pairs as they are presented at said receiving station to be engaged by the screws at edges across the minor axes of the can ends and lifted by said screws in spaced relation, means for rotating the lifter screws, guide means cooperating with each pair of screws and disposed to engage can and edges across the major axes thereof, means for discharging can ends at said delivery station, said delivery station being located at the top of the casing, a pair of parallel vertical can end lowering screws disposed outside the casing and between which the can ends are fed by the discharging means, means for guiding the can ends while they are being lowered by said lowering screws, a pair of stacking screws disposed in parallel relation a distance from the lowering screws, means for feeding the can ends one by one from the bottom of the lowering screws to the stacking screws to be stacked thereby, each of said means for discharging can ends at the delivery station and for feeding can ends from the bottom of the lowering screws comprising a reciprocatory feeder and there being included a crank arm for imparting movement to each reciprocatory feeder, a rock shaft to which one said crank arm is affixed, a sleeve rockable about the rock shaft and to which the other crank arm is affixed, a rotary driver shaft having two eccentrics affixed thereto, and a pitman and strap connecting each eccentric with one said crank arm.

15. In a machine of the character described, a supporting frame, a rotor, a casing surrounding said rotor and upstanding on said frame, a can end receiving station, a can end delivery station, a plurality of pairs of spaced parallel vertical can end lifter screws disposed with their axes in circular relation on the rotor, means for indexing the rotor to present the pairs of screws serially at said stations, means at said receiving station to feed oblong can ends endwise to the rotor with their major axes radially disposed with respect to the rotor and centered between the screws of the pairs as they are presented at said receiving station to be engaged by the screws at edges across the minor axes of the can ends and lifted by said screws in spaced relation, means for rotating the lifter screws, guide means cooperating with each pair of screws and disposed to engage can end edges across the major axes thereof, means for discharging can ends at said delivery station, said delivery station being located at the top of the casing, a pair of parallel vertical can end lowering screws disposed outside the casing and between which the can ends are fed by the discharging means, means for guiding the can ends while they are being lowered by said lowering screws, a pair of stacking screws disposed in parallel relation a distance from the lowering screws, a reciprocatory feeder for feeding the can ends one by one from the bottom of the lowering screws to the stacking screws to be stacked thereby, a crank arm for imparting movement to each reciprocatory feeder, a rock shaft to which one said crank arm is affixed, a sleeve rockable about the rock shaft and to which the other crank arm is affixed, a rotary driver shaft having two eccentrics affixed thereto, and a pitman and strap connecting each eccentric with one said crank arm, at least one said pitman having a yieldable section therein effective to prevent part damage due to jamming of the connected reciprocatory feeder.

16. In a machine of the character described, a supporting frame, a rotor, a casing surrounding said rotor and upstanding on said frame, a can end receiving station, a can end delivery station, a plurality of pairs of spaced parallel vertical can end lifter screws disposed with their axes in circular relation on the rotor, means for indexing the rotor to present the pairs of screws serially at said stations, means at said receiving station to feed oblong can ends endwise to the rotor with their major axes radially disposed with respect to the rotor and centered between the screws of the pairs as they are presented at said receiving station to be engaged by the screws at edges across the minor axes of the can ends and lifted by said screws in spaced relation, means for rotating the lifter screws, guide means cooperating with each pair of screws and disposed to engage can end edges across the major axes thereof, means for discharging can ends at said delivery station,

said delivery station being located at the top of the casing, a pair of parallel vertical can end lowering screws disposed outside the casing and between which the can ends are fed by the discharging means, means for guiding the can ends while they are being lowered by said lowering screws, a pair of stacking screws disposed in parallel relation a distance from the lowering screws, a reciprocatory feeder for feeding the can ends one by one from the bottom of the lowefing screws to the stacking screws to be stacked thereby, a crank arm for imparting movement to each reciprocatory feeder, a rock shaft to which one said crank arm is affixed, a sleeve rockable about the rock shaft and to which the other crank arm is affixed, a rotary driver shaft having two eccentrics affixed thereto, and a pitman and strap connecting each eccentric with one said crank arm, said lowering and stacking screws each having a driving sprocket of its lower end, a driver sprocket on said rotary driver shaft, and a single driver chain engaging all said sprockets for driving the lowering and stacking screws.

17. In a machine of the character described, a supporting frame, a rotor, a casing surrounding said rotor and upstanding on said frame, a can end receiving station, a can end delivery station, a plurality of pairs of spaced parallel vertical can end lifter screws disposed with their axes in circular relation on the rotor, means for indexing the rotor to present the pairs of screws serially at said stations, means at said receiving station to feed oblong can ends endwise to the rotor with their major axes radially disposed with respect to the rotor and centered between the screws of the pairs as they are presented at said receiving station to be engaged by the screws at edges across the minor axes of the can ends and lifted by said screws in spaced relation, means for rotating the lifter screws, guide means cooperating with each pair of screws and disposed to engage can end edges across the major axes thereof, and means for discharging can ends at said delivery station, said rotor including a central vertically disposed shaft, and said lifter screw rotating means comprising, a large spur gear movable with the rotor shaft, a double spur gear freely rotatable about said rotor shaft, a double idler gear meshing with the large spur gear and with said double spur gear and effective to impart rotation from the former to the latter, and a spur gear on each lifter screw meshing with and driven by said double spur gear.

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