

March 3, 1959

T. C. WERGE ET AL

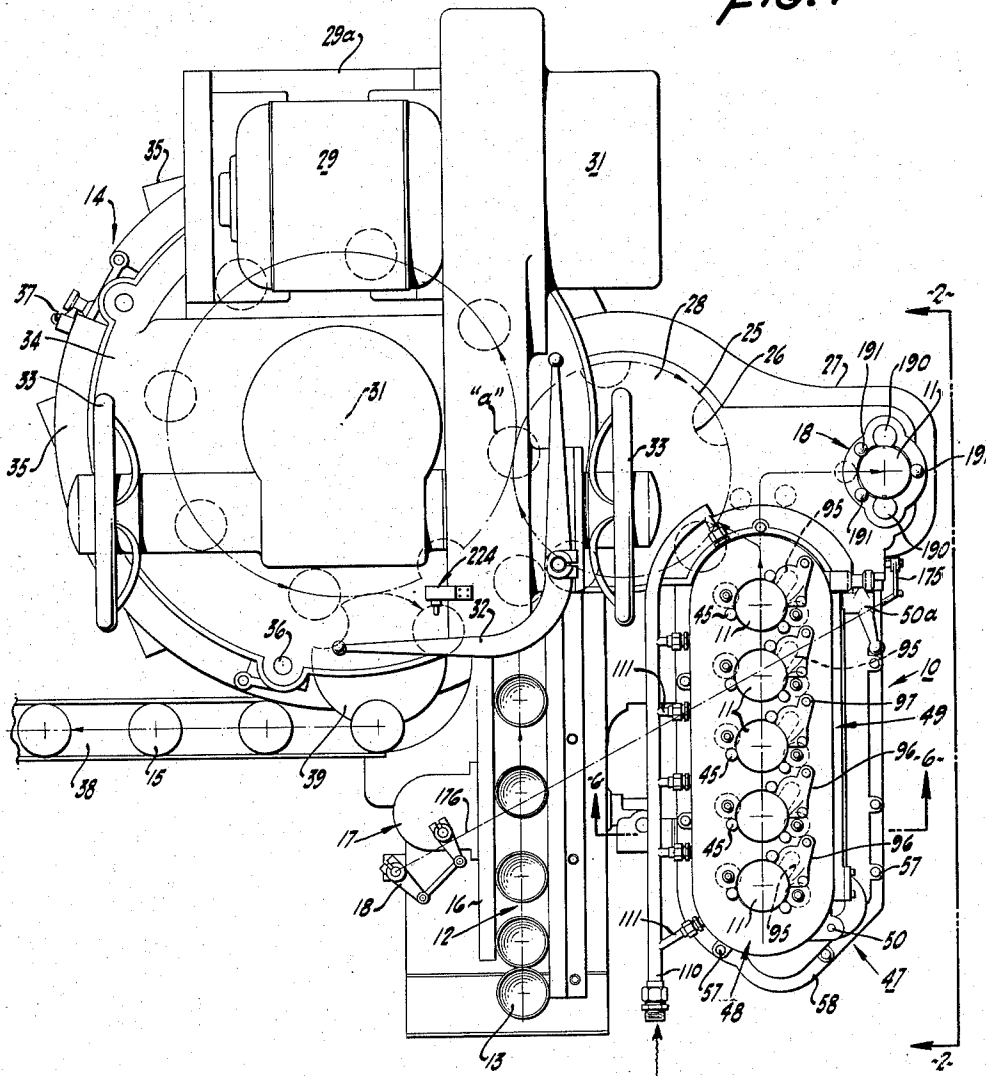
2,875,564

END FEED AND STERILIZER FOR CAN CLOSING MACHINE

Filed Jan. 25, 1954

9 Sheets-Sheet 1

FIG. 1



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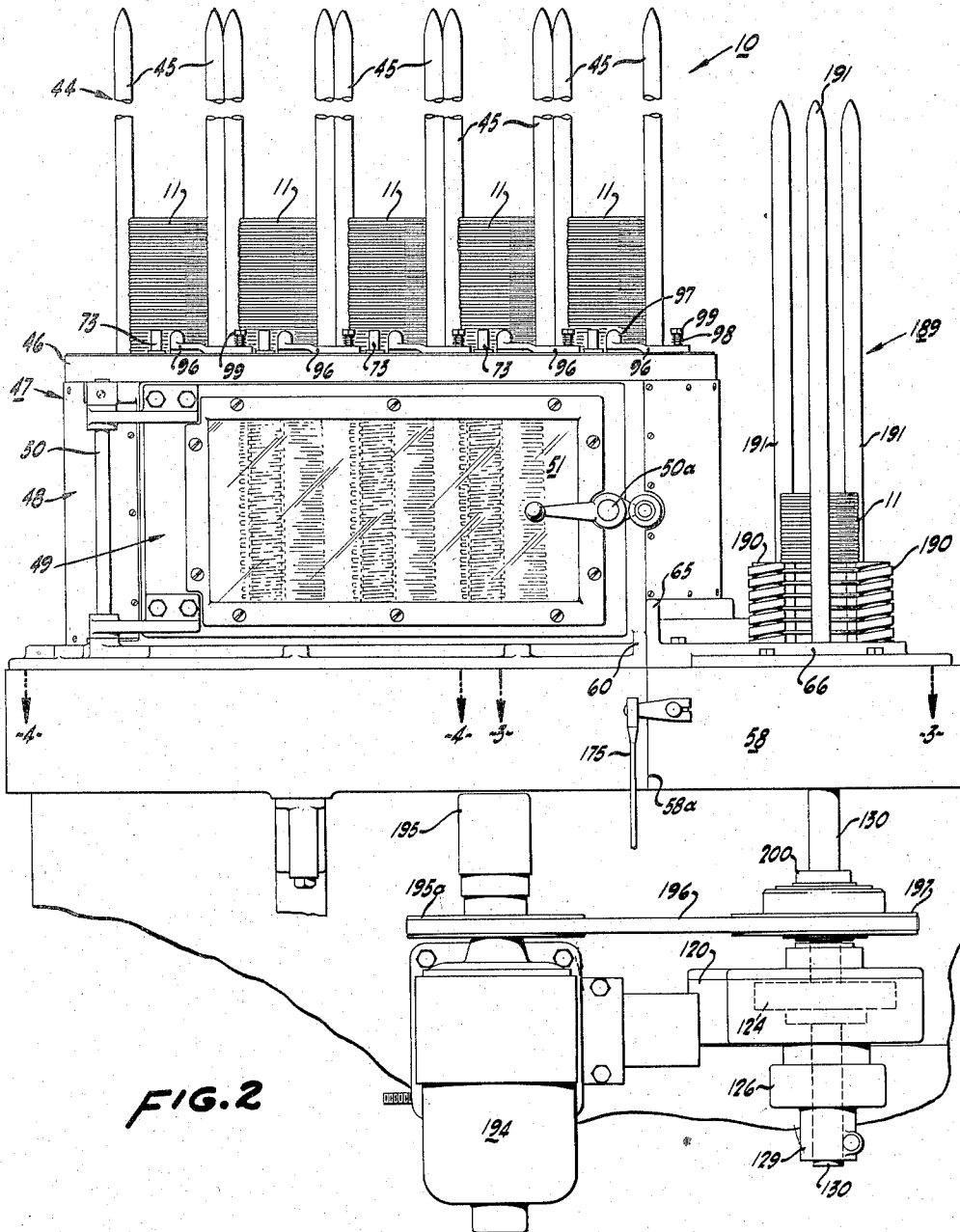


FIG. 2

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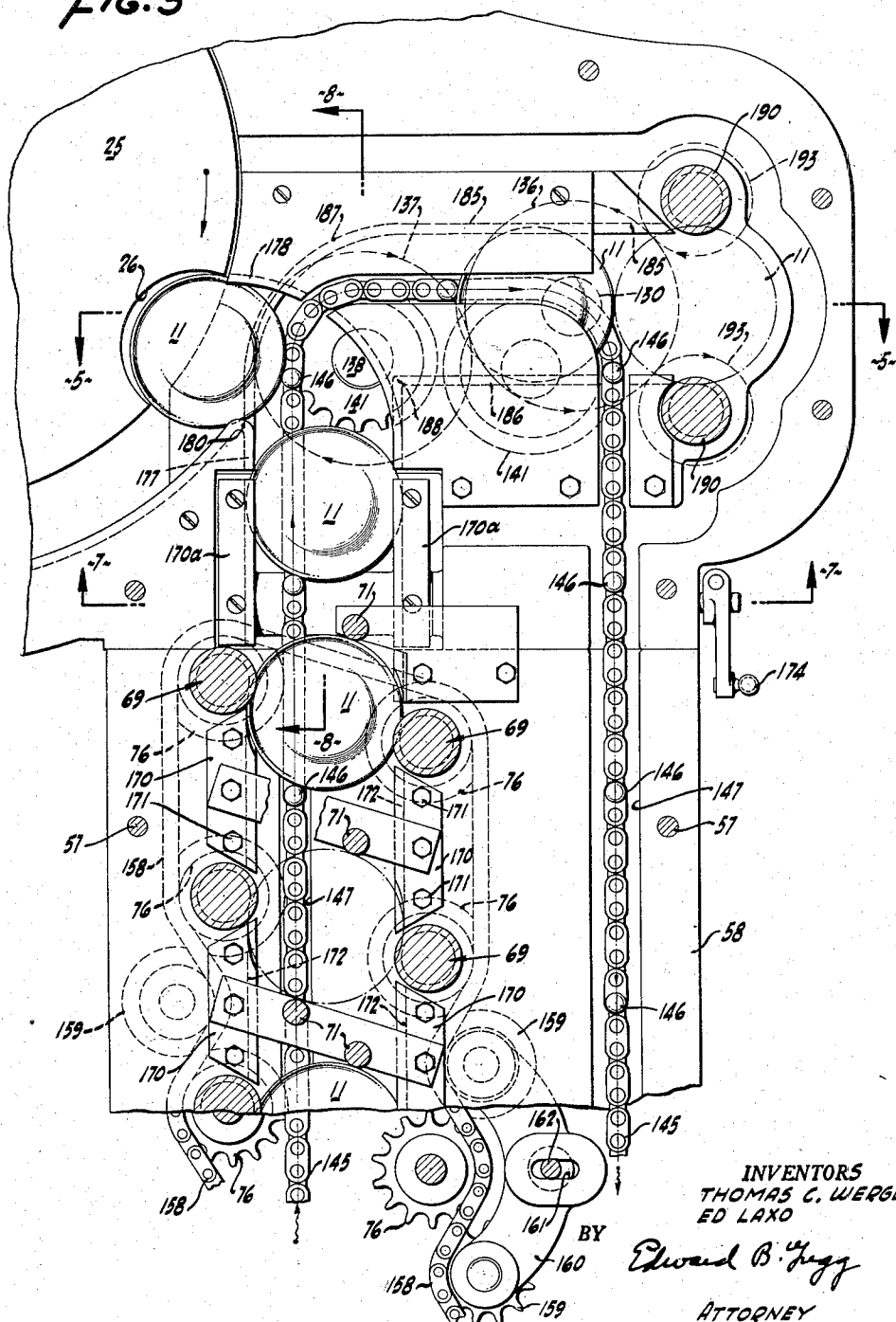
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FIG. 3



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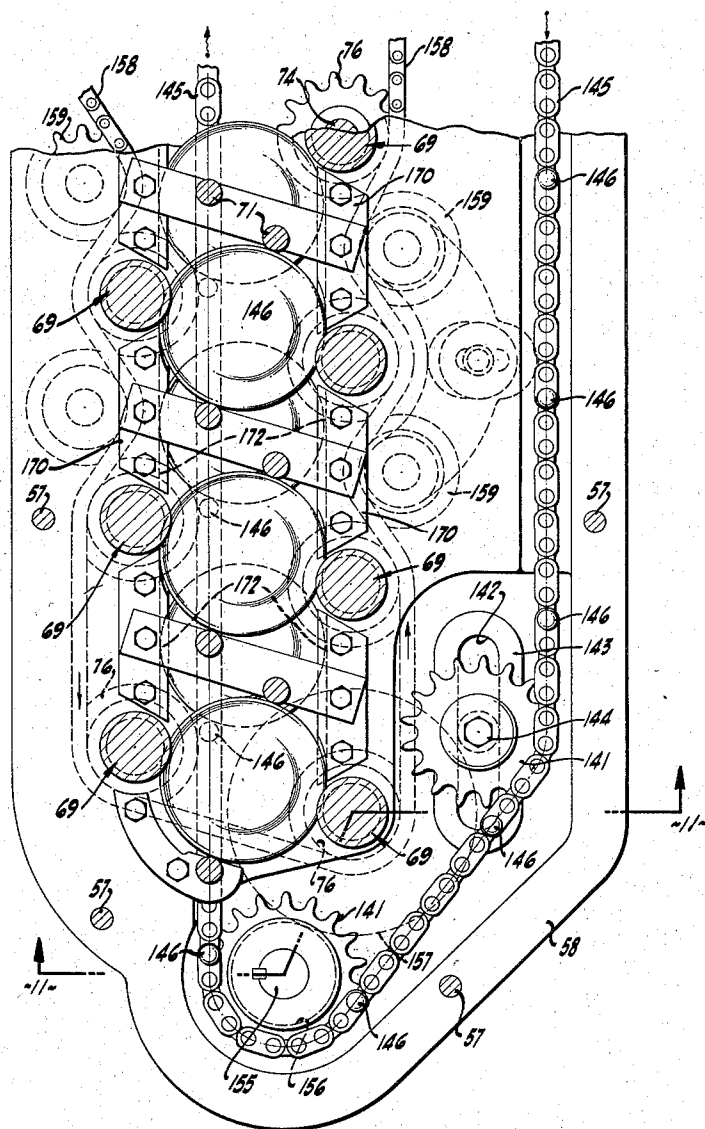


FIG. 4

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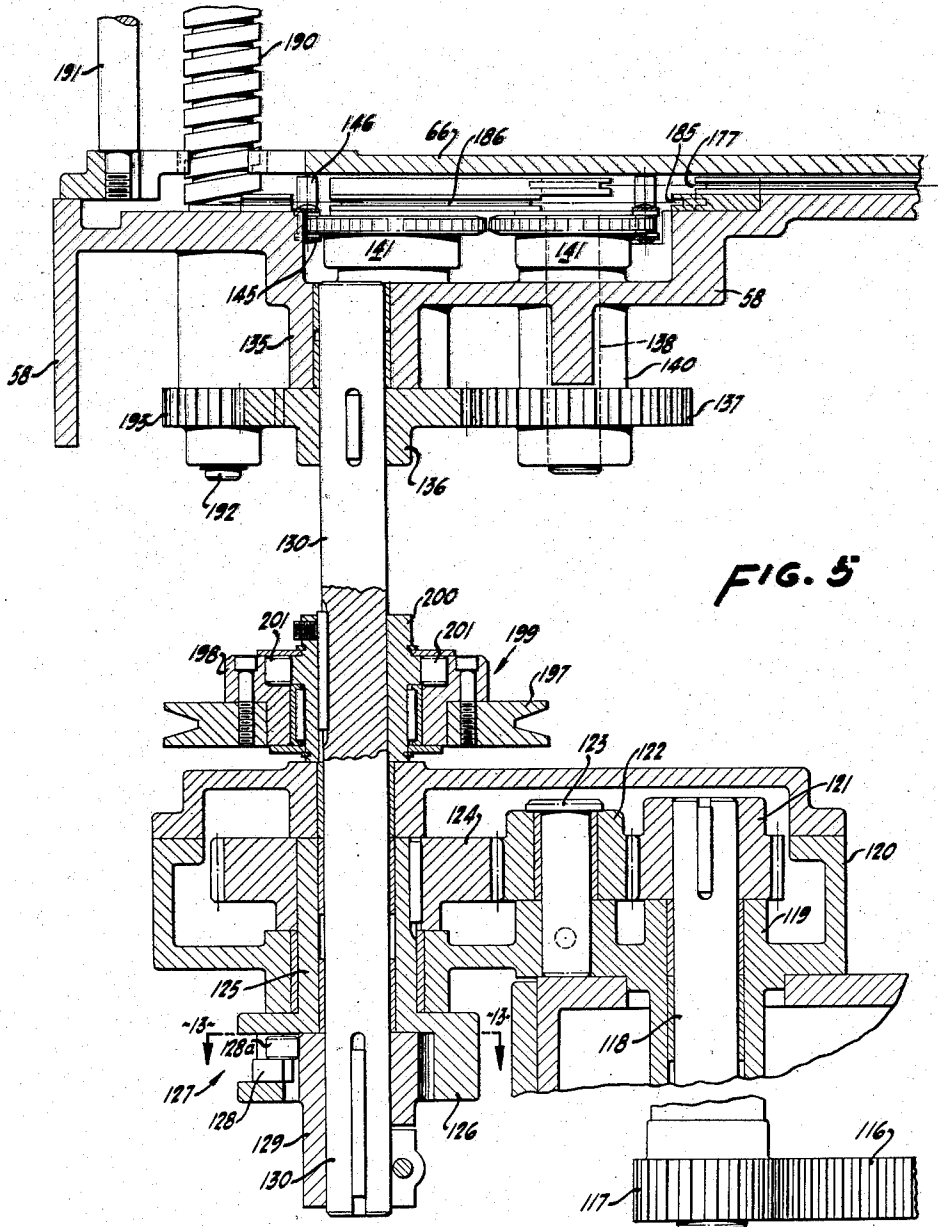
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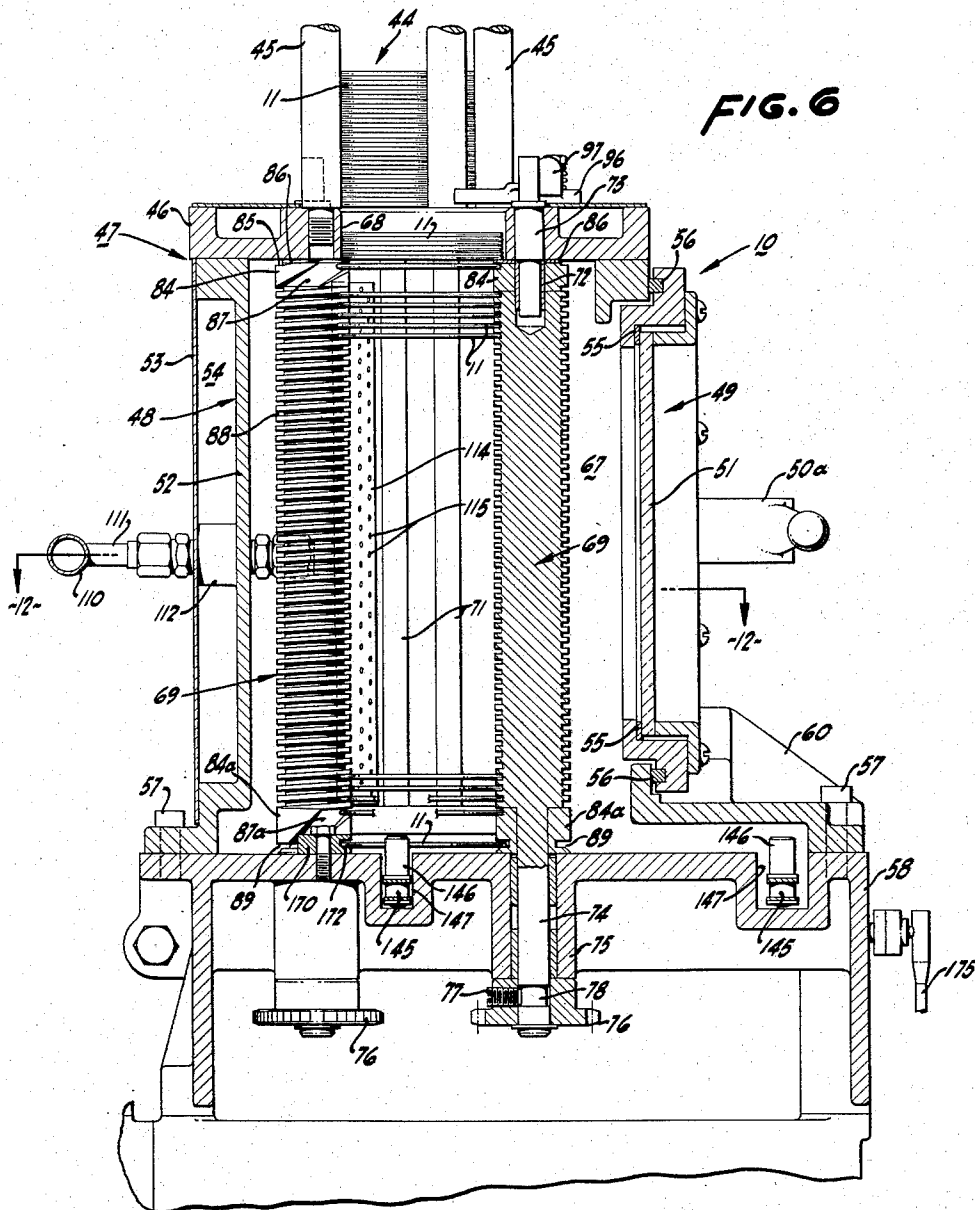
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FIG. 7

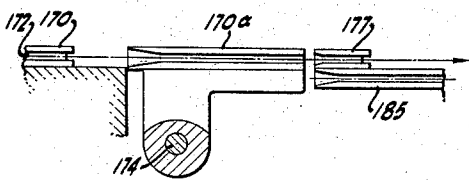
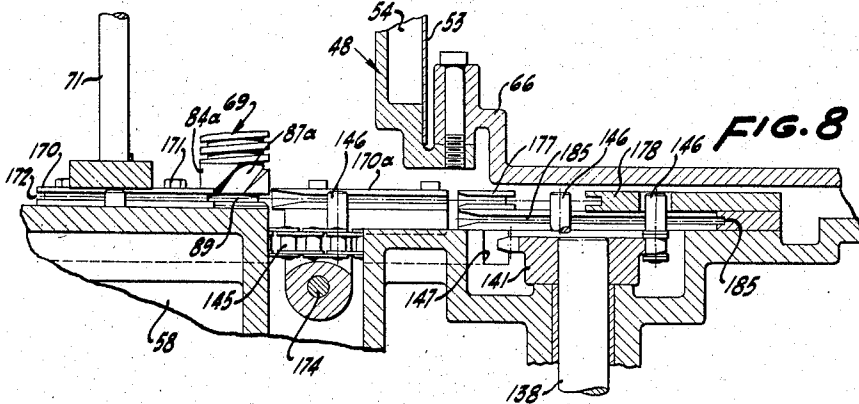
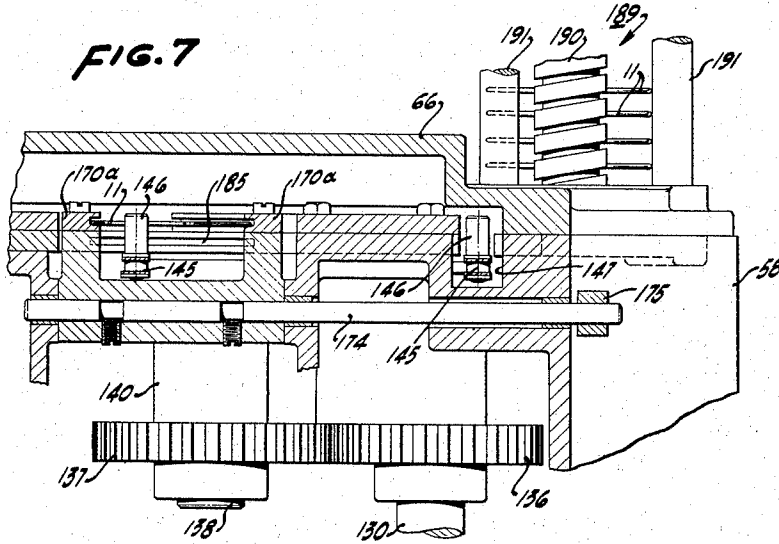


FIG. 9

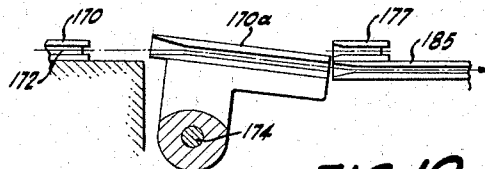


FIG. 10

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FIG. 11

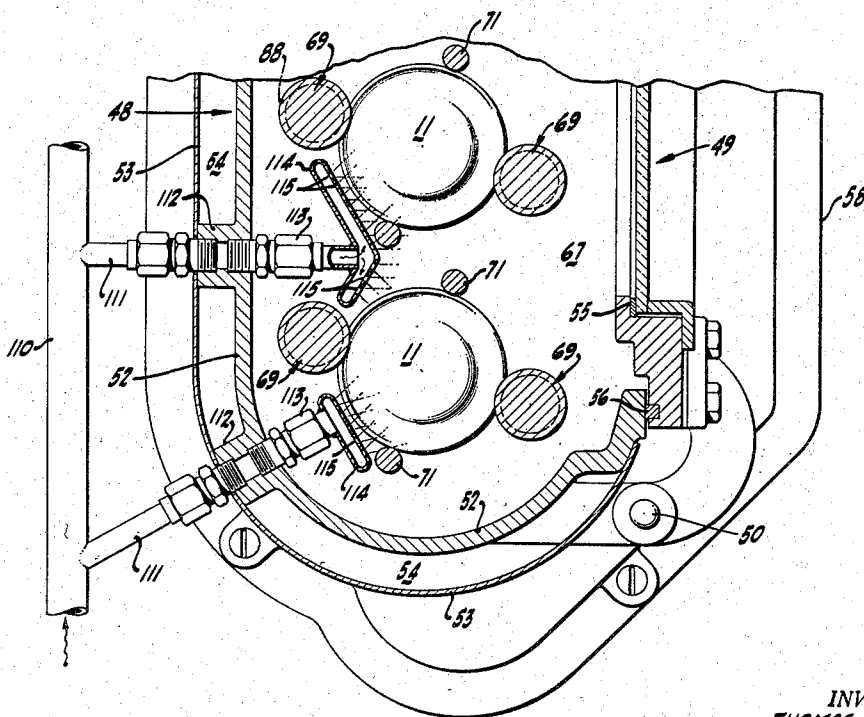
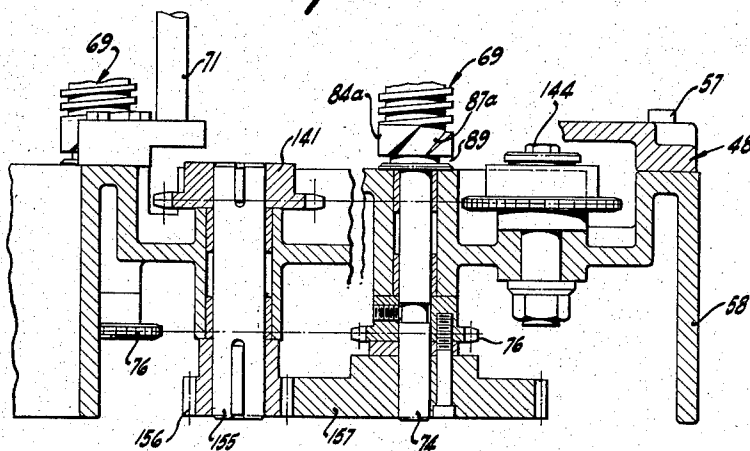


FIG. 12

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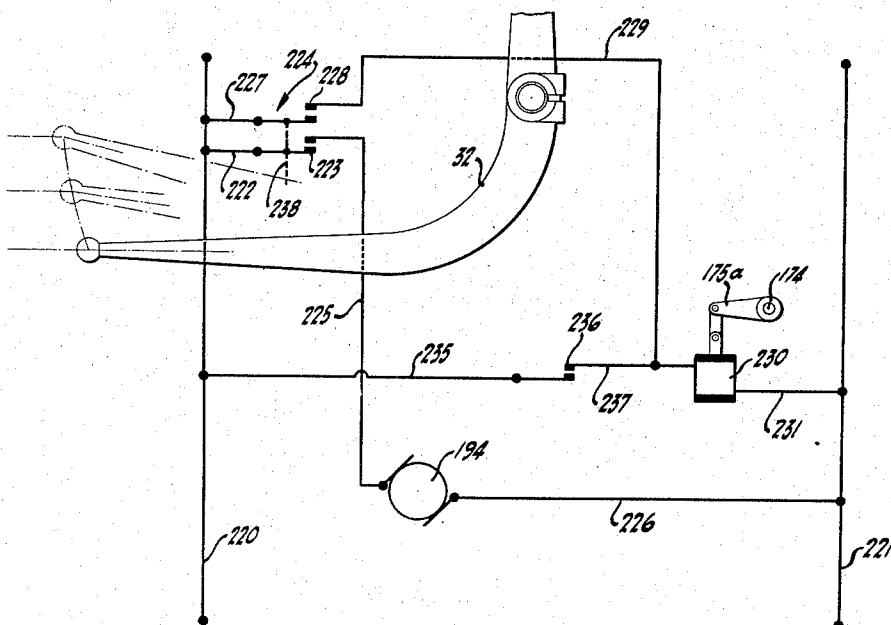
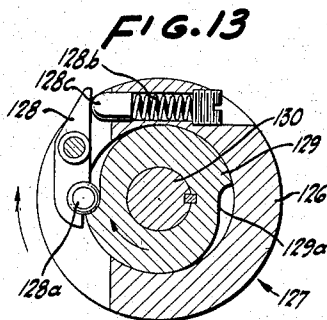


FIG. 14

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2,875,564

END FEED AND STERILIZER FOR CAN CLOSING MACHINE

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Application January 25, 1954, Serial No. 406,008

13 Claims. (Cl. 53—70)

This invention relates to an end feed and sterilizer for a can closing machine.

In can closing machines, can bodies and can ends or can lids are fed automatically to a closing machine. The can ends are supplied in timed relation to the can body feed so that for each can body there is a can end.

In ordinary can closing operations the machinery and the operations involved in supplying can bodies and can ends to the machine should be sanitary, particularly where a food product is being canned. However, no particular precautions beyond sanitation are required. In the case of certain canning operations, such as the aseptic canning operation described and claimed in Martin U. S. Patent 2,549,216, entitled "Apparatus and Method for Preserving Products in Sealed Containers," granted April 17, 1951, it is essential that can bodies and can ends be supplied to a closing machine under sterile or aseptic conditions.

In the operation of a can closing machine, as mentioned above, it is necessary that the can bodies and can ends be supplied to the machine in timed relation so that there is one can end for each can body. The can bodies and can ends are delivered to the machine in superimposed relation. For economical operation it is important that a closing machine operate at a relatively high speed, e. g., 250 cans per minute or more.

Previously, to our knowledge no can end feed has been provided which will rapidly, accurately and dependably supply can ends to a closing machine in timed relation to the supply of can bodies at a high rate of speed and under aseptic conditions. Among the problems involved in such an operation are the sterilization of can ends and a synchronized feed of can ends and can bodies to the closing machine under aseptic conditions, all of which should be carried out at high speed.

Yet another problem is the supply of can ends only when corresponding can bodies are supplied to the closing machine. Thus, if for any reason there is a gap in the can body feed line, and if a can end is supplied to the closing machine corresponding to the missing can body, the can end may cause a jam in the closing machine. Accordingly it is desirable to provide a no can-no end mechanism for diverting can ends corresponding to missing can bodies.

It is an object of the present invention to provide a can end feed which is capable of supplying can ends in timed relation to the supply of can bodies to a can closing machine at a relatively high rate of speed and under aseptic conditions.

Another object of the invention is to provide a means for sterilizing can ends and supplying the same at relatively high speed and in timed relation to the feed of can bodies to a can closing machine.

Yet another object is to provide a can end feed capable of operation under aseptic conditions at a relatively high rate of speed in synchronism with a can body feed and which is provided with no can-no end means for

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automatically diverting or rejecting can ends for which there are no corresponding can bodies.

Yet another object is to provide a novel type of feed mechanism capable of rapidly feeding can ends or the like and capable of variable capacity to suit varying conditions.

These and other objects of the invention will be apparent from the ensuing description and the appended claims.

One form of the invention is illustrated by way of example in the accompanying drawings, in which:

Figure 1 is a top plan view of a complete can closing assembly including a closing machine, a can body feed and the can end feed and sterilizer of the present invention.

Figure 2 is a view taken along the line 2—2 of Figure 1, showing the can end sterilizer in front elevation.

Figure 3 is a section taken along the line 3—3 of Figure 2 showing, partly in top plan and partly in horizontal section, a portion of the end feed and of the driving means for the can end sterilizer.

Figure 4, which is an extension of Figure 3, is a section taken along the line 4—4 of Figure 2 showing the remaining portion of the end feed and drive mechanism.

Figure 5 is a section taken along the line 5—5 of Figure 3 showing a part of the drive mechanism for the can end feed and sterilizer.

Figure 6 is a section taken along the line 6—6 of Figure 1 showing the can end feed and sterilizer partly in elevation and partly in vertical cross section.

Figure 7 is a section taken along the line 7—7 of Figure 3.

Figure 8 is a staggered section taken along the line 8—8 of Figure 3, showing a portion of the track or guide means for guiding can ends.

Figure 9 is a view similar to that in Figure 8 but with certain parts removed to more clearly reveal the structure and operation of the no can-no end means for selectively rejecting can ends for which there are no corresponding can bodies.

Figure 10 is a view similar to that of Figure 9 but showing the trip mechanism in a different position.

Figure 11 is a staggered section taken along the line 11—11 of Figure 4.

Figure 12 is a section taken along the line 12—12 of Figure 6, showing the inlet means for introducing steam or other sterilizing gas into the sterilizing chamber.

Figure 13 is a section taken along the line 13—13 of Figure 5, showing the overload clutch in detail.

Figure 14 is a diagrammatic drawing of the electrical circuit for operating the auxiliary motor and the no can-no end mechanism.

Referring now to the drawings and more particularly to Figure 1, a combined can end feed and can end sterilizer is shown at 10 for sterilizing and feeding can ends such as shown at 11. There is also illustrated a can body feed 12 for feeding can bodies 13 containing whatever product it is desired to can. There is also illustrated a closing machine or double seamer 14 which is intended to seam the ends 11 to the can bodies 12 to close the cans. Closed cans are shown at 15. The combined end feed and sterilizer 10 is illustrated in detail in other drawings and is described in detail hereinafter.

The body feed 12 may be of any type desired, e. g., it may comprise a helical feed member or it may comprise an endless chain with dogs to engage the can bodies and cause them to travel forwardly. Side walls of the can body feed are shown at 16 and for sterile, aseptic operation a cover member (not shown) will also be employed to cover the top of the body feed. Steam or other sterilizing gas will be introduced into the hous-

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ing of the body feed, e. g., in the manner described in the above-mentioned Martin Patent No. 2,549,216. Also illustrated in Figure 1 is a no can-no end device 17 which employs a feeler or contact member (not shown) to detect whether can bodies 13 are progressing in properly spaced relation. The purpose of such no can-no end device is to interrupt delivery of can ends to preclude the possibility of a can end being fed to the closing machine 14 when there is no corresponding can body. This no can-no end device 17 may be of any desired type of construction, several of which are well-known and require no detailed description herein. One known type of no can-no end device comprises a feeler member which spans the distance between can bodies when the can bodies are progressing normally with the proper spacing. When, however, a can body is missing, the feeler member is released to energize an electrical circuit, or to actuate a mechanical linkage such as shown at 18 in Figure 1. Such circuit or mechanical linkage controls the feed of can ends to the can closing machine 14 in the manner described hereinafter.

As can bodies 13 are supplied to the closing machine 14, can ends 11 are sterilized and fed forwardly in timed relation to the can bodies by means of the end feed and sterilizer 10, to a rotary end feed turret 25 having pockets 26 for reception of can ends. The feed turret 25 is completely covered and housed by means of the main frame 27 and a cover member 28. Can ends 11 are delivered by the end feed turret 25 to the closing machine 14 at the point "a." Timing of the can body feed 12, the end feed and sterilizer 10, the end feed turret 25 and the closing machine 14 is preferably accomplished by a common drive and suitable gearing. Thus a can end 11 is delivered to the point "a" each time a can body 13 is delivered to the point "a."

The closing machine 14 may be of any desired type. Preferably, however, it is a ring-type of closing machine such as described in the copending application of one of us, Laxo Serial No. 163,585, entitled "Double Seamer," filed May 23, 1950, now U. S. Patent No. 2,727,481. This type of double seamer or closing machine employs a circular bar or ring which is formed with seaming grooves, and it is also provided with rotary chucks which support and clamp together can bodies and can ends in superimposed relation. The chucks cause the can bodies and superimposed can ends to rotate about the seaming bars in contact therewith to effect the double seaming or closing operation.

As illustrated, the closing machine 14 is provided with a main drive motor 29 which is preferably a constant speed motor and which provides the motive power for the entire assembly illustrated in Figure 1, including the end feed and sterilizer 10, the body feed 12 and the end feed turret 25. The motor 29 is adjustable on a bracket 29a to adjust the pitch diameter of a variable pitch sheave (not shown) enclosed at 30, such sheave serving to drive the main drive shaft 31 of the closing machine 14 through the medium of a driving connection which includes a clutch (not shown) which is operated by a clutch lever 32. Handwheels are provided at 33 for manual operation of the machine, as when adjustments are made or the machine is inspected. The clutch lever 32 engages and disengages the motor 29 with respect to the drive shaft 31. It is shown in its engaged position in solid lines in Figure 1 and it is shown in Figure 14 in broken lines in an intermediate, neutral position which stops operation of the entire assembly, and also in a third position for operating the end feed and sterilizer 10 while the closing machine is shut down, all as more fully explained hereinafter.

For purposes of aseptic canning, the closing machine 14 is enclosed by a housing 34 and doors are provided at 35. The doors 35 may be provided with transparent windows and they may be hinged as shown at 36 and provided with a latch as shown at 37 to clamp the doors

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in closed position. Also illustrated is a can chute 38 for receiving the closed cans 15 as they are transferred from the closing machine 14 to the chute 38 by means of a rotary can feed turret 39. The can delivery chute 38 may be gravity operated or it may be provided with an endless chain or other means for positively conveying the filled cans 15 away from the closing machine to any desired location.

Referring now more particularly to Figures 2 and 6, the combined end feed and sterilizer 10 comprises a magazine 44 which is formed by a plurality of vertical guide posts 45. As is best shown in Figure 1, the posts 45 are arranged in groups of three which are spaced at 120° intervals. The posts 45 are mounted on the cover 46 of a sterilizer 47. Each group of three guide posts 45 provides lateral support for and guides a stack of can ends 11.

The sterilizer 47 comprises a housing 48 of which the cover 46 forms a part and it is provided with door 49 which is hingedly connected to the housing at 50 and is provided with a handle and latch 50a for operating the door and for latching it in the closed position. The door 49 is also provided with a transparent window 51, which is preferably constructed of Pyrex glass or other suitable heat resistant material. As is best shown in Figure 6, the housing 48 is of double-wall construction comprising an inner wall 52 and an outer wall 53. An insulating air space 54 is, therefore, provided between the two walls. The door 49 is provided with sealing gaskets 55 and 56. The housing 48 is bolted, as by means of bolts 57, to a feed table 58 which forms a part of the frame 27 of the end feed and sterilizer 10.

As is best shown in Figure 2 the end feed and sterilizer 10 has an upstanding flange 60 at its inner or right-hand (as viewed in Figure 2), which abuts a flange 65 fixed to or formed integral with a cover member 66 which is bolted to the feed table 58, which itself is of sectional construction as indicated at 58a. As explained more fully hereinafter, it is an advantageous and important feature of the end feed and sterilizer 10 that it is of sectional construction. The end feed and sterilizer shown at 10 in Figure 2 constitutes one such section or unit. If it is desired to increase the capacity of the machine, such may be accomplished by detaching the unit 10 shown in Figure 2, inserting another similar section in abutting relation to the flange 65, and attaching the end section 10 to the opposite end of the added section or unit.

As is shown most clearly in Figure 6, the housing 48 of the sterilizer 47 provides a sterilizing chamber 67 which, when the door 49 is closed, is sealed from the atmosphere except for openings 68 in the cover 46 which register with the stacks of can ends 11 and through which the can ends are fed by gravity to the interior of the drying chamber. The can ends are caused to travel downwardly through the drying chamber 67 by means of feed screws 69 which are rotated in the manner described hereinafter. As is best shown in Figures 3 and 4 two of the feed screws 69 and two guide posts 71 are provided for each stack of can ends, i. e., for each of the openings 68 in the sterilizer cover 46. The guide posts 71 provide lateral support to prevent any tendency of the can ends to twist as they are moved downwardly by the feed screws 69. As shown in Figure 6, each of the feed screws 69 is journaled at its upper end at 72 on a pin 73 which is fixed to the sterilizer cover 46. At its lower end each of the feed screws 69 is formed with a trunnion 74 which is journaled in a sleeve 75 which is integral with and extends below the feed table 58. A sprocket 76 is fixed to the extreme lower end of each of the trunnions 74 by means of a set screw 77 which is threaded through the hub of the sprocket and is received in an annular groove 78 formed in the trunnion 74. At its upper end each of the feed screws 69 is formed with a rotary feed member 84 having an upper annular shoulder 85, a stripper blade 86 and a helical groove 87. The lower end of the groove 87 communicates with the thread

88 of the feed screw 69. At its lower end each of the feed screws 69 is formed with a somewhat similar feed member 84a having a helical groove 87a. The lower feed member 84a is formed at its lower end with an annular groove 89 which serves as part of the trackway or guide system for can ends, as described in detail hereinafter.

Referring now to Figure 1 as well as Figures 2 and 6, the sterilizer cover 46 is formed with a fingerhole 95 adjacent each can end inlet opening 68. A cap 96 is provided for each hole 95 which closes such fingerhole. The cap 96 is provided with a nob 97 for manual operation and is normally maintained in closed position, covering the fingerhole 95, by a torsion spring 98 on the pivot 99. The purpose of the fingerholes 95 is to permit access by means of a finger to the interior of the sterilizing chamber 67. Thus, should a jam occur in the sterilizer, or if for any other reason it becomes necessary or desirable to deplete the sterilizer of its supply of can ends, the necessity of running all of the can ends through the sterilizer is obviated. In such an instance an operator can rotate each of the caps 96 to open position, then reach in with a finger and insert the finger beneath the stack of can ends supported on the annular shoulders 85 of the rotary feed members 84 and lift the can ends out of the opening 68.

Referring now more particularly to Figures 1 and 12, the sterilizer 47, in addition to being enclosed and substantially completely shut off from the ambient atmosphere, is also provided with a positive means for producing and maintaining sterile, aseptic conditions. Thus, steam or other suitable sterilizing gas is introduced through a manifold 110 from any suitable source (not shown). Branches 111 connect the manifold 110 with internally threaded tubes 112 which are integral with the inner wall 52 of the sterilizer housing 48. Fittings 113 are threaded into the opposite ends of tubes 112. Fixed to the inner ends of the fittings 113, adjacent the stacks of can ends supported and moved by the feed screws 69, are nozzles 114 which are formed with openings 115 through which jets of steam or other sterilizing gas issue. As will be seen, the nozzles 114 are so shaped and positioned as to direct the issuing jets of steam or other gas between the can ends, which are separated by the threads 88 of the feed screws 69. By this means, a very intimate, uniform and complete contact between the hot sterilizing gas and the can ends is provided.

Referring now more particularly to Figure 5, the driving means for the sterilizer and end feed 10 comprises a main driving gear 116, which may be the driving gear for the end feed turret 25 shown in Figure 1. It will be understood, of course, that the various parts of the entire assembly illustrated in Figure 1 have a common drive originating with the main drive motor 29, and that the main driving gear 116 of the sterilizer and end feed 10 is driven by this common drive. Thus, the gear 116 may be driven in timed relation to the closing machine 14, by a gear (not shown) which is fixed to the shaft 31 of machine 14.

The main driving gear 116 drives a gear 117 fixed to the lower end of a shaft 118 which is journaled in a collar 119 which is integral with a gear housing 120. To the upper end of shaft 118 is fixed a gear 121 which meshes with a gear 122 fixed to a shaft 123 which is journaled in the gear housing 120. The gear 122 meshes with a gear 124 which is keyed to the hub 125 of the driving element 126 of an overload clutch 127. Referring to Figure 13 as well as to Figure 5, the driving element 126 is connected by a dog 128 to the driven element 129 of the clutch 127. The driven element 129 is formed with two, diametrically opposite notches 129a. As shown in Figure 13, the dog 128 has a roller 128a which is engageable with the notches 129a and which is urged into engagement with one or the other of these notches by an expansion spring 128b and a plunger 128c.

The purpose of the overload clutch 127 is to break the driving connection between the main driving gear 116 and the various elements of the sterilizer 47 in the event of a jam within the sterilizer. In such event the roller pops out of the notches 129a and causes the driving element 126 to overrun the driven element 129. This interrupts the end feed and sterilizer drive for the purpose just explained and avoids or minimizes damage which would otherwise be caused if the drive continued. When the jam has been eliminated, the roller 128a will re-engage and remain in one of the notches 129a, and will restore the driving connection between the driving and driven elements of the clutch, in proper time with the other elements of the assembly.

The shaft 130 is journaled in the gear housing 120 and, at its upper end, it is journaled in a sleeve 135 which is integral with the feed table 58. A gear 136 is keyed to the upper end of the shaft 130 and meshes with a gear 137 which is fixed to a shaft 138 which is journaled in a sleeve 140. To the upper end of the shaft 138 is fixed a sprocket 141.

Referring now to Figures 3 and 4 as well as to Figure 5, the right-hand sprocket 141 shown in Figure 5 is one of several like sprockets. Another of these sprockets is shown at the left in Figure 5, and others are shown in Figures 3 and 4. One of the sprockets 141 which is shown in Figure 4 is slidably mounted in a slot 142 formed in a bracket 143 fixed to the frame of the machine. This sprocket can be secured in adjusted position by means of a cap screw 144 thereby permitting tightening or loosening a can end conveyor chain 145 which extends about the sprockets 141 and which has spaced lugs 146 fixed thereto and extending upwardly therefrom. By reason of the drive described above and illustrated in Figure 5, the conveyor chain 145 is driven in clockwise direction as viewed in Figures 3 and 4. As shown in Figure 6, the conveyor chain 145 is countersunk with respect to the feed table 58, by placement in troughs 147. Thus only the upper ends of the lugs 146 project above the plane of the feed table 58. The purpose of the endless chain 145 and the lugs 146 is to convey can ends from the sterilizing chamber 67 to the end feed turret 25, in a manner which is described in detail hereinafter.

Referring now to Figures 6 and 11, it will be seen that one of the conveyor chain drive sprockets 141 (i. e., the sprocket 141 which is shown at the left in Figure 11) has a shaft 155, to the lower end of which is fixed a gear 156. The gear 156 meshes with a gear 157 fixed to the lower end of the trunnion 74 of one of the feed screws 69. As noted hereinabove, a sprocket 76 is fixed to each of the trunnions 74, and as shown in Figures 3 and 4, a drive chain 158 extends about the sprockets 76.

Idler sprockets 159 are also provided, two of which are fixed to an arcuate bracket 160 which is adjustably mounted by means of a slot 161 and a screw 162 on the frame of the machine. By this means the tension of the drive chain 158 can be adjusted and maintained as desired.

It will, therefore, be apparent that a drive is provided for moving can ends 11 downwardly through the sterilizing chamber 67 and that each can end, after traversing the height of the sterilizing chamber, is delivered by a pair of the feed members 84a to annular grooves 89 formed in these feed members. Meanwhile, continued movement of the can end conveyor chain 145 and of the lugs 146 will cause the can ends to be fed forwardly, or from left to right as viewed in Figures 3 and 4.

Referring now more particularly to Figures 3, 4 and 6, it will be seen that track sections 170 are provided, each of which is bolted to the feed table 58 by means of cap screws 171. Each of the track members 170 is formed with a longitudinal groove 172, such grooves being in alignment with the annular grooves 89 formed in rotary feed members 84a of the feed screws 69.

Referring now to Figures 3 and 8 to 10, it will be seen that a pair of pivotal track sections 170a are provided at one end of the sterilizer, such track sections being shown near the top of Figure 3. The pivotal track sections 170a are mounted on a pivot shaft 174 which is shown in section in Figures 8, 9 and 10 and in elevation in Figure 7. To one end of pivot shaft 174 is attached a linkage 175 which is best shown in Figure 3 and which is connected by any suitable means, which is generally indicated in Figure 1 as 176, with the mechanical linkage 18 operated by the no can-no end device 17 illustrated in Figure 1.

Referring more particularly to Figures 9 and 10, the pivotal track sections 170a are normally maintained in the horizontal position shown in Figure 8, in alignment with an upper track section 177 (which is shown in Figures 3, 8, 9 and 10) and a mating upper track section 178 (which is shown in Figures 3 and 8). It will be apparent that, as long as the pivotal track sections 170a are in the horizontal position shown in Figures 8 and 9, they are in alignment with the upper track sections 177 and 178 and that can ends will be delivered by the conveyor chain 145 to the end feed turret 25 as shown in Figure 3. As illustrated in Figure 3, the track section 178 is arcuate. It constitutes an arc of a circle having its center at the point 180 on track section 177. It will, therefore, be apparent that, as each can end 11 is propelled forwardly, it will be caused to roll on the point 180 into a pocket 26 of the can end feed turret 25. In addition to the upper track sections 177 and 178, a pair of lower track sections 185 and 186 are also provided. The track section 185 is shown in Figures 3 and 8 to 10, and it has an arcuate portion 187 having as its center the corner 188 of track section 186. The track section 186 is shown in Figure 3. It will be apparent that, whenever the pivotal track sections 170a are rotated by means of the shaft 174 to the inclined position shown in Figure 10, they will then be in alignment with the lower track sections 185 and 186.

The purpose of the lower track sections 185 and 186, as is explained more fully hereinafter, is to divert can ends from their normal path of movement to the end feed turret 25 and closing machine 14, to an auxiliary magazine 189 which is formed by helical feed members 190 and guide posts 191 (see Figure 2).

Referring now to Figures 3 and 5, each of the helical feed members 190 has a trunnion 192 journaled beneath the feed table 58, and to each of the trunnions 192 is fixed a gear 193 which meshes with the gear 136 on shaft 130. This provides a drive for the feed members 190 which are, therefore, rotated constantly during operation of the end feed and sterilizer 10.

An auxiliary means is also provided for driving the end feed and sterilizer 10, such auxiliary drive means being illustrated in Figures 2 and 5.

Referring to these figures, it will be seen that an auxiliary motor 194 is adjustably fixed to the frame of the machine and that, through a transmission 195 (a variable speed sheave), it drives a pulley 195a which is connected by means of a belt 196 to another pulley 197 which is shown in both Figures 2 and 5. Referring more particularly to Figure 5, the pulley 197 is bolted to the driving element 198 of an overrunning clutch 199, the driven element of which is indicated by the reference numeral 200. The clutch 199 includes rollers 201 which operate to engage the driving element 198 with the driven element 200 when, but only when the driven element ceases to rotate or slows down to a speed less than that of the driving element. The overrunning clutch 199 may be of standard construction and is intended to provide a driving connection between the auxiliary motor 194 and the shaft 130 when, for any reason, the drive from the driving gear 116 through the gearing illustrated in Figure 5 is interrupted. Thus, from time to time, it may be desirable to shut down the closing machine itself for in-

spection or for removing a jammed can body or can end. The purpose and advantages of this auxiliary drive will be explained more fully hereinafter.

In operation stacks of can ends 11 are maintained in the magazine 44 (see Figure 2). The can ends are stripped from each stack one by one by means of the rotary feed members 84 and are delivered to the feed screws 69 which cause the can ends to travel downwardly through the sterilizing chamber 67 (see Figure 6). It will be apparent that, as the can ends traverse the sterilizing chamber 67, they are separated by the thickness of the thread of the feed screws 69. Consequently, steam or other sterilizing gas admitted through the nozzles 114 (see Figure 12) will pass between the can ends and will blanket them completely in a sterilizing atmosphere. The height of the feed screws 69, their speed of rotation and the pitch of their threads are factors which control the length of residence of each can end in the sterilizing chamber 67. This length of residence is determined by the temperature to which the can ends are subjected by reason of the steam or other sterilizing gas. As is known, sterilization can be accomplished more quickly by employing a higher temperature. However, the use of high temperatures is limited by reason of the fact that can ends customarily have deposited on their curls a sealing compound which deteriorates if subjected to too high a degree of heat for too long a period of time. It has been found that a temperature of substantially 400° F. and a residence time in the sterilizing chamber of substantially one minute are usually ample to accomplish sterilization without a deleterious effect on the can ends and the sealing compound deposited thereon.

The pitch of the grooves 87 in the bottom feed members 84a (see Figure 6) is such that, when a can end reaches the bottom of the thread 88 of feed screws 69, such can end will be dropped at high speed into the annular grooves 89. Five ends are dropped simultaneously in the case of a five stack machine such as illustrated.

Continuous movement of the conveyor chain 145 and its lugs 146 will cause each can end, as it is delivered to the lower end of the sterilizing chamber 67, to be propelled forwardly or to the right as viewed in Figures 3 and 4. The conveyor chain 145 is driven in such timed relation to the feed screws 69, and the lugs 146 are so spaced, that each can end is propelled forwardly separately and without jamming. Also, the feed screws 69 and the conveyor chain 145 are driven in timed relation to the body feed 12, the end feed turret 25 and the closing machine 14, such that operation of all parts of the assembly are synchronized.

Assuming that there is a proper supply of can bodies 13 by the can body feed 12 (see Figure 1), i. e., that there is no gap in the can body feed line, the no can-no end device 17 will remain inoperative and the pivotal track sections 170a will remain in the up or horizontal position illustrated in Figures 8 and 9. Accordingly can ends will be propelled by the conveyor chain 145 and will be guided by the track sections 170, to the terminal track sections 177 and 178 shown in Figure 3, thence to the can end feed turret 25 which, in turn, will feed the can ends to the closing machine 14 in timed relation to the feed of can bodies 13.

If, for any reason, there is a gap in the can body feed line, the no can-no end device 17 will be actuated and, through the linkage generally indicated at 18, 175 and 176 (see Figures 1 and 3), it will rotate the shaft 174 and thereby pivot the pivotal track sections 170a to the inclined position shown in Figure 10. The design and timing are such that rotation of shaft 174 occurs when the track sections 170a contain a can end, and only when such can end corresponds to the particular can body which is missing in the can body line. Accordingly, the can end intended for the missing can body will be di-

verted from the normal path of movement to the closing machine, to the alternative path of movement provided by the track sections 185 and 186. Accordingly, each and every can end for which no corresponding can body is delivered to the closing machine, will be rejected and diverted to the auxiliary magazine 189. The diverted can ends will be fed upwardly by the helical feed member 190.

As shown in Figure 2, the feed members 190 terminate a relatively short distance above the feed table 58 and will merely operate to stack the rejected can ends in the magazine 189. From time to time, an operator to whom such duty is assigned will lift the rejected can ends out of the magazine 189 and will restore them manually to the principal magazine 44 of the sterilizer.

It will be understood that when the first can body 13 following a gap has reached the no can-no end device 17, the latter will be reset, the pivotal track sections 170a will be rotated to their normal, horizontal position and the corresponding can end will be delivered to the closing machine 14.

Referring now to Figure 14, which is a diagrammatic circuit drawing showing electrical circuits for operating the auxiliary motor 194 and the pivotal track sections 170a: The clutch lever 32, the pivot shaft 174 and the auxiliary motor 194 shown in Figures 1, 8-10 and 2, respectively, are illustrated. Power leads are shown at 220 and 221. A lead 222 is connected to normally open contacts 223 forming part of a control switch 224, which in turn are connected by a lead 225 to one terminal of the auxiliary motor 194. The switch 224 is also shown in Figure 1. The other terminal of auxiliary motor 194 is connected by a lead 226 to the other power lead 221. A lead 227 is connected to normally open contacts 228, also forming a part of switch 224, and these contacts are in turn connected to a lead 229 which is connected to the coil of a solenoid 230. A lead 231 connects the other terminal of the solenoid to the other power lead 221. Yet another sub-circuit is provided by a lead 235, normally open contacts 236 and a lead 237 which connects with the solenoid 230.

In operation, and as long as the main clutch lever 32 is in the position shown in solid lines in Figure 14, the contacts 223 and 228 remain open; hence, the auxiliary motor 194 remains unenergized, and the solenoid 230 also remains unenergized except as noted hereinafter. This same condition continues when the lever 32 is moved to the intermediate position shown in broken lines in Figure 14. In this position, the lever 32 disengages the drive for the entire assembly, including the closing machine 14, the end feed and sterilizer 10 and the body feed 12; i. e., the entire assembly is shut down.

It is sometimes desirable to shut down the closing machine for a short while, e. g., for inspection, to remove a jammed can or to prevent an over supply of filled, closed cans to the operator who is stacking the cans. In such case, and for reasons explained hereinafter, it is desirable to continue operation of the end feed and sterilizer 10. To accomplish this, the clutch lever 32 is moved to the inner position shown in Figure 14, causing it to contact a switch operating member shown generally at 238, thereby closing the contacts 223 and 228. The auxiliary motor 194 is thereby energized and continues operation of the end feed and sterilizer 10 notwithstanding the fact that the closing machine is shut down. Also, the solenoid 230 is energized and it operates to rotate the pivot shaft 174 and to rotate the pivotal track sections 170a to the position shown in Figure 10. Accordingly, can ends are diverted to the auxiliary magazine 189.

The subcircuit including the leads 235 and 237 and the contacts 236 serve a different purpose. As illustrated in Figure 1 and as described hereinabove, a mechanical linkage may be provided between the no can-no end device 17 and the pivot shaft 174. The subcircuit illustrated in Figure 14 and including leads 235 and 237

and contacts 236, illustrates an electrical linkage which may be preferred in certain installations. Thus the normally open contacts 236 are closed by the no can-no end device 17 when a can body is missing in the can body line. This energizes the solenoid 230, thereby rotating the pivot shaft 174 to divert the corresponding can end to the auxiliary magazine 189.

It will, therefore, be apparent that a can end feed and sterilizer have been provided which fulfill the several objects and which solve or alleviate the problems mentioned above. Thus, a means is provided of continuously feeding can ends through a sterilizer, of sterilizing the can ends in the sterilizer and then feeding the can ends forwardly under aseptic conditions to a can closing machine. The sterilizer has several advantageous features such as the spacing of the can ends as they progress through the sterilizer chamber to permit the steam or other sterilizing gas to penetrate between the can ends and thereby thoroughly and completely sterilize the same. Another advantageous feature of the sterilizer is the fact that its capacity and throughput can be readily increased by the addition of units as mentioned above. Thus, any desired number of units may be provided, each comprising a magazine 44, a sterilizer 47, a feed table section, the necessary driving means for the feed screws 69 and the necessary conveyor means for conveying sterilized can ends. Alternatively, the capacity of the sterilizer can be changed by lengthening or shortening the feed screws 69.

It will be apparent, of course, that the rate of output of the sterilizer can be increased by rotating the feed screws 69 more rapidly. However, it must be borne in mind that, if the device is employed as a sterilizer, then each can end must reside in the sterilizer for a certain minimum period of time. Otherwise the desired sterilization will not be accomplished, unless the temperature is increased. But as noted above, there is an upper limit on temperature. However, the rate of output of our sterilizer can be increased in the manner stated above by adding more units. By adding another unit the capacity can be increased without increasing the speed of the feed screws 69. Alternatively, both the speed and length of the feed screws 69 and the height of the sterilizing chamber 67 can be increased, to increase the rate of output of the sterilizer without decreasing the residence time of the can ends in the sterilizer.

The several components of the assembly are so organized and timed that a very rapid rate of operation is possible. For example, in an end feed and sterilizer measuring approximately 18' in height, 30' in length and 13' in width, can ends up to No. 300 diameter may be supplied to a closing machine at the rate of 250 per minute with a residence time of one minute in the sterilizing chamber and a temperature of 400° F.

A novel and very advantageous means is provided for rejecting and diverting all those can ends, but only those can ends for which there are no corresponding can bodies. This by-pass means may be actuated by a standard no can-no end device and it not only rejects can ends but permits continuous operation of the sterilizer. Thus, a no can-no end device which interrupts operation of the sterilizer is disadvantageous because cessation of such operation increases residence time of can ends in the sterilizing chamber. Increased residence time in a hot sterilizing chamber may have a deleterious effect on the can ends.

The sterilizer 47 can also be used simply as a feed mechanism for standard sanitary packing operations. In such case the sterilizer housing 48 and the steam inlet means may be eliminated. Among the advantages of a can end feed of this type is the fact that a very large volume of can ends can be maintained in a magazine of modest height.

The auxiliary drive provided by the auxiliary motor 194, the overrunning clutch 199, etc. (see Figures 2 and

5) is advantageous because it continues operation of the sterilizer notwithstanding shut-down of other components of the assembly. This assures that, during temporary shut-downs, can ends will not be overheated in the sterilizing chamber 67. Also, because can ends are continuously circulated through the sterilizer, it may be kept at sterilizing temperature. Consequently, when operation of the closing machine is re-commenced, the sterilizing chamber is filled with can ends, no waiting period is required to bring the sterilizer up to sterilizing temperature, and the feed of can ends commences immediately.

The overload clutch 127 shown in Figures 5 and 13 and described above provides the following advantages: It operates to interrupt the sterilizer and end feed drive in the event of a jam. However, unlike an overload clutch having a shear pin, interruption of the drive does not break a mechanical link; the driving element 126 continues to overrun the driven element 129 and, when the jam is relieved, the dog 128 automatically re-engages the curved, concave notches 129a and re-establishes the drive. Moreover, when the drive is re-established, the driving and driven elements are in proper time in relation to each other. The spring 128b is selected or adjusted so that the dog 128 disengages its notch 129a and interrupts the drive when the torque exerted thereon exceeds a certain value, and so that the dog 128 re-engages one of the notches 129a and re-establishes the drive when such condition is relieved.

We claim:

1. A combined can end feed and sterilizer comprising an enclosed chamber having a plurality of apertures at its top portion adapted to pass can ends to the interior of the chamber, can end support means for each such aperture adapted to provide lateral support for a stack of can ends but to allow passage of the can ends through such aperture, means for introducing a sterilizing gas into said chamber, and rotary helical feed means arranged in registry with each such aperture to receive can ends therethrough.

2. A feeding device comprising a plurality of cylindrical feed members mounted in parallelism for rotation about their longitudinal axes and in a plurality of groups, each such feed member having an inlet end and an outlet end; at least one rotary stripper member of each such group fixed to the inlet end of one of the feed members thereof and capable of supporting a stack of can ends and of stripping can ends from such stack and supplying the same one-by-one to such group of members; track means located adjacent the outlet ends of said feed members for guiding can ends away from the feed members; and endless conveyor means with spaced projections for engaging can ends deposited on the track means and carrying the same away from said feed members.

3. A feeding device comprising a plurality of cylindrical, helical feed members mounted in parallelism for rotation about their longitudinal axes and in a plurality of groups, each such feed member having an inlet end and an outlet end; at least one rotary stripper member for each such group fixed to the inlet end of one of the feed members thereof and capable of supporting a stack of can ends and of stripping can ends from such stack and supplying the same one-by-one to such group of members; track means located adjacent the outlet ends of said feed members for guiding can ends away from the feed members; endless conveyor means with spaced projections for engaging can ends deposited on the track means and carrying the same away from said feed members; and drive means for rotating said feed members and moving said conveyor means simultaneously and in timed relation to one another.

4. A feeding device comprising a plurality of cylindrical, helical feed members mounted in parallelism for rotation about their longitudinal axes and in a plurality of groups, each such feed member having an inlet end and an outlet end; at least one rotary stripper member

for each such group fixed to the inlet end of one of the feed members thereof and capable of supporting a stack of can ends and of stripping can ends from such stack and supplying the same one-by-one to such group of members; track means located adjacent the outlet ends of said feed members for guiding can ends away from the feed members; endless chain means with spaced projections for engaging can ends deposited on the track means and carrying the same away from said feed members; and drive means for rotating said feed members and moving said conveyor means simultaneously and in timed relation.

5. A can end sterilizer comprising a housing providing a sterilizing chamber, rotary feed means located within said housing and capable of feeding can ends simultaneously from a plurality of stacks of such ends through said chamber to a common level, means for continuously sterilizing the can ends as they pass through said chamber and means for continuously picking up each can end after transit through the sterilizing chamber and supplying the same to a fixed point.

6. A can end sterilizer comprising a housing providing a sterilizing chamber, rotary helical feed means located within said housing and capable of feeding can ends simultaneously and in spaced relation from a plurality of stacks of such ends through said chamber to a common level, means for introducing a sterilizing gas into said chamber as the can ends pass therethrough, and means for continuously picking up each can end after transit through the sterilizing chamber and supplying the same to a fixed point.

7. A can end sterilizer comprising a housing providing a sterilizing chamber and having a plurality of apertures in its upper portion to allow entry of can ends from a plurality of stacks thereof, helical rotary feed means located within said housing in registry with each such aperture and capable of feeding can ends simultaneously and in spaced relation from its respective aperture through said chamber to a common level, means for introducing sterilizing gas into said chamber as the can ends pass therethrough and means for continuously picking up each can end at said common level and supplying the same to a fixed point.

8. In combination with the elements of a can closing machine, a can body feed, a can end sterilizer including means for continuously passing can ends therethrough to sterilize the same, a can end feed and driving means for synchronously and continuously operating said elements to continuously supply can bodies and sterilized can ends to the closing machine: a no can-no end mechanism for sensing the absence of a can body in the can body feed and automatically terminating normal operation of the can end feed to divert each can end for which there is no corresponding can body, and auxiliary driving means for the sterilizer, such auxiliary driving means being normally inoperative but being operative during cessation of operation of the closing machine to prevent overexposure of can ends in the sterilizer to the sterilizing medium.

9. A can end feed comprising rotary feed means arranged and adapted to feed can ends vertically and downwardly from a plurality of stacks of can ends to a common level, endless conveyor means having spaced projections to engage such can ends at such common level and to carry each can end forwardly, a track means for guiding movement of said can ends, a first extension of said track means operable to guide can ends to a normal point of delivery, a second extension of said track means operable to guide said can ends to an auxiliary point of delivery and switching means movable between a first position rendering said first extension operative and a second position rendering said second extension operative.

10. A can end feed comprising rotary feed means arranged and adapted to feed can ends vertically and down-

wardly from a plurality of stacks of can ends to a common level, endless chain means having spaced projections to engage such can ends at such common level and to carry each engaged can end forwardly, track means for guiding movement of said can ends, a first extension of said track means operable to guide can ends to a normal point of delivery, a second extension of said track means operable to guide said can ends to an auxiliary point of delivery and switching means movable between a first position rendering said first extension operative and a second position rendering said second extension operative.

11. A can end sterilizer and can end feed operable in conjunction with a can body feed for sterilizing can ends and delivering the sterilized ends under aseptic conditions to an aseptic closing machine in timed relation to the feed of can bodies to such closing machine, said sterilizer and end feed comprising a main can end magazine adapted to support a plurality of stacks of can ends, a sterilizing chamber disposed beneath said main magazine and having at its upper portion a plurality of apertures in registry with the several stacks of can ends, a plurality of rotary feed means in registry with said apertures and each comprising a pair of spaced, helically threaded feed members arranged vertically and in parallelism and mounted for rotation about their longitudinal axes, each such helical feed member being provided at its top with a rotary feed blade capable of providing bottom support for a stack of can ends and of stripping can ends from such stack one-by-one and feeding them to the thread of the respective feed member, said feed members being formed at their lower ends with similar rotary feed blades, a main track section disposed beneath said feed members for guiding can ends horizontally, endless conveyor means disposed beneath said main track section and having spaced projections engageable with can ends as the same are delivered to said track means, means for introducing a sterilizing gas into said sterilizing chamber, a first track extension operable to guide can ends to said closing machine, an auxiliary magazine, a second track extension operable to guide can ends to said auxiliary magazine, switching means comprising a pivotal track section mounted to be capable of pivoting between a first position connecting said main track section with said first track extension and a second position connecting said main track section with said second track extension, and a no can-no end mechanism operating said pivotal track section and controlled by the can bodies in said can body feed so as normally to retain said pivotal track section in said first position but to rotate the same to said second position when a can body is missing in said can body feed.

12. A can end feed mechanism of variable capacity and throughput comprising a frame, conveyor means mounted on said frame for engaging can ends at a plurality of spaced points in a fixed plane and for continuously moving such can ends to a desired point of delivery; and a plurality of similar feed units attachable to and detachable from the frame and being operable singly and in combination with one another, each said unit comprising a plurality of feed means capable of continuously and simultaneously separating can ends from a plurality of stacks thereof and moving the separated can ends to said conveyor means at said spaced points.

13. A can end feed and sterilizer of sectional construction and variable capacity and throughput comprising a plurality of similar sterilizer-conveyor units operable singly and in combination to deliver sterilized can ends to a desired point of delivery, each such unit comprising: an enclosure providing a sterilizing chamber; means for simultaneously and continuously separating can ends from a plurality of stacks thereof and moving the separated can ends through said chamber in contact with a sterilizing medium introduced into the chamber, and for delivering the sterilized can ends to a plurality of fixed points in a predetermined plane in registry with a similar plane in the other units; and conveyor means capable of separate operation or of conjoint operation with the conveyor means of other units, said conveyor means being operable to engage each can end as it is delivered to one of said fixed points and moving it toward said point of delivery.

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