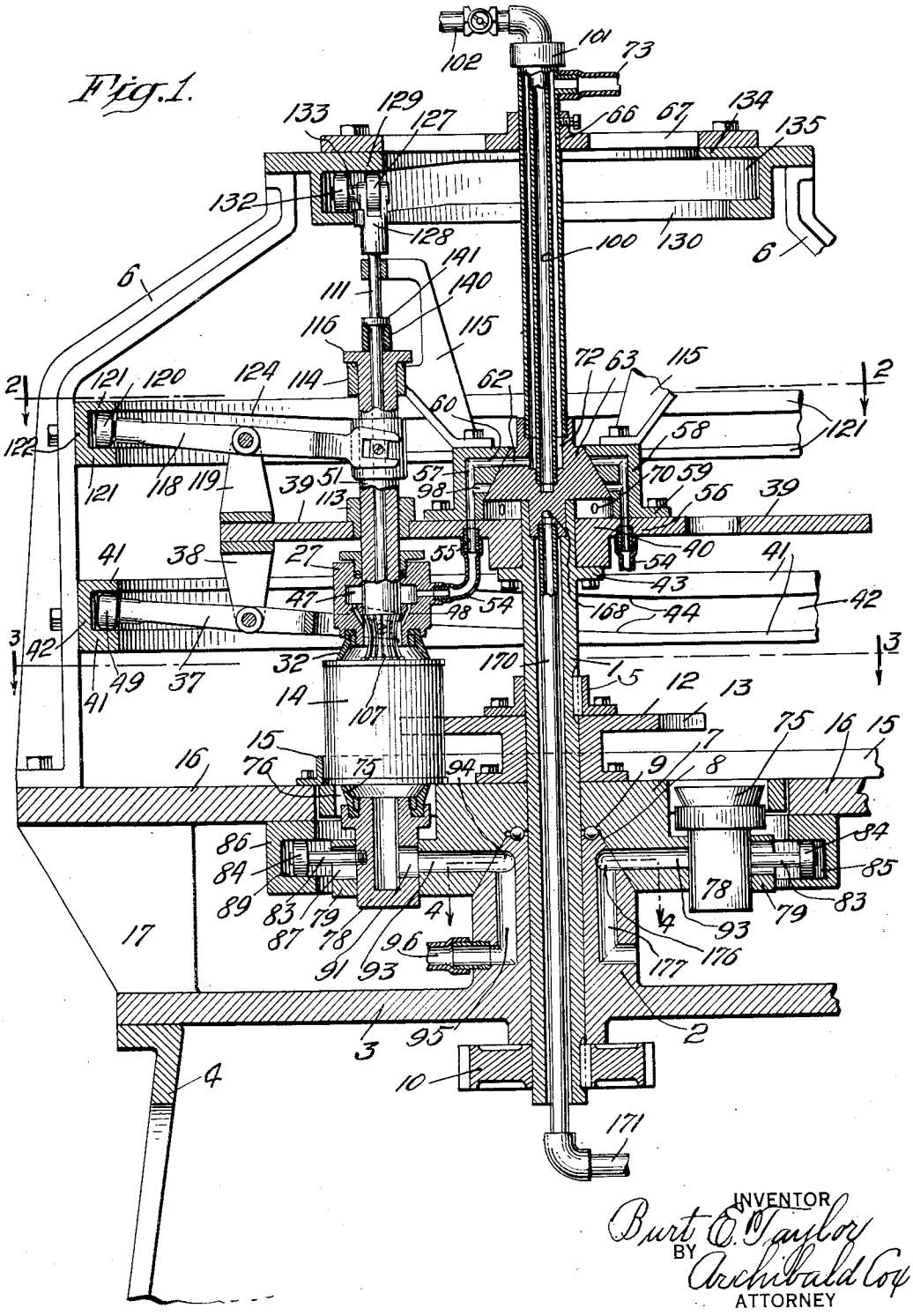
Nov. 27, 1928. 1,693,262

B. E. TAYLOR

MACHINE FOR TREATING AND SEALING CANS

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Fig. 1.



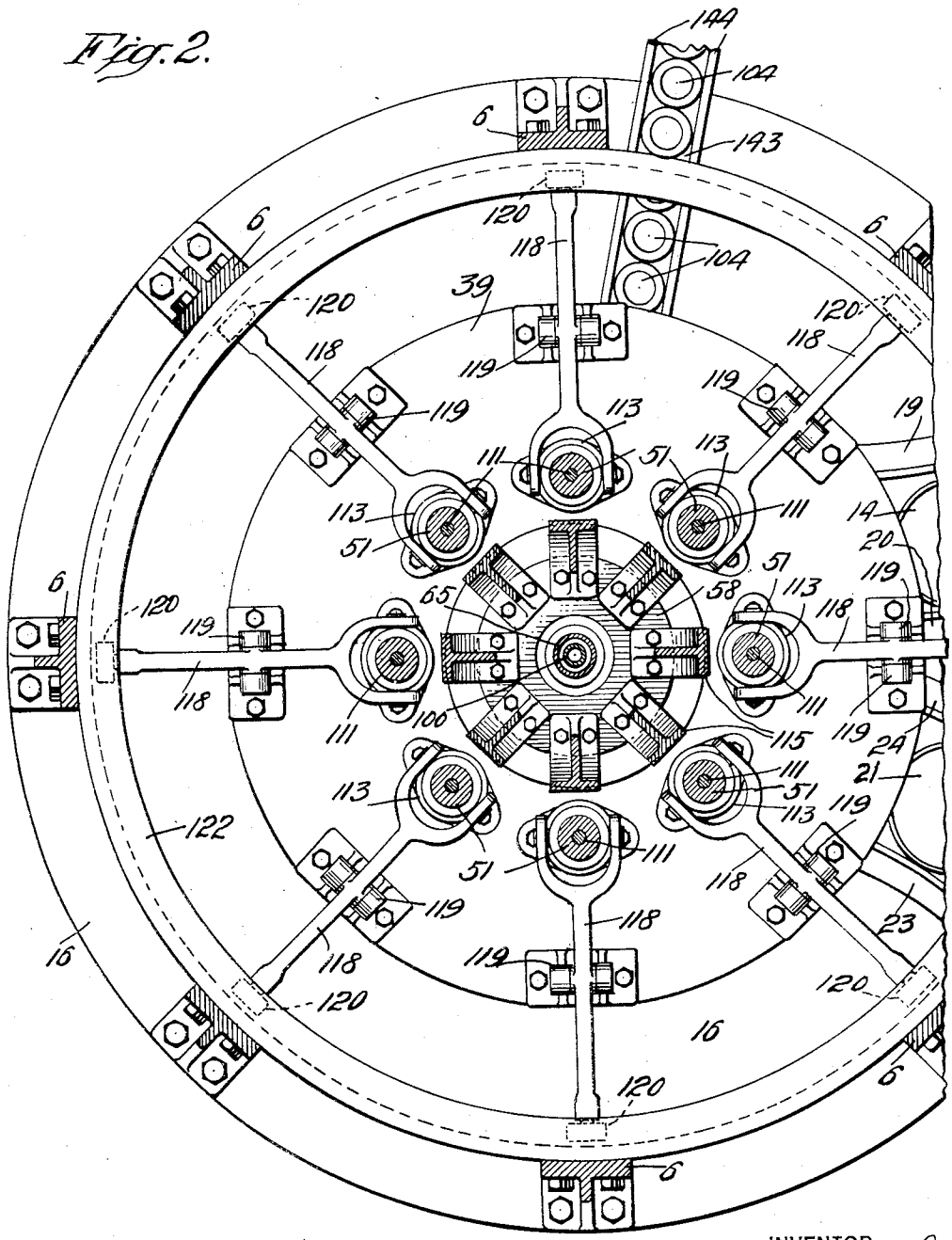
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Fig. 2.



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Fig. 3.

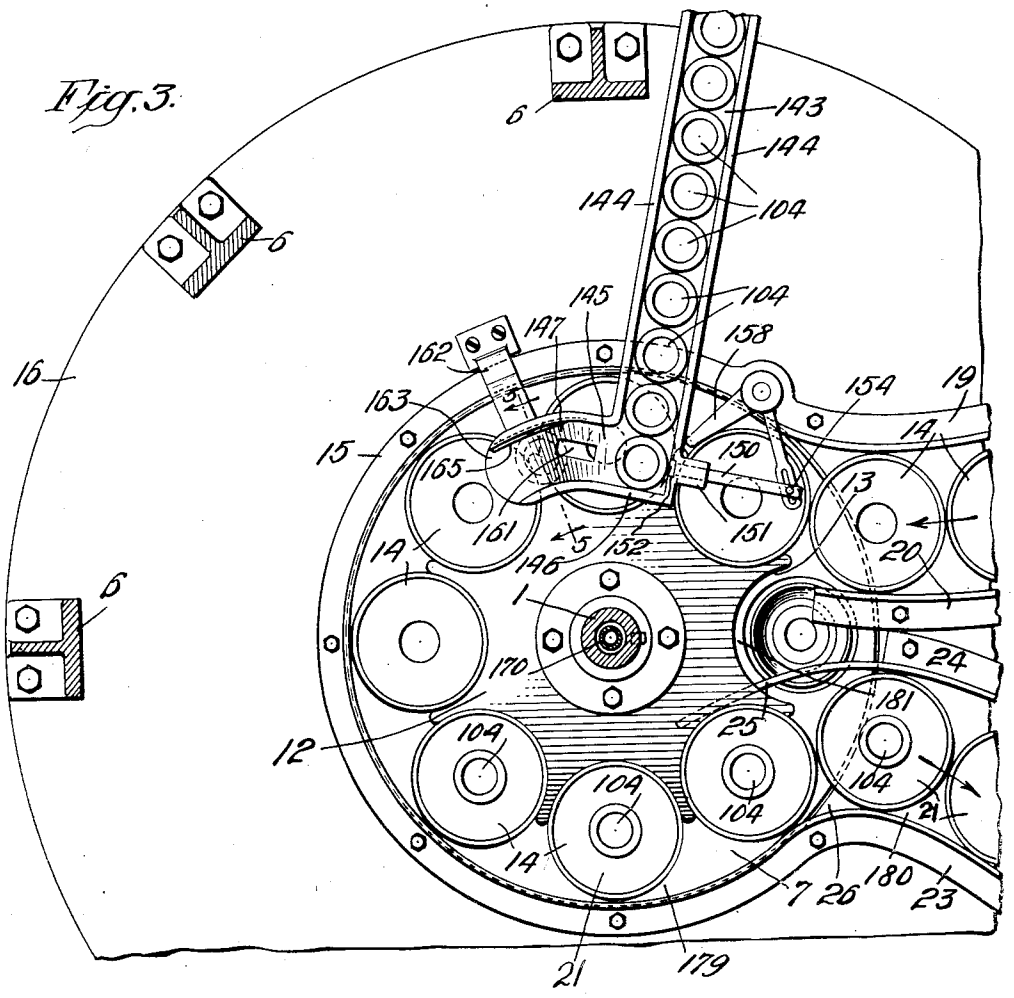


Fig. 4.

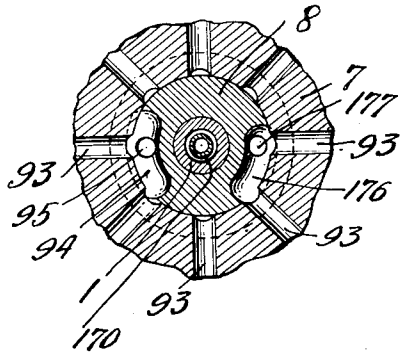
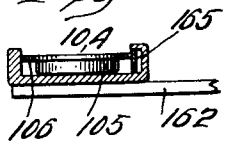


Fig. 5.



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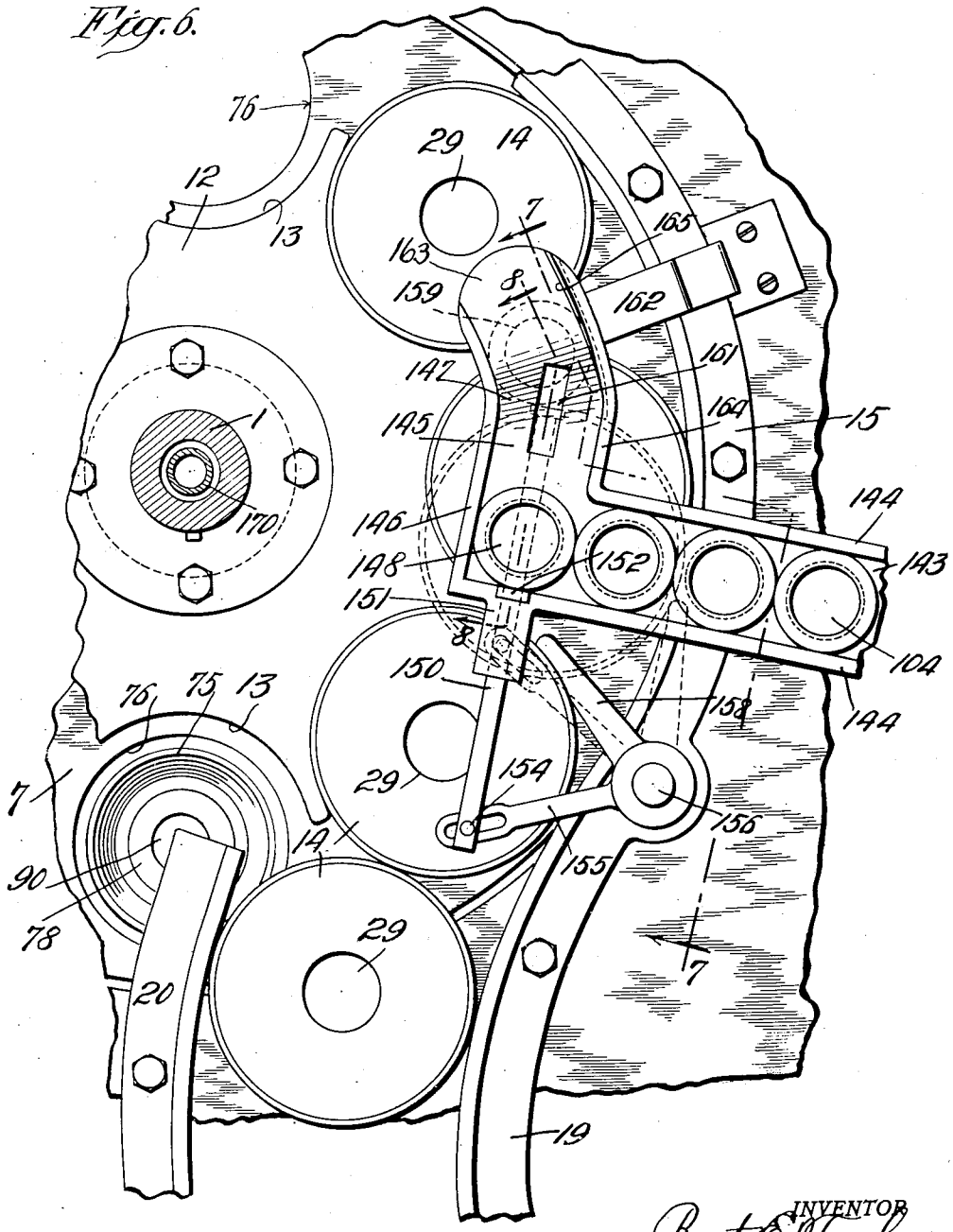
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Fig. 6.



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Fig. 7.

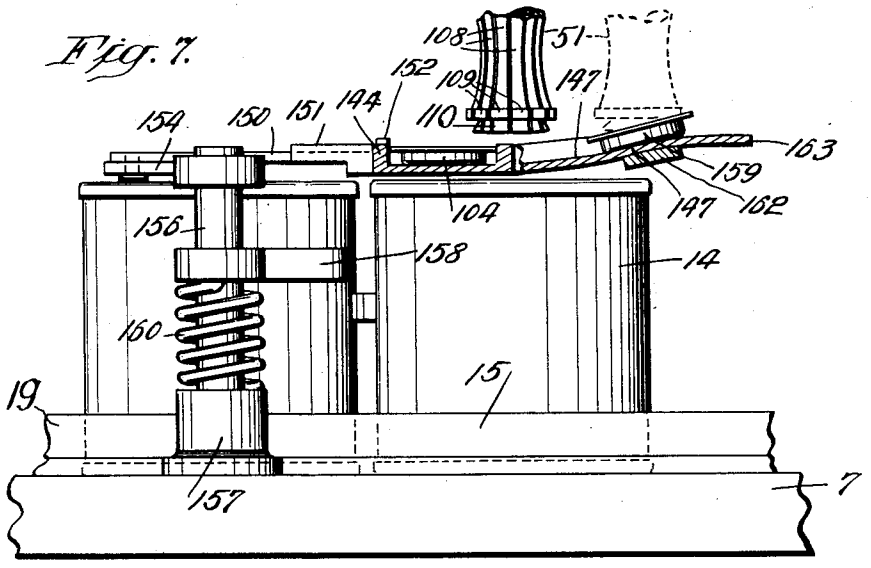
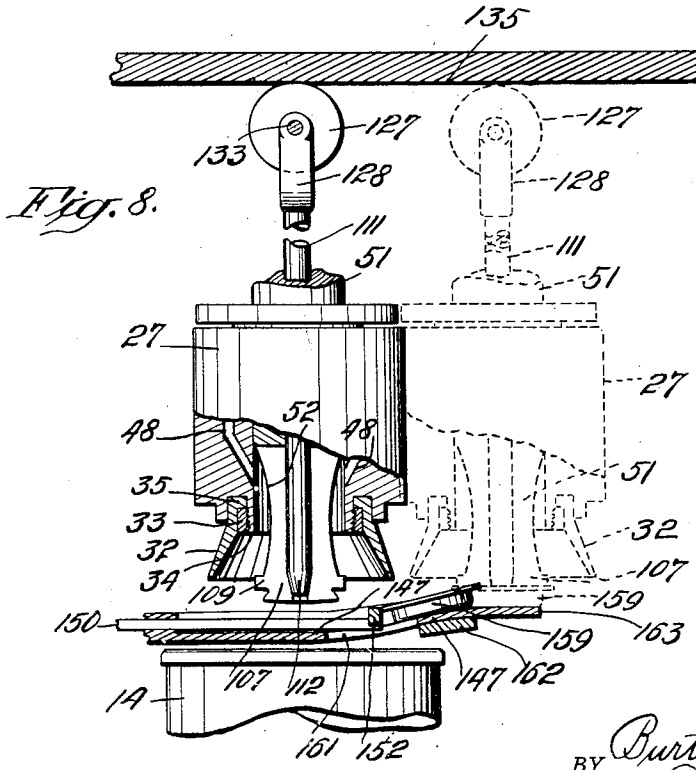


Fig. 8.



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Fig. 10.

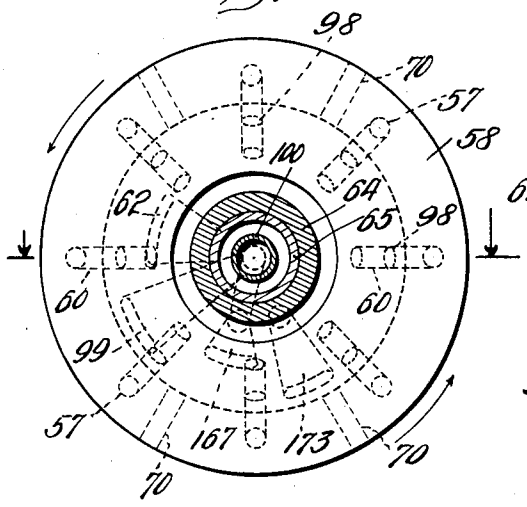


Fig. 11.

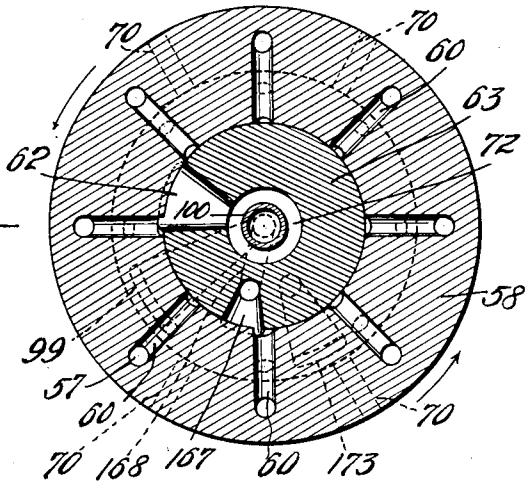


Fig. 12.

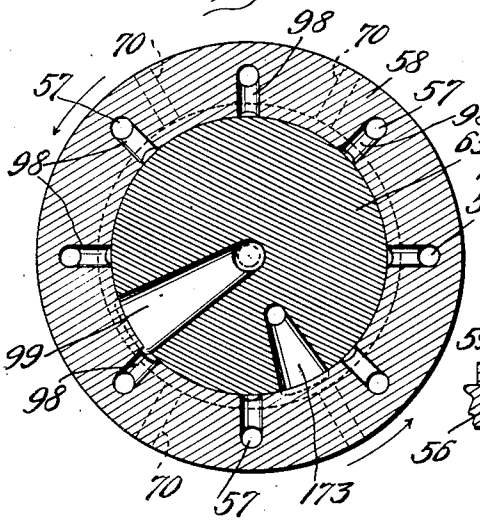
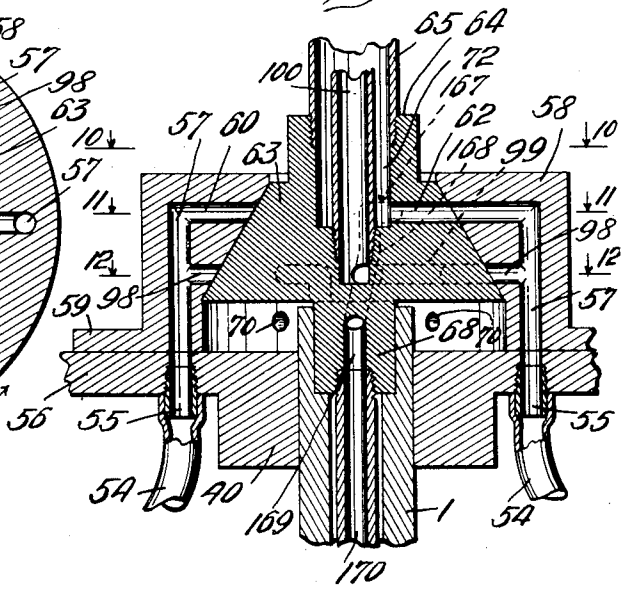


Fig. 9.



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Fig. 13.

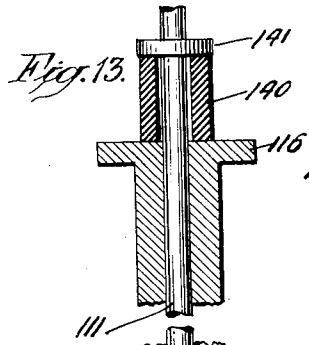


Fig. 16.

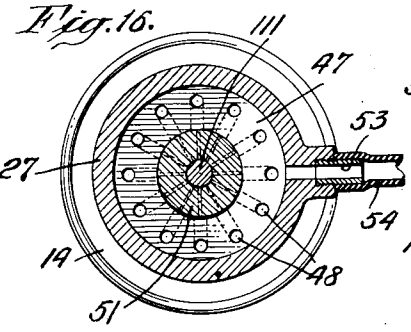


Fig. 17.

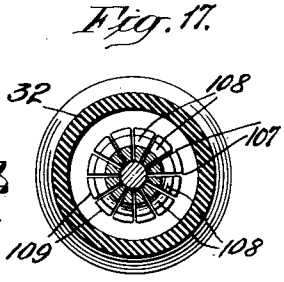


Fig. 14.

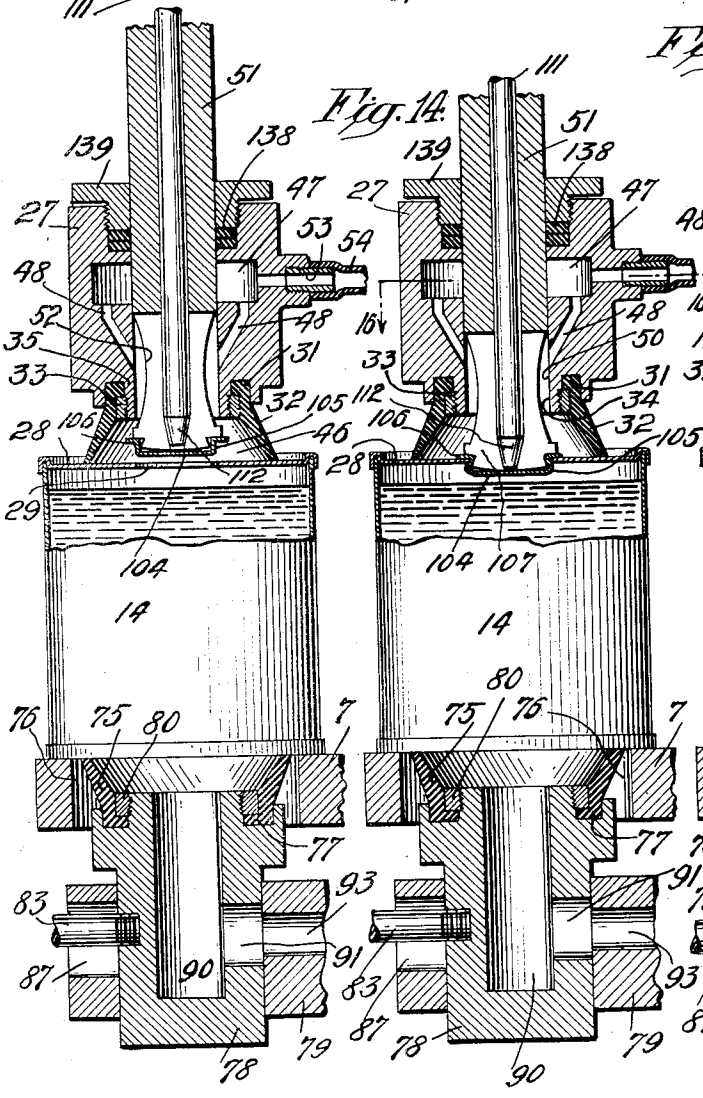
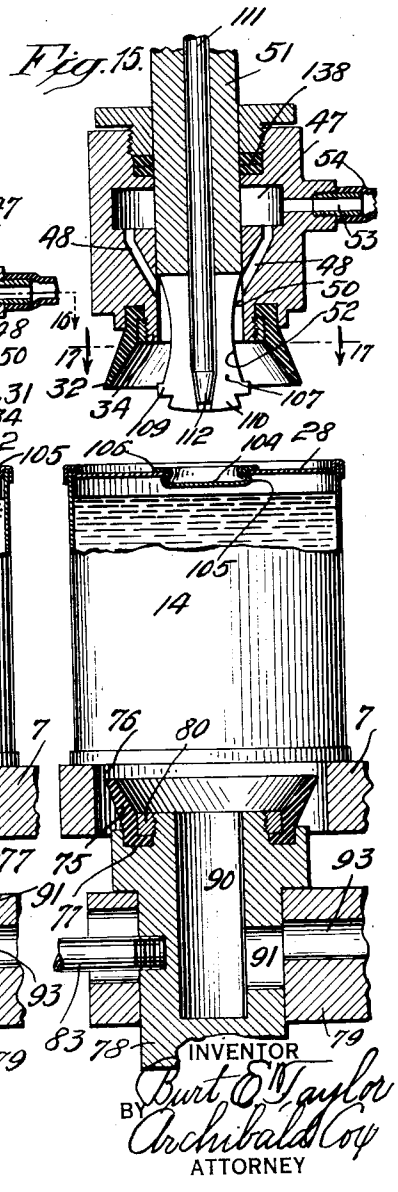


Fig. 15.



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MACHINE FOR TREATING AND SEALING CANS

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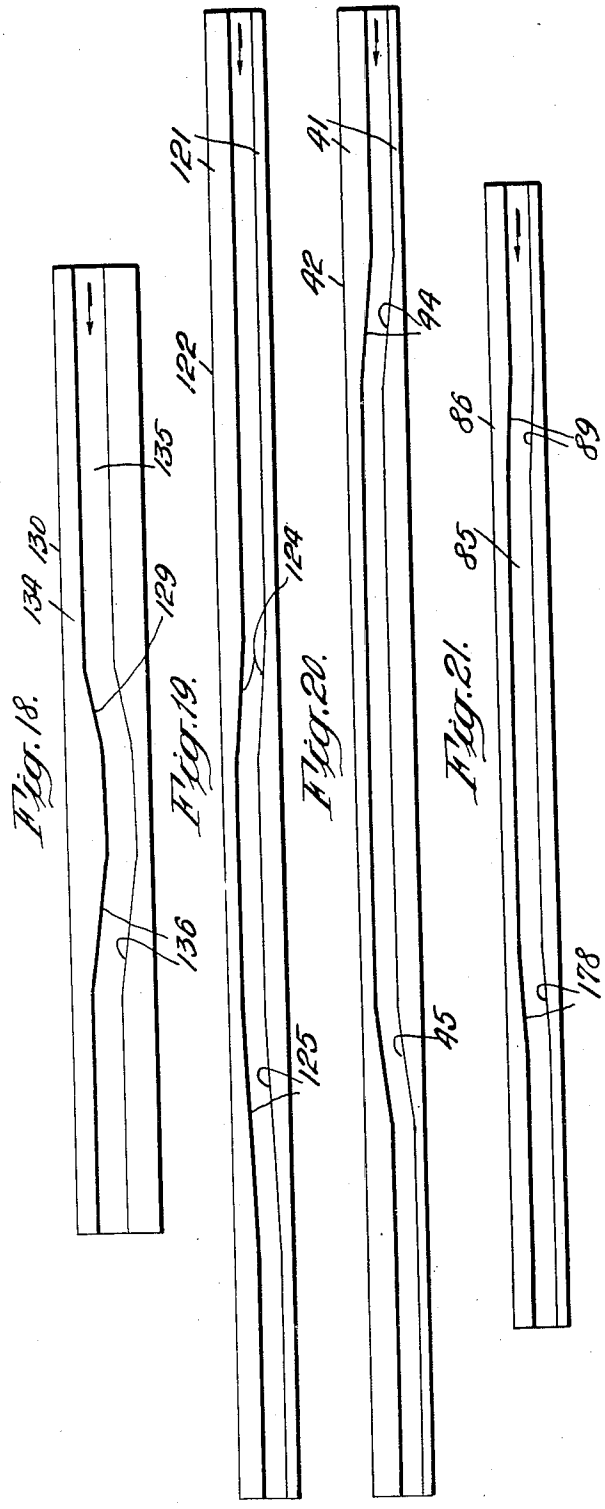


Fig. 18.

Fig. 19.

Fig. 20.

Fig. 21.

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Patented Nov. 27, 1928. 1,693,262

UNITED STATES PATENT OFFICE.

BURT E. TAYLOR, OF MOUNT VERNON, NEW YORK, ASSIGNOR TO THE BORDEN COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

MACHINE FOR TREATING AND SEALING CANS.

Application filed January 3, 1927. Serial No. 158,455.

The invention relates to an improvement in machines for treating and sealing cans, and more particularly to an improvement in that class of machines which operate to exhaust the air from cans or other containers filled with food, introduce an inert gas or other fluid or liquid into the cans to replace the air, and then hermetically seal the cans.

The object of the invention is to produce an improved machine of this type especially adapted for treating and sealing cans filled with condensed milk or the like. In accordance with this object one feature of the invention is the provision of means for creating a vacuum against the open top of the can to create a vacuum within the can, and substantially simultaneous therewith creating a vacuum against the outer surface of the bottom of the can to prevent the pressure of the atmosphere from acting on the can and disturbing the level of the contents of the can. Another feature of the invention is the provision of means for introducing an inert gas into the can to take the place of the exhausted air, and means for saving the surplus inert gas remaining in the conduits leading to the can after the can has been sealed. A further feature of the invention is the provision of means for inserting the cap in the hole in the top of the can and swaging it therein to make an air-tight joint while the can is under vacuum or is filled with inert gas. Other features of the invention relate to the construction and arrangement of parts whereby the machine is caused to act uninterruptedly, automatically and at great speed on a continuous line of cans.

In the accompanying drawings illustrating the preferred form of the invention, Fig. 1 is a partial vertical section through the improved machine; Fig. 2 is a section taken on the line 2—2 of Fig. 1; Fig. 3 is a section taken on the line 3—3 of Fig. 1; Fig. 4 is a detail section taken along the line 4—4 of Fig. 1; Fig. 5 is a section taken along the line 5—5 of Fig. 3; Fig. 6 is a detail plan on an enlarged scale of the means for feeding the filled cans and the caps into the machine; Fig. 7 is a section taken along the line 7—7 of Fig. 6; Fig. 8 is a section taken along the line 8—8 of Fig. 6, and showing in addition the action of the swinging device in picking up a cap; Fig. 9 is a vertical section on an enlarged scale through the manifold head or device connecting the cans with the vacuum creating means and with the means for supplying the inert gas; Figs. 10, 11 and 12 are sections taken respectively on the lines 10—10, 11—11, and 12—12 of Fig. 9; Fig. 13 is a vertical section through the vacuum head, the swaging device, and the device for creating the vacuum against the bottom of the can and showing them in the position they occupy while the can is under vacuum and before the cap is inserted in the can; Fig. 14 is a view similar to Fig. 13, showing the swaging device in the act of swaging the cap in the hole in the top of the can; Fig. 15 is a view similar to Fig. 14, showing the positions of the parts after the cap has been swaged in the top of the can and the can is in position to be discharged from the machine; Fig. 16 is a section taken along the line 16—16 of Fig. 14; Fig. 17 is a section taken along the line 17—17 of Fig. 15; Fig. 18 is a development of the cam for actuating the inner member of the swaging device; Fig. 19 is a development of the cam for raising and lowering the outer member of the swaging device; Fig. 20 is a development of the cam for raising and lowering the vacuum head; and Fig. 21 is a development of the cam for raising and lowering the means for creating the vacuum against the bottom of the can.

The improved machine, as illustrated in the drawings, comprises means for supporting the filled cans, means for creating a vacuum in the cans and substantially simultaneously therewith a vacuum against the outer surface of the bottoms of the cans, means for introducing an inert gas into the cans, means for hermetically sealing the cans, means for saving the surplus inert gas, and means for breaking the vacuum against the top and bottom ends of the cans. The mechanism for performing these various operations is embodied in a machine of the rotary type comprising a central, vertically arranged shaft provided with the means for supporting the cans and the means for operating on the cans to withdraw the air therefrom, supply the inert gas thereto and seal the cans. Cooperating with these elements are means for feeding the filled cans to the machine and means for feeding the caps to be placed in the open upper ends of the cans after the air has been withdrawn from the cans or after the inert gas has been introduced into them.

More specifically the improved machine

comprises the central, vertically arranged shaft 1 journaled at its lower end in the bearing 2 rising from the center of a disk-like plate 3 supported at its outer edge on the upper end of a base 4. The plate 3 and base 4 constitute a frame work which supports all the operative parts of the machine.

The means for supporting the cans during the various operations performed on them comprises a plate 7, the central hub-like portion of which is recessed to bear on the conical bearing surface 8 of the bearing 2. To eliminate friction as much as possible the ball bearings 9 are interposed between the hub of the plate 7 and the top of the bearing 2. The can supporting plate 7 is secured to the shaft 1 so as to turn therewith, the shaft receiving its actuation by means of the gear 10 secured to its lower extremity and driven from any convenient source. The cans to be treated are held in proper position on the plate 7 while they are passing through the machine for the various operations to be performed upon them by means of a star wheel 12 centered on the shaft 1 and secured to the hub of the plate 7. A collar 5 keyed to the shaft 1 and fastened to the star wheel 12 causes the star wheel and plate 7 to turn with the shaft 1. The pockets 13 of the star wheel 12 are concave to receive snugly the cylindrical body portions of the cans 14. The cans are held in the pockets 13 by means of the rail 15 which is in the form of an angle iron secured to the annular plate 16 supported by the uprights 17 rising from the outer edge of the plate 3. The annular plate 16 surrounds the disk-like can supporting plate 7 and the upper surfaces of the two plates are substantially flush, as shown in Fig. 1. That portion of the rail 15 which serves to hold the cans in the pockets 13 of the star wheel 12 is concentric with the shaft 1. At the entrance of the machine, that is, at the point where the filled cans enter the machine, the rail 15 is offset at 19 to cooperate with the rail 20 to form the lower end of a chute by which the filled cans are introduced into the machine. These cans are under the action of gravity or other propelling means so that as the capped and sealed cans are discharged from the machine, and an empty pocket 13 comes opposite the discharge end of the chute, the can occupying this position is forced into the empty pocket by the pressure of the other cans behind it. At the discharge end of the machine, that is, at the point at which the capped and sealed cans are discharged from the machine, the rail 15 is offset at 23 to constitute with the cooperating rail 24 the entrance of a chute by which the cans are conveyed away from the machine. The inner end 25 of the rail 24 extends under the star wheel 12 so that when the capped and sealed cans 21 reach the point 26 they are guided out of the machine, the propelling force being the pressure exerted on them by the arms of the star wheel.

The mechanism for creating a vacuum in the cans, and for supplying an inert gas thereto, if that is desired, comprises a series of cylindrical vacuum heads 27 supported in alinement with the pockets 13 of the star wheel 12 so as to be brought into contact with the top surface of the cans at the beginning of the operations to be performed upon them, and so as to be lifted therefrom at the completion of the sealing operation to permit the cans to be discharged from the machine. Each vacuum head 27 is adapted to be moved into contact with the top end 28 of a can 14 so as to form a hermetically sealed chamber around the central opening 29 in the top end of the can. For this purpose the lower end of the head 27 is provided with an annular recess to receive the neck portion 31 of a suction cup 32 composed of soft rubber or other flexible material. The cup 32 is held in place in the lower end of the head 27 by means of a ring 33 threaded onto the central part 34 of the head and bearing at its inner end against the internal flange 35 of the cup. Thus the cup 32 constitutes a flexible lower rim for the vacuum head.

The head 27 is lowered into contact with the top end of the can and raised therefrom by means of a lever 37 pivoted in the lower end of a bracket 38 depending from the rim of a plate 39 provided with a hub 40 mounted on the upper end of the shaft 1 and supported thereon by a flange 43. Each head 27 is pivotally and slidingly supported on the inner bifurcated end of a lever 37. To raise and lower the head 27 the outer end of the lever 37 is provided with a roll 49 which travels in a cam path formed by the inwardly extending ledges 41 of a ring 42 supported by the uprights 6. When the cam roll 49 encounters the rise 44 in the cam ring 42 at the beginning of the travel of the can through the machine the head 27 is lowered to bring the cup 32 into contact with the top of the can, and when the cam roll 49 travels down the depression 45 of the cam ring 42, the lever 37 is actuated to lift the head 27 from the top of the can.

When the head 27 is lowered onto the top end of the can thereunder, causing the cup 32 to form a hermetically sealed space 46 around the central opening 29 in the top end of the can, as shown in Fig. 13, the first operation to be performed upon the can is to withdraw the air from the can. For this purpose the head 27 is provided with an annular chamber 47 connecting by the passages 48 with the lower end of the vertical axial bore 50 which extends through the head 27. The lower end of the bore 50 opens into the cup 32. In this bore 50 reciprocates the lower end of the outer member 51 of the cap swaging device. The member 51 of the swaging

device is concaved at the point 52 opposite the lower ends of the passageways 48, and by this means a free passage is established between the chamber 47 and the interior of the cup 32.

In the side wall of each head 27 is a nipple 53 which leads into the chamber 47 and receives on its outer projecting end one end of a flexible tube 54, the other end of which is secured to a nipple 55 screwed into the bottom of the flange part 56 of the hub 40 of the plate 39 in alinement with a vertical hole 57 which passes through the flange 56 and into an inverted cap or manifold 58 secured at its flanged portion 59 to the outer edge of the flange 56 of the hub 40. The vertical holes 57 are located in the outer rim of the manifold 58, and each hole 57 corresponds to the head 27 with which it is connected by a flexible tube 54. The upper end of each hole 57 terminates in the outer end of one of a series of radial holes 60 formed in the upper part of the manifold 58. As the manifold 58 rotates with the shaft 1, the holes 60 are successively brought into alinement with the outer end of a wedge-shaped hole 62 formed radially in the upper part of a cone shaped head 63 which engages with the inner, corresponding cone surface of the manifold 58. The upper central part 64 of the head 63 projects through a central opening in the top of the manifold 58 and receives tightly the lower end of a pipe 65 the upper end of which is secured by a collar 66 to the plate 67 forming the top of the machine and supported on the upper ends of the uprights 6. In this manner the head 63 is held against turning while the manifold 58 rotates about it. The lower part of the head 63 is provided with a central boss 68 which loosely enters the top end of shaft 1. The lower surface of the outer part of the bottom of the head 63 is spaced apart from the top surface of the hub 40 to provide a chamber which opens into the atmosphere by the radial holes 70. The inner end of the wedge-shaped hole 62 opens into a central hole 72 in the top of the head 63 which connects with the interior of the pipe 65. The upper end of the pipe 65 is provided with a flexible hose connection 73 which leads to a pump or other air exhausting means. Thus as each hole 60 comes opposite the outer end of the hole 62 during the rotation of the manifold 58, the head 27 connected therewith is exhausted of air and a vacuum is created in the can with which the head is in contact.

The cans or other receptacles to be treated and then sealed by the improved mechine are usually composed of tinned metal which is relatively thin. Owing to its shape the cylindrical body portion of the can is able to withstand the crushing effect of the air in spite of a relatively high vacuum within the can. The flat ends of the cans, however, cave inwardly when a vacuum is created within the can. In order to prevent the bottom of the cans from caving inwardly when the air is withdrawn from the cans and thereby prevent the contents of the cans from overflowing through the opening 29 in the top thereof, I provide means for creating a vacuum against the outer or lower surface of the bottom of each can. This vacuum is created either previous to or simultaneous with the vacuum which is created within the can and continues until the can is sealed.

The means for creating the vacuum against the lower surface of the bottom of each can comprises a suction cup 75 composed of rubber or other flexible material and of substantially the same shape and size as the cup 32. The size of the cup 75 is such that when it is pressed against the bottom of the can and a vacuum is created in it, the air pressure on the rim of the bottom of the can surrounding the rim of the cup 75 can not press the bottom of the can inwardly, even though a high vacuum is created within the can. The cup 75 reaches the bottom surface of the can through a hole 76 formed in the rim of the plate 7. The holes 76 are slightly smaller in diameter than the cans 14 and are in axial alinement with the pockets 13 of the star wheel 12. Each cup 75 consists of a flared rim adapted to press against the bottom of the can and an annular base 77 received within an annular hole in the upper part of a plunger 78 slidingly received in a vertically arranged hole in the rim of the outward extension 79 of the lower part of the plate 7. The base of each cup 75 is secured in the top of its plunger 78 by means of a ring 80 screwed onto the threaded central part of the upper end of the plunger and bearing at its lower end against the inturned flange of the base of the cup.

The means for raising the plunger 78 to bring the flexible cup 75 in contact with the bottom of the can and for lowering it to disengage it therefrom, comprises a pin 83 screwed at its inner end into the outer side of the plunger and carrying on its outer end a roll 84 which travels in the cam path 85 formed in the inwardly flanged ring 86 secured to the under surface of the inner edge of the annular plate 16. The pin 83 travels in the vertical hole 87 formed in the rim of the part 79 of the plate 7. When the roll 84 encounters the rise 89 in the cam path 85 the plunger 78 is lifted to force the flexible cup 75 against the bottom of the can. The rise 89 in the cam path 85 is slightly behind the cam rise 44, so that when the flexible cup 32 is lowered onto the upper surface of the top of the can, immediately therafter the flexible cup 75 is raised and pressed against the lower surface of the bottom of the can.

The means for creating the vacuum within the cup 75 comprises an axial hole 90 formed

in the vertically arranged plunger 78 and connecting at its upper end with the space within the cup 75. The hole 90 connects at its lower end by a radial hole 91 in the plunger 78 with a radial hole 93 formed in the lower part 79 of the plate 7. The hole 91 is larger in vertical measure than the hole 93 so that the hole 91 will always be in alinement with the hole 93, irrespective of the vertical position of the plunger 78. The radial holes 93 in the part 79 of the plate 7 open at their inner ends in the cone-shaped bearing surface of the central or hub part of the plate 7. As the plate 7 rotates the holes 93 are successively brought into alinement with an arc-shaped groove 94 formed in the cone-shaped upper end 8 of the hub 2. The groove 94 connects by a vertical hole 95 in the hub 2 with a tube 96 which leads to the vacuumizing means. The length and position of the groove 94 are such that each hole 93 comes into alinement with its forward end at substantially the same time that a hole 60 moves into alinement with the hole 62, so that a vacuum is created against the lower surface of the bottom of the can substantially simultaneously with the creation of the vacuum in the can. Consequently there is no buckling of the bottom of the can.

In case it is desired to introduce an inert gas such as nitrogen, carbon dioxide or the like into the can after the air has been withdrawn therefrom I provide a second series of radial holes 98 in the manifold 58 and connected at their outer ends with the vertical holes 57. The inner ends of the holes 98 are adapted to move into alinement with the outer end of the wedge-shaped hole 99 formed in the head 63 and the inner end of which opens into the lower end of a tube 100 located within the tube 65. The upper end of the tube 100 passes through a coupling 101 (which seals the upper end of the tube 65) and connects by the valve controlled pipe 102 with the source of the inert gas. The angular relationship between the hole 62 and the hole 99 is such that when the hole 60 connected with the head in contact with the vacuumized can has passed beyond the hole 62, the next succeeding hole 98 comes into alinement with the hole 99 to supply the inert gas to the can.

After the inert gas has been introduced into the can, the can is hermetically sealed by placing a cap 104 in the hole 29 in the top of the can and swaging the cap so as to form an air-tight joint between it and the edges of the hole 29. The cap 104 comprises a dish-shaped body portion 105 having on its upper edge a flat circular rim 106 (Fig. 5). The member 51 of the swaging device operates to place the cap 104 in the hole 29 on the completion of the gas introducing step, and then the member 51 of the swaging device is operated to hold the rim 106 of the cap against the edge of the hole 29 while the bottom end 107 of the member 51 is spread laterally to force the side walls of the body portion 105 of the cap outwardly, thereby effectually sealing the joint between the cap 104 and the hole 29.

The swaging device for placing the cap 104 in the hole 29 and then swaging the joint between the cap and the top of the can comprises the vertically arranged outer member 51 the lower end of which is slidingly received in the central bore 50 of the head 27. The lower extremity of the member 51 is slotted radially and so is divided into the sectors 108 (Fig. 17). The flanged part 109 of the sectors 108 serve to hold the rim 106 of the cap against the top of the can while the pointed lower edges 110 operate to expand or bulge outwardly the side walls of the body portion of the cap. The lower ends of the sectors are spread outwardly by means of a plunger rod 111 slidingly received within the member 51 and having its lower end 112 formed as a cam surface which acts on the correspondingly shaped lower end of the hole in the member 51.

The member 51 of the swaging device is slidingly held in its vertical position by means of a lower bearing 113 inserted in a hole formed in the plate 39 and in an upper bearing 114 formed on a bracket 115 supported from the manifold 58. The member 51 is provided on its upper end with a flange 116 which is adapted to contact with the bearing 114 and limit the downward movement of the member 51 in inserting the cap into the head of the can; and thus the member 51 is held stationary as the rod 111 is moved downward to spread the lower ends of the sectors 108. The means for lowering and raising the member 51 is a lever 118 pivoted on the bracket 119 rising from the rim of the plate 39. The inner end of the lever 118 is bifurcated to embrace loosely the member 51 with which it is pivotally and slidingly connected, and the outer end of the lever 118 carries a roll 120 which travels in a cam path formed by the ledges 121 projecting inwardly from the ring 122 supported above the ring 42 by the uprights 6. When the roll 120 encounters the rise 124 in the cam path 121 after the hole 98 (connected with the can in question) passes out of alinement with the hole 99 leading to the source of inert gas, the lever 118 is actuated to cause the member 51 to descend and insert the cap into the can which has just been supplied with the inert gas. If no gas is to be used to supplant the air withdrawn from the can, the member 51 will be actuated to insert the cap into the can on the completion of the vacuumizing operation. After the plunger rod 111 has been operated to spread the lower ends of the sectors 108 to swage the cap into place and has been withdrawn into inoperative position the member 51 is lifted out of the cap. This ac-

tion takes place with relative rapidity and has no other relationship to the air exhausting and gas supplying steps than that these steps are completed first. When the cam roll 120 passes down the depression 125 of the cam path 121, the lever 118 is actuated to raise the member 51 from engagement with the cap which has just been swaged.

The means for actuating the plunger rod 111 to spread the lower part of the sectors 108 of the members 51 for the swaging operation comprises a cam roll 127 journaled in the forked upper end 128 of the rod 111. When the cam roll 127 moves under the cam surface 129 formed on the inwardly projecting ledge 134 of the cam ring 130 supported from the upper ends of the uprights 6, the rod 111 is depressed to perform the swaging operation. The cam roll 127 is arranged axially over the rod 111 so that there will be a direct axial thrust on the rod 111 by the cam surface 129. The rod 111 is raised by means of a roll 132 carried on the outer end of the shaft 133 on which the cam roll 127 is supported. The cam roll 132 travels in the path 135 of the cam ring 130 and when the roll 132 encounters the rise 136 therein the rod 111 is lifted to disengage the cam part 112 thereof from the contracted lower end of the hole in the member 51, thereby permitting the sectors 108 to return to normal position. The angular relation between the cam parts 124 and 129 on the one hand and 136 and 125 on the other is such that as the movable parts of the machine rotate, carrying the cans and the swaging devices with them, the member 51 is first depressed by the engagement of the roll 120 with the rise 124, the rod 111 is then forced downwardly by the engagement of the roll 127 with the depression 129, the rod 111 is then raised by the engagement of the roll 132 with the rise 136, and finally the member 50 is lifted by the engagement of the roll 120 with the depression 125. In order to prevent any leakage of air past the movable joint between the head 27 and the member 51, the head 27 is recessed on its upper side to receive the packing rings 138 compressed and held in place by the gland 139. To prevent any leakage past the movable joint between the member 51 and the rod 111 a rubber collar 140 surrounds the rod 111 and bears at its lower end against the top of the flange 116 against which it is held by means of the collar 141 secured to the rod 111. When the rod 111 is depressed the collar 140 collapses, and when the rod 111 rises again the collar 140 returns to normal condition, at all times keeping the joint between itself and the upper end of the member 51 and the lower surface of the collar 141 tight.

The caps 104 are fed into position to be picked up and held on the lower end of the member 51 by a chute down which the caps are fed by gravity and of which only the lower end 143 is indicated in the drawings. The upper parts of the cap conveying chute are of course enclosed to prevent the caps from falling out but the lower end 143 of the chute is on a slight incline only and therefore requires no top to keep in the caps 104, the side walls 144 of the chute serving to guide the caps properly. The lower extremity of the chute is provided with an offset portion 145 the side wall 146 of which serves as a stop to arrest the travel of the caps until each lowermost cap is to be removed from the line of caps by the means which places it in position to be taken up by the lower end of the member 51 of the swaging device. To effect this operation the offset end 145 of the chute curves inwardly and rises slightly at the point 147 which is located over substantially the path of travel of the centers of the cans. The lowermost cap 148 in the row of caps in the chute is removed from its place and shoved forward onto the rise 147 in position for the member 51 to pick it up by means of a rod 150 slidingly mounted in the bearing 151 projecting rearwardly from the lower end of the chute. The head 152 of the rod 150 is received within a recess in the rear wall of the chute while the rod 150 is in inoperative position so as not to interfere with the travel of the caps to their position against the wall 146. The rod 150 is actuated by the can which has just been engaged by a pocket of the star wheel 12. For this purpose the outer end of the rod 150 is articulated by a pin and slot connection 154 with the outer end of an arm 155 projecting inwardly from a pin 156 journaled at its lower end in the boss 157 secured to the base of the rail 19. A second arm 158 secured to the pin 156 projects inwardly into the path of travel of the cans. When a can encounters the inner end of the arm 158 the pin 156 is oscillated and the rod 150 is moved forward to shove the cap 148 onto the incline 147, the position of the cap on the incline being indicated by the dotted lines 159 in Fig. 6. When the can passes out of engagement with the arm 158 the spring 160 operates to return the rod 150 and the arm 158 to inoperative position. In order that the lower edge of the head 152 of the rod 150 may not scrape against the bottom of the chute, a slot 161 is provided.

While the cap is on the inclined portion 147 of the chute it is in position for the lower end of the member 51 to enter the body portion of the cap, as indicated in Figs. 7 and 8. As the member 51 continues its travel it carries the cap along with it, forcing the cap up the incline onto the level raised end 163 of the chute, thereby causing the lower ends of the sectors 108 to enter fully into the body portion of the cap, as indicated by the dotted lines in Fig. 8. This action is aided by yieldingly supporting the end of the chute by the bracket 162 supported on

the plate 16. The lower ends of the sectors 108 have a slightly larger diameter than the internal diameter of the body portion of the caps, and since the lower ends of the sectors 108 are under spring tension, the cap will be held on the sectors until the member 51 is actuated to insert the cap into the hole 29 of the can. To prevent the cap 159 on the incline 147 from accidental displacement the side wall 164 of the end of the chute is recessed to receive the spring 165 which presses against the edge of the rim portion 106 of the cap. As the cap is moved out of the open discharge end of the chute it forces the spring 165 into the recess.

In order to save the inert gas remaining in the passages of the head 27, in the tube 54 and in the holes 57 and 98, I provide means for conducting away this surplus gas and carrying it back to the source of supply. This means comprises a wedge-shaped hole 167 formed radially in the head 63 on substantially the same plane as the hole 62 so as to register with the holes 60. The hole 167 connects at its inner end with a hole 168 which passes obliquely down through the head 63 and connects at its lower end in the center projection 68 of the head 63 with the hole 169 which opens into the upper end of the tube 170 located within a hollow shaft 1. The lower end 171 of the tube 170 leads to a pump or other means for conducting the surplus inert gas back to the source of supply. The angular relation between the hole 167 and the hole 99 is such that when the hole 98 (in question) has passed out of registry with the hole 99, the hole 60 corresponding thereto moves into alinement with the hole 167, and the surplus gas is removed from the passageways leading from the head 63 to the can which has just been sealed. The angular relation between the hole 167 and the cam part 129 is such that the hole 167 does not register with the hole 60 connected with the can being sealed until after the cam roll 132 leaves the cam part 129.

In order that the suction cup 32 may be lifted from the can it is necessary to break the vacuum. This is done by providing a wedge-shaped hole 173 in the head 63 formed on substantially the same plane as the hole 99 so as to register with the holes 98. The inner end of the hole 173 terminates within the base of the head 63 and turns downwardly to enter the space between the lower surface of the head 63 and the top surface of the hub 40. This space is connected by the holes 70 with the atmosphere. Thus when in the rotation of the manifold 58 and the parts connected therewith, the hole 98 connected with the can which has just been sealed and the surplus gas recovered therefrom registers with the hole 173, the vacuum in the head 27 is broken by establishing a clear passage from the chamber 46 (formed by the cup 32 with the top of the can) to the atmosphere. After the vacuum against the top of the can has been broken, the head 27 is raised by the engagement of the cam roll 49 with the depression 45 in the cam ring 42.

The vacuum created against the lower surface of the bottom of the can is not broken until the vacuum against the top of the can is broken. This is to assure that the can will remain firmly in place until all the operations performed on the top of the can have been completed and the head 27 raised clear thereof. The vacuum against the lower surface of the bottom of the can is broken by providing an arcuate groove 176 in the cone-shaped upper end 8 of the hub 2, almost diametrically opposite the groove 94, and on substantially the same plane as the groove 94 so as to register with the holes 93. The groove 176 connects with the atmosphere through the vertical hole 177 in the hub 2.

After the vacuum against the lower surface of the bottom of the can has been broken the suction cup 75 is pulled away from the bottom of the can by the downward movement imparted to the plunger 78 by the cam roll 84 when it reaches the depression 178 in the cam path 85.

The cup 75 is moved out of engagement with the bottom of the can at about the point 179 in the travel of the cans through the machine. The can is now in condition to be discharged from the machine. This is done by the arm of the star wheel propelling the can through the machine. When the can reaches the point 26 the inner end 25 of the rail 24 causes the can to be pushed outwardly through the discharge end of the cam run until the arm of the star wheel 12 in engagement therewith is free to pass by. The discharged can remains in this position (at 180, Fig. 3) until the next sealed can engages it and pushes it out of the machine.

The mode of operation of the improved machine is briefly recapitulated as follows:— Referring to Fig. 3, the filled cans 14 to be treated and sealed enter the machine through the can chute constituted by the rails 19 and 20. When a sealed can 21 has been discharged from the machine leaving the pocket 181 of the star wheel empty, the innermost can of the row of cans in the can chute is forced by the pressure of the other cans in the chute into the empty pocket. As this can encounters the arm 158, the rod 150 is actuated to shove the lowermost cap 148 onto the inclined portion 147 of the end of the cap chute, where it is picked up by the lower end of the outer member 51 of the swaging device. The can which has just entered the machine and the cap therefor are then carried through the machine together, the cap being held above the opening 29 in the can until after the can has been subjected to the various

steps of the treatment to be performed on it.

After the can and its cap have passed beyond the end 163 of the chute, the cam roll 49 encounters the rise 44 of the cam ring 42, and the head over the can is thereby caused to descend until the flexible cup 32 forms an air-tight chamber with the top of the can around the hole 29 therein. Immediately after this action the cam roll 84 encounters the rise 89 in the cam path 85, whereby the plunger 78 is lifted to bring the flexible cup 75 into contact with the lower surface of the bottom of the can. After the cups 32 and 75 have been pressed against the top and bottom ends of the can, respectively, the hole 60 corresponding to the can moves into alinement with the hole 62 connected with the pump which exhausts the air from the head 27 and the interior of the can, and the hole 93 corresponding to the can moves into alinement with the groove 94 and hole 95 connected with the means for creating the vacuum in the cup 75. Thus when the air is exhausted from the can a vacuum is created against the lower surface of the bottom of the can.

When it is desired to substitute an inert gas for the air which has been withdrawn from the can, the hole 98 corresponding to the can will move into alinement with the hole 99 connected with the source of inert gas after the hole 60 has passed out of alinement with the hole 62. The can is now in condition for capping and sealing. The member 51 of the swaging device is lowered to insert the cap into the hole 29 in the top end of the cam due to the fact that the cam roll 120 encounters the rise 124 of the cam ring 122. The downward travel of the member 51 is limited by the engagement of the flange 116 with the bearing 114, and the parts are so related that the downward movement of the member 51 brings the flange part 106 of the cap against the upper surface of the top of the can and no more. The inner member 111 of the swaging device is now caused to descend to expand the sectors 108 of the member 51 to swage the cap and make a tight joint between it and the top of the can. This is done when the cam roll 127 connected with the member 111 encounters the cam surface 129 of the cam ring 130. The farther travel of the can and the parts connected with it brings the cam roll 132 into engagement with the rise 136 of the cam path 135 and the member 111 is thereby raised to disengage the lower end thereof from the lower end of the hole in the member 51. Immediately after this action the cam roll 120 passes down the incline 125 of the cam ring 122 so that the member 51 of the swaging device is withdrawn from the cap.

After the can has been sealed, assuming an inert gas has been introduced into the can, the surplus inert gas remaining in the passages of the head 27, in the tube 54 and in the holes in the manifold 58 and head 63, is saved and conducted back to the source of supply when the hole 60 connected with the sealed can moves into registry with the hole 167 connected with the pipe 170. After the surplus inert gas has been saved the vacuum against the top of the can is broken when the hole 98 is connected with the sealed can moves opposite the hole 173 which is connected with the atmosphere through the holes 70. The head 27 may now be lifted from the can, and this is accomplished by the engagement of the cam roll 49 with the depression 45 in the cam ring 42.

While the head 27 is being lifted from the can the vacuum against the bottom of the can is broken by the fact that the hole 93 connected with the can moves opposite the hole 177 leading to the atmosphere. The suction cup 75 is then moved downwardly out of engagement with the bottom of the can when the cam roll 84 enters the depression 178 of the cam path 85. The breaking of the vacuums may be substantially simultaneous, and the lifting of the member 51 of the swaging device (after its initial freeing from the cap) may take place while the cups 32 and 75 are moving away from the can, as indicated by the relative positions of the cam parts 125, 45 and 178 in Figs. 19, 20 and 21. The sealed can is now in condition to be discharged from the machine, this being effected by the arm of the star wheel which propelled the can through the machine. The star wheel leaves the can at the point 180 and the next can to be discharged from the machine pushes the preceding can out through the discharge chute.

Having thus described the invention, what I claim as new is:—

1. A machine for treating and sealing cans having a hole in their top ends, comprising a vertically arranged shaft, means for turning the shaft, a can supporting plate attached to the shaft and having a hole therein affording access to the bottom of the can, means whereby a vacuum is created against the lower surface of the bottom of the can, a head carried by the shaft and adapted to contact with the top of the can to form an air-tight space around the hole therein, said head being provided with a passageway, a manifold connected with the shaft and having a hole leading to the passageway in the head, a stationary member cooperating with the manifold and having a hole therein adapted to register with the hole in the manifold, said member being adapted to be connected with an air exhausting means, and means for inserting a cap in the hole in the can and sealing it therein.

2. A machine for treating and sealing cans having a hole in their top ends, comprising, a vertically arranged shaft, means for turning

the shaft, a can supporting plate mounted on the shaft and having a hole in its rim over which the can is placed, a hollow plunger slidingly supported in the plate and having a flexible upper rim adapted to contact with the bottom of the can, means for raising and lowering the plunger, means whereby the air is exhausted from the plunger to create a vacuum against the bottom of the can, a head supported from the shaft and adapted to contact with the top of the can to form an air-tight space around the hole therein, a manifold connected with the shaft and having a hole leading to the head, a stationary member having a series of holes therein, one hole of the member being adapted to be connected with an air exhausting means, another hole in the member being adapted to be connected with a supply of inert gas, a third hole in the member being adapted to be connected with means for withdrawing the inert gas from the head after the can has been sealed, and a fourth hole in the member leading to the atmosphere, the hole in the manifold being adapted to successively aline with the holes in the stationary member, and means for inserting a cap in the hole in the top of the can and sealing it therein.

3. A machine for treating and sealing cans having a hole in one end, comprising, a head adapted to contact with the end of the can to form an air-tight space around the hole therein, means whereby a vacuum is created against the outer surface of the other end of the can, a manifold having a hole connected with the interior of the head, a member having a series of holes therein:—one hole being adapted to be connected with means for exhausting the air from the can, a second hole being adapted to be connected with means for supplying inert gas to the can, a third hole being adapted to be connected with means for removing the inert gas from the head after the can has been sealed, and a fourth hole leading to the atmosphere, said manifold and said member being relatively movable, the hole in the manifold being adapted to register successively with the holes in the member, and means for inserting a cap in the hole in the can and sealing it therein.

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