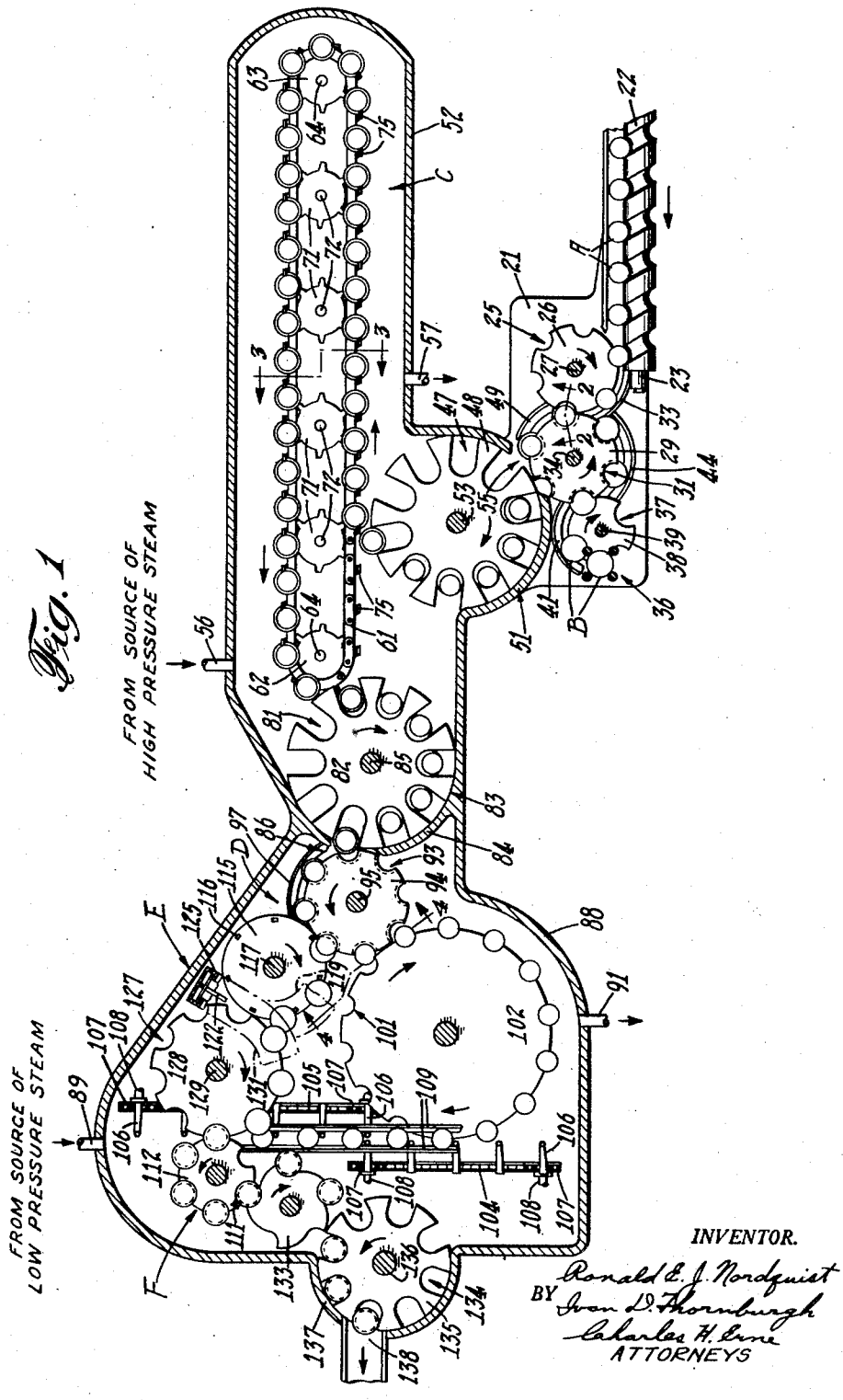
July 24, 1951 R. E. J. NORDQUIST 2,561,404

FILLING AND CLOSING MACHINE WITH CAN AND COVER HANDLING DEVICE

Filed Feb. 27, 1948

3 Sheets-Sheet 1

Fig. 1



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Filed Feb. 27, 1948 3 Sheets-Sheet 2

Fig. 2

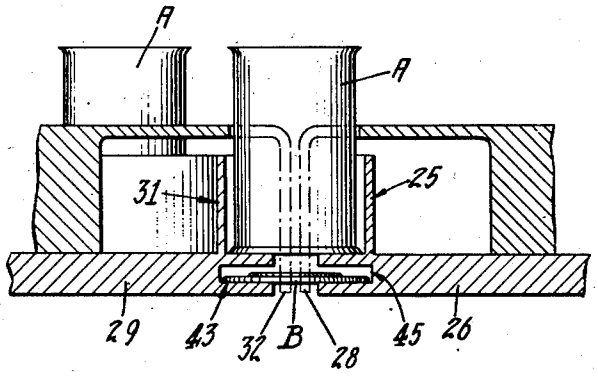
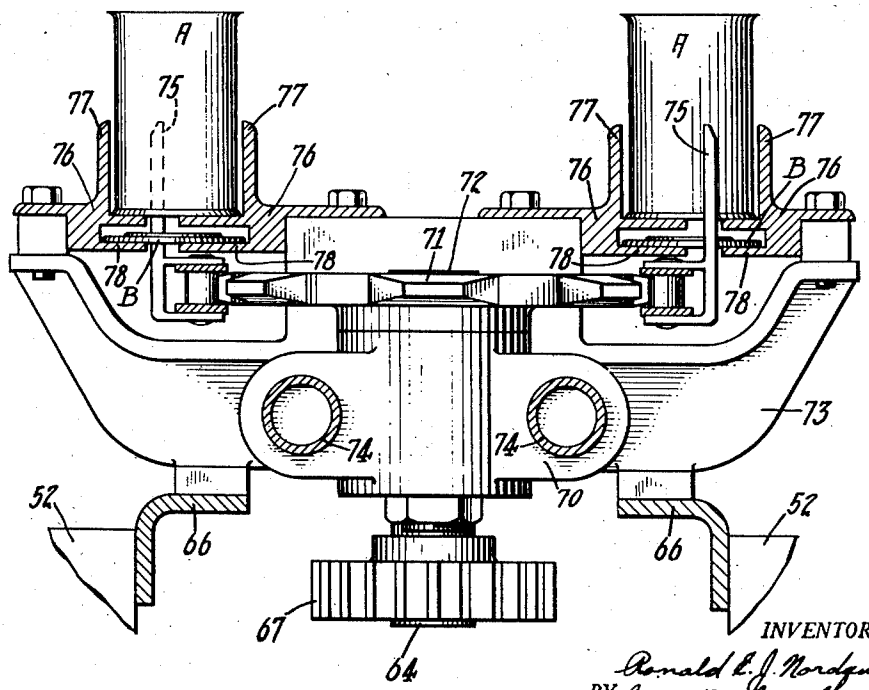


Fig. 3



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Filed Feb. 27, 1948 3 Sheets-Sheet 3

Fig. 4

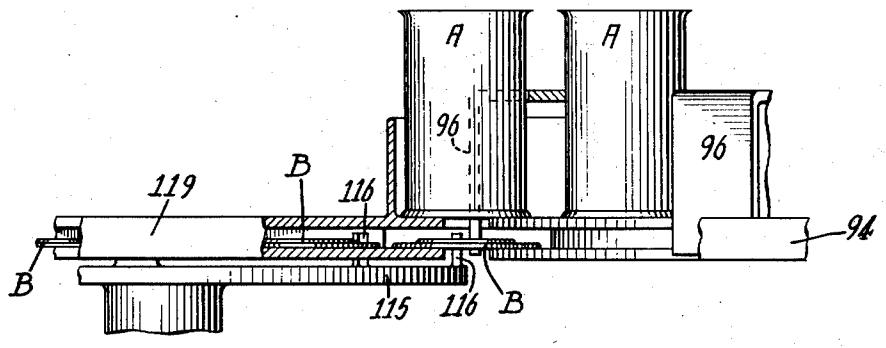
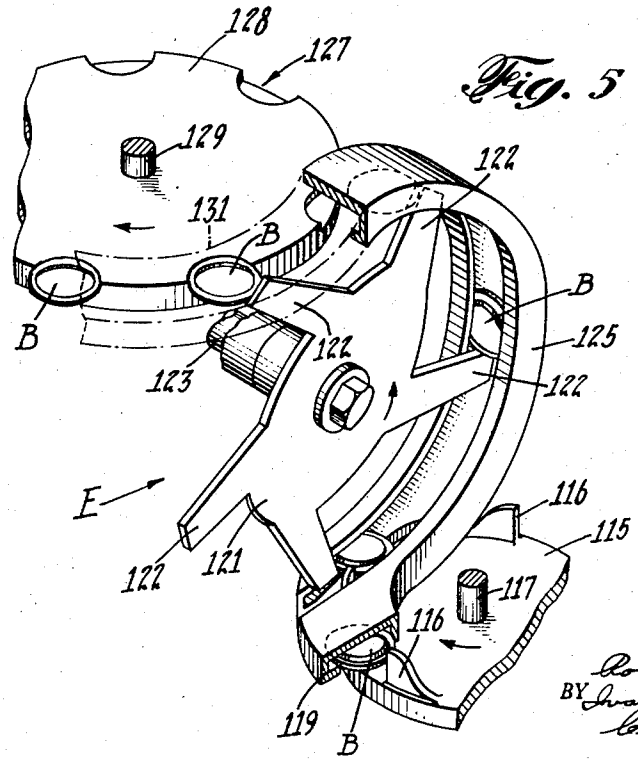


Fig. 5



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2,561,404

UNITED STATES PATENT OFFICE

2,561,404

FILLING AND CLOSING MACHINE WITH CAN AND COVER HANDLING DEVICES

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Application February 27, 1948, Serial No. 11,776

4 Claims. (Cl. 226—68)

1

The present invention relates to a machine for filling and closing containers or cans under sterile conditions and has particular reference to devices for handling cans and their covers simultaneously while traveling through sterile treating chambers. This is a companion application to my copending United States application Serial No. 11,777, filed February 27, 1948, on Conveyor Mechanism With Supporting Sprockets.

An object of the invention is the provision in an aseptic filling and closing machine of devices wherein the cans and the covers may be advanced through the machine for a sterilizing or other treatment simultaneously and in a predetermined aligned relation which is unaffected by the height of the cans so that the machine may be readily utilized for cans of different heights without affecting the feeding devices for the cans and their covers.

Another object is the provision of such a machine wherein the treating of the containers and their covers and the filling and closing of the containers may be carried on continuously as the containers and their covers travel through the machine in a continuous procession and in spaced relation with the covers beneath the container bodies.

Another object is the provision of such a machine wherein the covers may be treated in an inverted position to effect proper treatment of the inner face of the covers, the treated covers being turned over into an upright position just prior to assembly with the cans for closing.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a top plan sectional view of a machine embodying the instant invention, with parts broken away;

Fig. 2 is an enlarged fragmentary sectional view taken substantially along the broken line 2—2 in Fig. 1, the view showing cans and covers in place in the machine;

Fig. 3 is an enlarged sectional view taken substantially along the line 3—3 in Fig. 1, the view showing cans and covers in place and parts broken away;

Fig. 4 is an enlarged fragmentary sectional view taken substantially along the broken line 4—4 in Fig. 1, the view showing cans and covers in place; and

Fig. 5 is an enlarged fragmentary perspective view of cover turnover devices used in the machine, the view showing covers in place in the devices.

As a preferred embodiment of the invention the drawings illustrate principal parts of a sterilizing, filling and closing machine in which sheet metal containers or cans A (Fig. 1) in an upright position, and unattached and inverted or upside down sheet metal covers or end members B disposed under and in alignment with the cans, simultaneously travel through a sterilizing section or chamber C for sterilizing the cans and the covers prior to transfer into a filling and closing chamber D which is a sterile chamber. Within the filling and closing chamber D the sterilized cans and their covers travel along independent paths of travel, the cans moving along one path of travel for filling with a product and the covers moving along another path of travel which leads into a turnover device E which turns the covers over into proper position for application to the cans and also elevates them to a plane above the tops of the cans. This action is followed by a meeting of the filled cans and their righted covers and an introduction into a can closing mechanism F which permanently seals the covers to the cans. The sealed cans thereafter are discharged from the machine to any suitable place of deposit.

2

The cans A are received from any suitable source of supply of such cans, upon a horizontal table 21 (Fig. 1) which forms a part of the machine and are advanced along this table in spaced and timed order by a continuously rotating propelling screw 22 carried in bearings 23 formed on the table. The screw is rotated in any suitable manner in time with the other moving parts of the machine. As the cans are advanced, they are deposited into pockets 25 of a continuously rotating receiving turret 26 (see also Fig. 2) carried on a shaft 27 journaled in suitable bearings formed in the table 21. The shaft is rotated in any suitable manner in time with the screw 22. Adjacent each pocket, the turret is formed with a depending finger 28 (Fig. 2) which engages behind a can for advancing it in time with the rotation of the turret.

The receiving turret 26 carries the cans A forward into a transfer turret 29 (see also Fig. 2) having spaced pockets 31 for the reception of the cans. This turret like the receiving turret 26 is formed with can propelling fingers 32. Guide rails 33 adjacent the outer periphery of the receiving turret retain the cans in the turret pockets 25 during this advancement. The transfer turret 29 is mounted on a shaft 34 journaled in suitable bearings formed in the table 21. This shaft is rotated in any suitable manner in time with the receiving turret 26.

In the transfer turret 29, a can A is received above and in vertical alignment with a cover B which has been previously deposited in the transfer turret. These covers B are fed in an inverted position from a stack of such covers located in a magazine 36 (Fig. 1) of a cover feed device such as disclosed in United States Patent

2,039,338, issued May 5, 1936 to R. E. J. Nordquist et al. on Vacuum Closing Machine. The cover feed device introduces a cover B into a pocket 37 of a cover turret 38 mounted adjacent the transfer turret 29. The cover turret is carried on a rotatable shaft 39 journaled in bearings formed in the table 21 and rotated in any suitable manner in time with the transfer turret 29.

A cover B carried forward by the cover turret 38 is retained within its pocket by a guide rail 41 disposed adjacent the outer periphery of the cover turret. An advanced cover is introduced by the cover turret 38 into an annular groove 43 (Fig. 2) formed in the outer peripheral edge of the transfer turret 29 just below the can pockets 31 and is immediately engaged by the depending finger 32 as the turret rotates and is thus advanced with this turret. The finger extends down below the turret for this purpose. A curved guide rail 44 disposed adjacent the outer edge of the transfer turret 29 retains the cover in place in the groove 43.

The annular groove 43 in the transfer turret 29 is in horizontal alignment with a similar groove 45 (Fig. 2) formed in the outer edge of the receiving turret 26 just below the can pockets 25 of this turret. Hence as the receiving turret 26 advances a can, the transfer turret advances a cover, and they both meet in the transfer turret with the cover in an inverted position beneath the can and in spaced vertical alignment therewith. In this relation the can and its cover are advanced by the transfer turret into a pocket 47 of a rotating entrance valve 48 (Fig. 1). During this advancement the can and its cover are retained in place in the transfer turret by a curved guide rail 49 which is disposed adjacent the outer edge of the turret.

The rotating valve 48 is disposed in a cylindrical seat 51 formed in an outer wall of an elongated housing 52 that encloses the sterilizing chamber C. The valve is mounted on a shaft 53 journaled in bearings formed in the housing 52 and rotated in any suitable manner in time with the transfer turret 29. The cans and covers are shifted simultaneously from the transfer turret 29 into a pocket 47 of the valve, through an entrance opening 55 formed in the valve seat 51.

Steam is circulated through the chamber C for sterilizing the cans and the covers introduced into the chamber. The temperature of the steam may be varied in accordance with the speed of travel of the cans and covers through the machine to effect thorough sterilization, as for example when cans and covers are traveling at a rate of 250 per minute a steam range of from 270° to 300° may be used. The steam is circulated by way of an inlet pipe 56 and an outlet pipe 57 which are threadedly secured in the wall of the housing 52. The inlet pipe leads from any suitable source of high pressure steam while the outlet pipe leads to a drain or exhaust for the spent steam. The valve 48 seals off the can and cover entrance of this steam chamber from the atmosphere while permitting the cans and covers to be passed into the chamber.

The cans A and their covers B disposed therebeneath upon introduction into the steam filled sterilizing chamber C by the valve 48 are conveyed lengthwise of the chamber along a predetermined path of travel to insure proper sterilizing of the cans and the covers. For this purpose the cans and the covers while remaining in their relative superimposed positions are received from the valve 48 onto a horizontally disposed endless chain conveyor 61 located within the housing 52. The conveyor operates continuously over a driving sprocket 62 and an idler sprocket 63. These sprockets are mounted on vertical shafts 64 journaled in suitable bearings formed in cross brackets (see Fig. 3) carried on longitudinal rails 66 secured to the housing 52. The drive shaft 64 is rotated in any suitable manner, as by a gear 67, in time with the other moving parts of the machine.

Intermediate the operating sprockets 62, 63, the conveyor 61 is supported against sagging, in a horizontal position by a plurality of spaced sprockets 71 (Figs. 1 and 3) which are interposed between and mesh with both longitudinal runs of the conveyor. These supporting sprockets are carried on short vertical stub shafts 72 which are carried in cross brackets 70 floatingly mounted on a pair of spaced and parallel hollow tubes or slide rods 74 which extend through and are secured to brackets 73 bolted to the rails 66.

Any change in the length of the conveyor due to expansion or contraction is compensated for by the sliding brackets 70. Since the sprockets are in mesh with both runs of the conveyor, they substantially maintain their relative positions but are capable of some floating action along the slide members 74 when one run of the conveyor for any reason becomes shorter or longer than the other. Thus a floating mounting for the sprockets is provided.

A can A and its cover B located under it are advanced simultaneously by the conveyor 61. For this purpose the conveyor is provided with a plurality of upright fingers or dogs 75 (Figs. 1 and 3) which are secured to the conveyor at spaced intervals therealong. These fingers are long enough to engage and propel a can and its cover while in vertically spaced and aligned order as best shown in Fig. 3, regardless of the height of the can.

During the advancement of a cam and its cover, they are supported in a pair of laterally spaced and parallel guide members 76 which are adjustably bolted to the cross brackets 73 and movable relative to each other for accommodating different sizes of containers and covers. Each guide member includes an upper L-shaped guide rail or track 77 for supporting and guiding the cans A and a lower level guide rail or track 78 setting off a horizontal guide groove for the covers B. The propelling fingers 75 extend up between the two guide members 76 adjacent the two levels of the guide rails 77, 78 and thus propel a can and its cover simultaneously.

The entrance end of these guide members 76 is disposed adjacent the entrance valve 48 for the reception of the cans and their covers therefrom. Beyond the valve, the guide members extend along the conveyor 61, toward the right as viewed in Fig. 1, passing around the idler operating sprocket 63, and thence extending back along the opposite run of the conveyor toward and partially around the conveyor driving sprocket 62. Thus a can and a cover are conveyed through the sterlizing chamber C a predetermined length of time and in spaced and unobstructed manner to insure full sterilization of the can and its cover by the sterilizing medium which preferably is steam under pressure but could also be superheated steam, heated air or a sterilizing gas.

Upon reaching the terminal ends of the guide members 76 disposed within the sterilizing chamber C, a can and its cover are simultaneously transferred into a pocket 81 of a chamber sealing valve 82 which is disposed adjacent the conveyor 61

and which rotates continuously in a valve seat 83 formed in a partition wall 84 of the housing 52. The partition wall is disposed between the sterilizing chamber C and the filling and closing chamber D. The sealing valve 82 is carried on a vertical shaft 85 journaled in bearings formed in the housing 52 and rotated in any suitable manner in time with the conveyor 61 and other parts of the machine. This valve seals off the sterilizing chamber C from the filling and closing chamber D and transfers the sterilized cans A and their covers B while still in superimposed relation, from the chamber C to the chamber D. An opening 86 (Fig. 1) formed in the partition wall 84 and sealed by the valve 82 provides for passage of the cans and covers from one chamber to the other.

The filling and closing chamber D is enclosed by walls of a housing 88 (Fig. 1) which is integral with the housing 52. Low pressure steam at substantially 220° F. temperature and from 2 to 3 lbs. per square inch pressure or other suitable sterilizing fluid is circulated through this chamber D to keep the chamber free of air and to thus maintain the sterilized cans and covers in their sterile condition. The steam is circulated by way of an inlet pipe 89 and an outlet pipe 91 which are threadedly secured in the walls of the housing 88. The inlet pipe leads from any suitable source of low pressure steam while the outlet pipe leads to a drain or exhaust for the spent steam.

A sterilized can A and its cover B introduced into the low pressure steam chamber D is received in a two level double pocket 93 of a horizontally disposed transfer turret 94 disposed within the housing 88 adjacent the sealing valve 82. This transfer turret is mounted on a vertical shaft 95 journaled in bearings in the housing 88 and rotated in any suitable manner in time with the other moving parts of the machine. The turret adjacent each pocket is formed with a depending can and cover propelling finger 96 (see Fig. 4). A short curved guide rail 97 disposed adjacent the periphery of the turret retains the cans and their covers in their pockets.

As the rotating transfer turret 94 advances a can A and cover B in superimposed relation, the cover is separated from the can and advanced toward the turnover device E while the can temporarily is advanced alone and deposited by the turret into a pocket 101 of a rotating filling turret 102 of a filling unit such as for example that disclosed in United States Patent 2,222,617, issued November 26, 1940, to J. M. Hothersall on Filling Machine. The filling turret 102 is rotated in any suitable manner in time with the other moving parts of the machine.

During its travel with the filling turret 102 the can A is filled with a product and is then removed from the turret and conveyed to the closing unit F hereinbefore mentioned. This transfer of the filled can is effected preferably by a pair of endless chain conveyors 104, 105 having feed dogs 106 secured thereto at spaced intervals therealong. The conveyors operate over pairs of spaced sprockets 107 mounted on idler and driving shafts 108 journaled in suitable bearings in the housing 88. The driving shafts are rotated in any suitable manner in time with the other moving parts of the machine.

The feed dogs 106 move past the filling turret 102 and engage behind a can therein and propel it along a pair of spaced and parallel guide rails 109 which extend from the filling turret 102 to

the closing unit F. At the closing unit a filled can A is received in a pocket 111 of a rotating closing turret 112 which forms a part of the closing unit F. The turret is rotated in any suitable manner in time with the other moving parts of the machine. This closing unit may be for example, of the type disclosed in the Nordquist Patent 2,039,338 above mentioned.

At the closing unit F, the filled can A meets a cover B fed by the transfer turret 94. For this purpose a cover B, in being separated from a can A while in the transfer turret 94, is received on a rotating horizontally disposed feed disc 115 (Figs. 1 and 5) having spaced fingers 116 which extend up from the disc and have propelling engagement with the covers. The disc is carried on a vertical shaft 117 journaled in bearings in the housing 88 and rotated in any suitable manner in time with the other moving parts of the machine.

As a cover B is received on the feed disc 115 it enters a curved runway 119 (Fig. 5) which is disposed adjacent the outer periphery of the feed disc and is propelled along this runway toward the turnover device E. The turnover device E comprises a vertically disposed rotatable star wheel 121 (Fig. 5) having prongs 122 which sweep past the outer periphery of the feed disc 115 and engage behind a cover B being propelled along the runway 119. This star wheel is mounted on a horizontal shaft 123 journaled in bearings formed on the housing 88 and rotated in any suitable manner in time with the feeding disc 115.

A cover B engaged by the star wheel 121 is propelled upwardly through a vertically curved path of travel to a position above the star wheel as best shown in Fig. 5. During this travel of the cover it is guided in a vertically curved rail extension 125 of the cover guide rail 119. This rail extension curves upwardly around the outer periphery of the star wheel. Thus as the cover traverses this guide rail extension and reaches the top of the wheel, it turns through an angle of 180° and is thus turned over or righted from its upside down position on the feed disc 115 to an elevated position right side up and above the level of the top of the cans A for application thereto.

At the top of the star wheel 121, the righted cover B is pushed into a pocket 127 (Figs. 1 and 5) of a horizontally rotating transfer turret 128 mounted on a vertical shaft 129 journaled in bearings formed in the housing 88. The shaft is rotated in any suitable manner in time with the other movable parts of the machine. This turret advances the cover along a horizontally curved runway 131 which is a continuation of the vertical runway extension 125. The runway terminates adjacent the closing unit F and thus guides a cover B into place in a pocket 111 of the closing turret 112 where the cover is now in superimposed relation with and slightly above the top of the can. In this relation the cover is clamped onto the can and is sealed thereto in the usual manner, as the closing turret rotates.

Upon completion of the can closing and sealing operation, the sealed can is diverted into a discharge star wheel 133 which deposits the can into a pocket 134 of a discharge valve 135. The valve is mounted on a vertical shaft 136 journaled in bearings formed in the chamber 88 and rotated in any suitable manner in time with the other movable parts of the machine. This valve rotates in a cylindrical seat 137 formed in the wall of the chamber 88 and seals an opening 138

formed in the wall through which the cans are discharged from the machine to any suitable place of deposit. The valve thus prevents escape of low pressure steam from the chamber D enclosed by the chamber housing 88.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In a machine for conveying containers and container covers through a sterilizing operation as a feature in positioning a sterilized cover onto a sterilized container incident to sealing, the combination of a cover guide track for guiding the covers along a predetermined path of travel in an inverted position with the inner surface exposed for the sterilizing treatment and spaced away from said track, a container guide track spaced above said cover guide track for guiding containers in upright position along a path of travel coincident with the path of travel of said covers with the inner surface of the container exposed for sterilization, conveyor means for advancing a cover and a superposed container in vertical alignment along said guide tracks, and turnover devices located in the path of said covers for moving a cover from under its superposed container and for turning it into assembling position above the container for subsequent delivery onto the top of an upright container for sealing thereto.

2. In a machine for conveying containers and container covers through a sterilizing chamber as a feature in positioning a sterilized cover onto a sterilized container in a sterile chamber incident to sealing, the combination of a sterilizing chamber having a sterile atmosphere, a cover guide track located within said sterilizing chamber for guiding the covers along a horizontal path of travel in an inverted position with the inner surface exposed for sterilization and spaced away from said track, a container guide track located within said chamber and spaced above said cover guide track for guiding containers in an upright position along a path of travel corresponding with the path of travel of said covers and with the inner surface of the container exposed for sterilization, conveyor means including a finger for engaging the outer edges of a cover and its superposed container simultaneously to propel them in vertical alignment along said guide tracks, a sterile chamber adjoining said sterilizing chamber, means for introducing the containers and the covers into said sterilizing chamber and for discharging them from said sterilizing chamber into said sterile chamber while maintaining said container in superposed position, and turnover devices located in said sterile chamber for receiving the discharged cover from under its discharged superposed container and for turning the cover into righted assembling position above an upright container with its inner surface facing down and in position for confining the inner sterile surfaces of both container and cover on the inside incident to sealing container and cover.

3. In a machine for conveying containers and container covers through a sterilizing chamber as a feature in positioning a sterilized cover onto a filled sterilized container in a sterile chamber incident to sealing, the combination of a sterilizing chamber having a sterile atmosphere, a pair of cover guide tracks located within said sterilizing chamber for guiding the covers along a predetermined path of travel in an inverted position with the inner surface exposed for sterilization and spaced away from said track, a pair of container guide tracks located within said chamber and spaced above said cover guide tracks for guiding containers in an upright position along a path of travel corresponding with the path of travel of said covers with the inner surface of the container exposed for sterilization, conveyor means including fingers traversing the spaces between said pairs of guide tracks for engaging the outer edges of a cover and its superposed container simultaneously and for advancing them in vertical alignment, a sterile chamber adjoining said sterilizing chamber, means for introducing the container and the covers into said sterilizing chamber in superposed position and for discharging them in superposed position into said adjacent sterile chamber, turnover devices located in said sterile chamber for receiving the discharged cover and for turning it into righted position above the plane of the top of the corresponding container and with its inner surface facing down, filling means within said sterile chamber for filling an upright sterile container, and means within said sterile chamber for clamping said cover into sealing position on said filled container.

4. In a machine for conveying containers and container covers through a sterilizing operation as a feature in positioning a sterilized cover onto a sterilized container incident to sealing, the combniation of a cover guide track for guiding the covers along a predetermined path of travel in an inverted position with the inner surface exposed for the sterilizing treatment and spaced away from said track, a container guide track superposed above said cover guide track for guiding containers in upright position with the inner surface of the container exposed for sterilization, conveyor means for propelling said covers and said containers in vertical alignment along said guide tracks, said conveyor means also advancing said covers and containers along different paths, and a star wheel located in the path of travel of said covers and rotatable on a horizontal axis for receiving individual inverted sterile covers and for turning each cover into a righted position above the plane of the top of a corresponding upright container, said conveyor means also advancing a can and a superposed cover along vertically aligned paths for subsequent delivery onto the top of said container for sealing thereto.

RONALD E. J. NORDQUIST.

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