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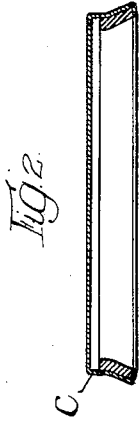
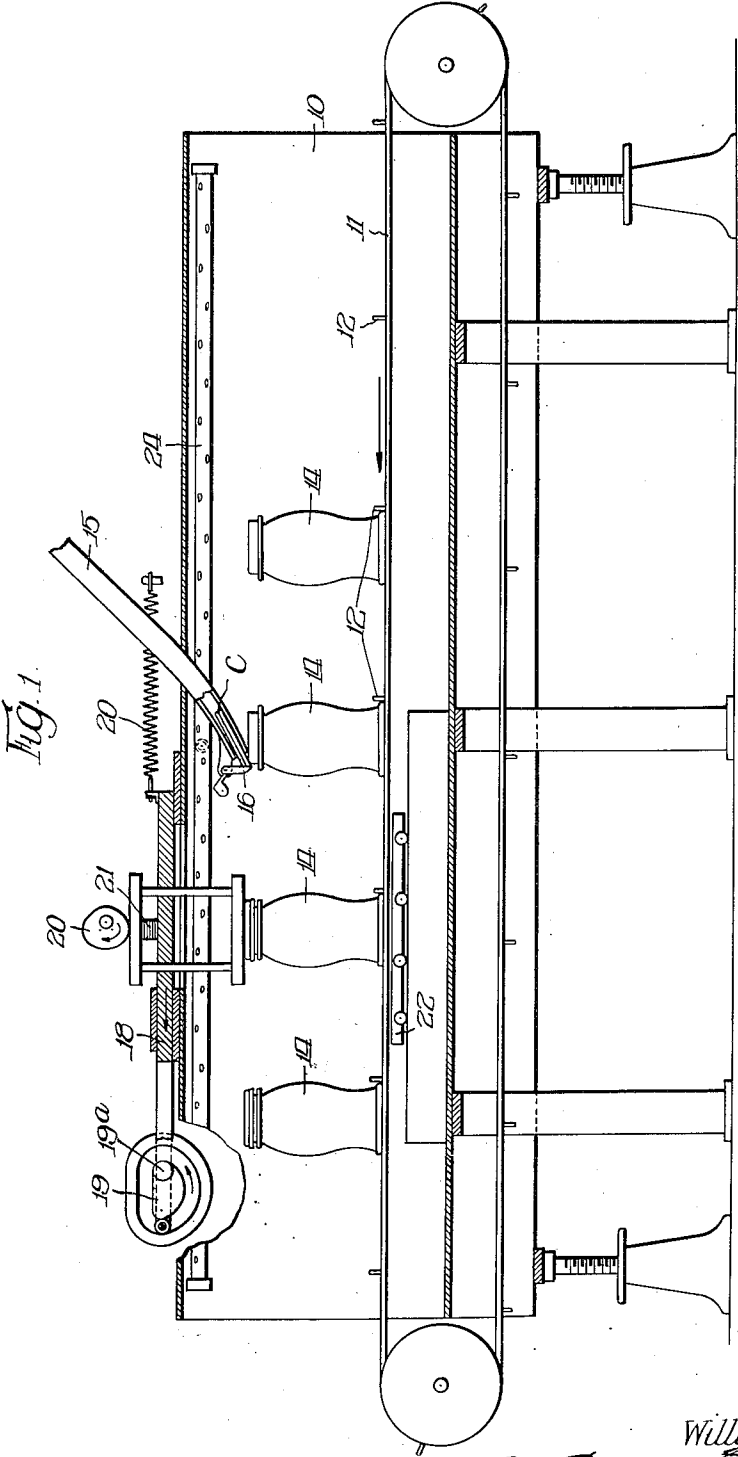
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1,920,539

PACKAGE SEALING METHOD AND APPARATUS

Filed Dec. 20, 1930

6 Sheets-Sheet 1



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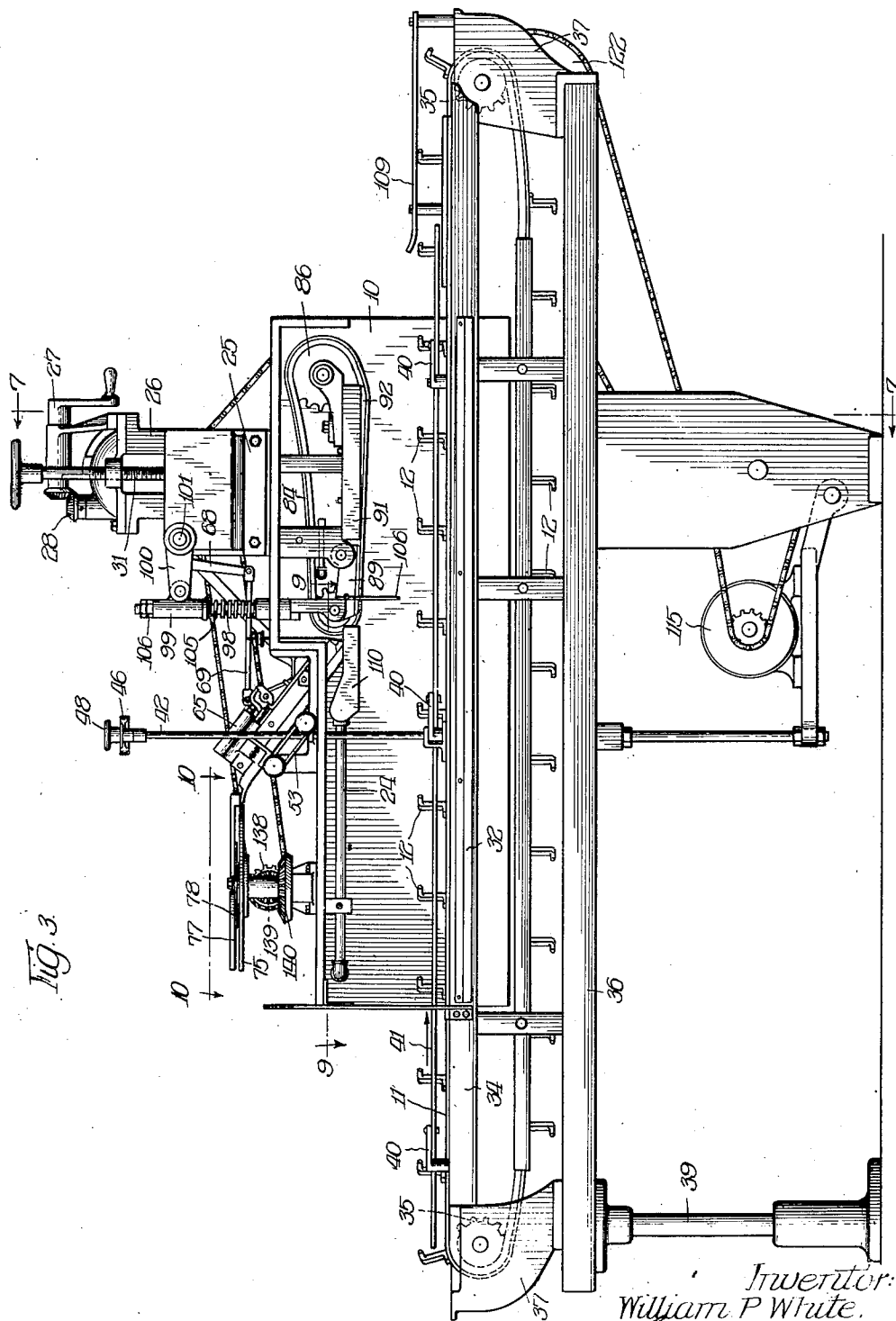
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6 Sheets-Sheet 3

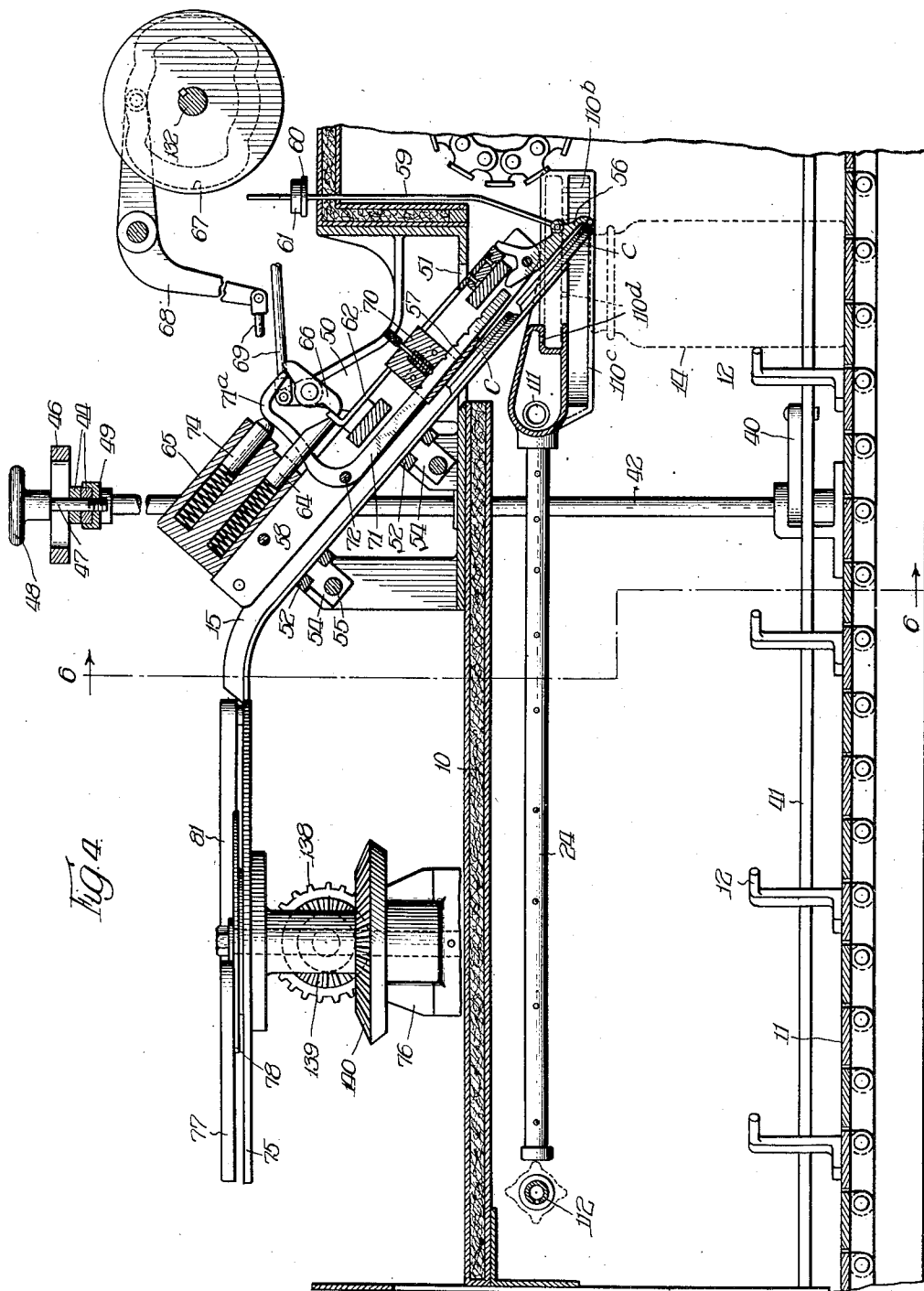


Fig. 4.

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Filed Dec. 20, 1930

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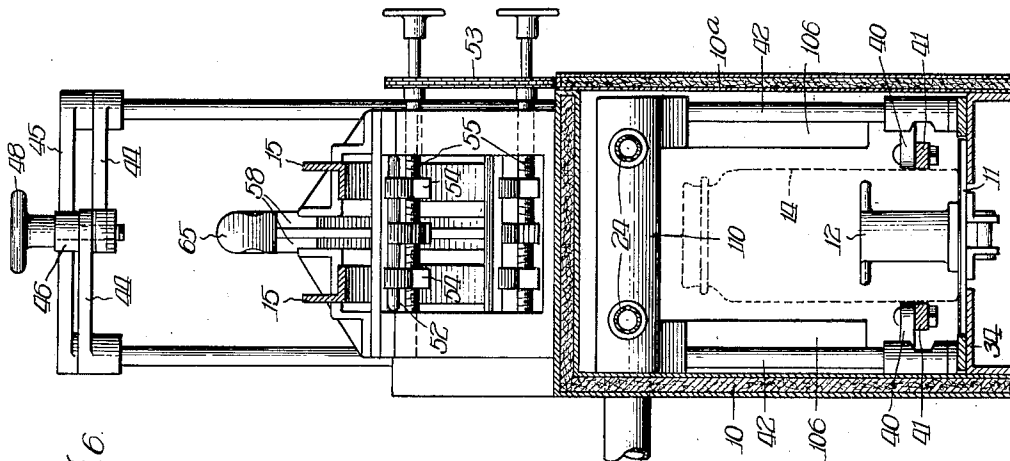


Fig. 6.

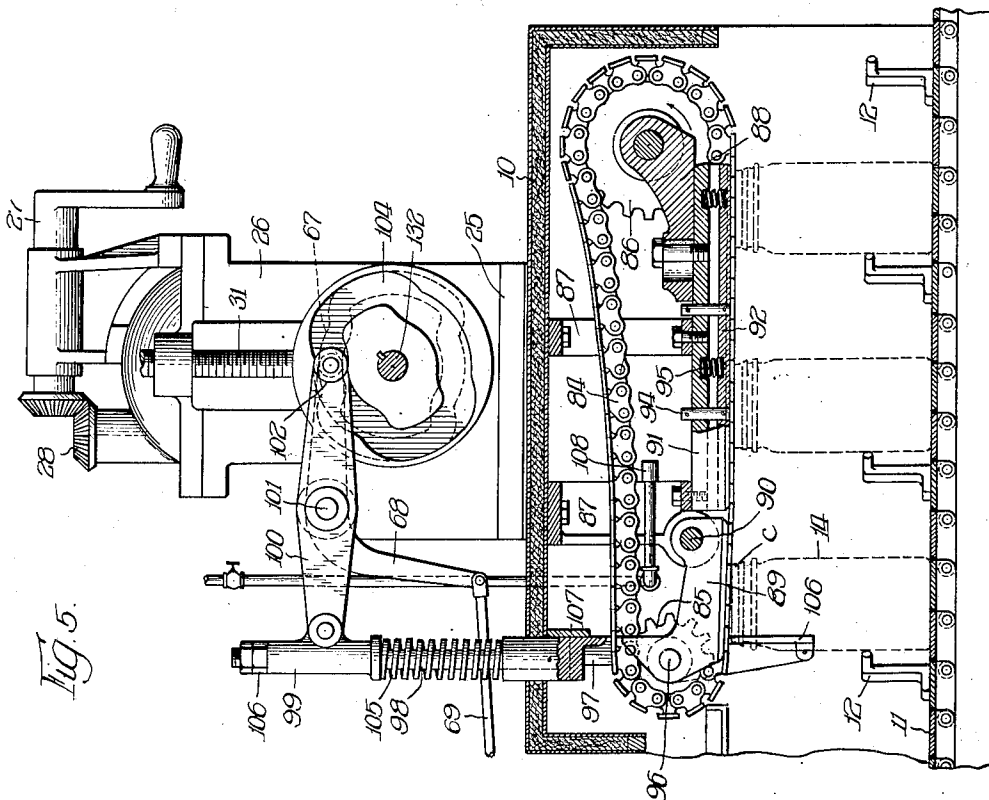


Fig. 5.

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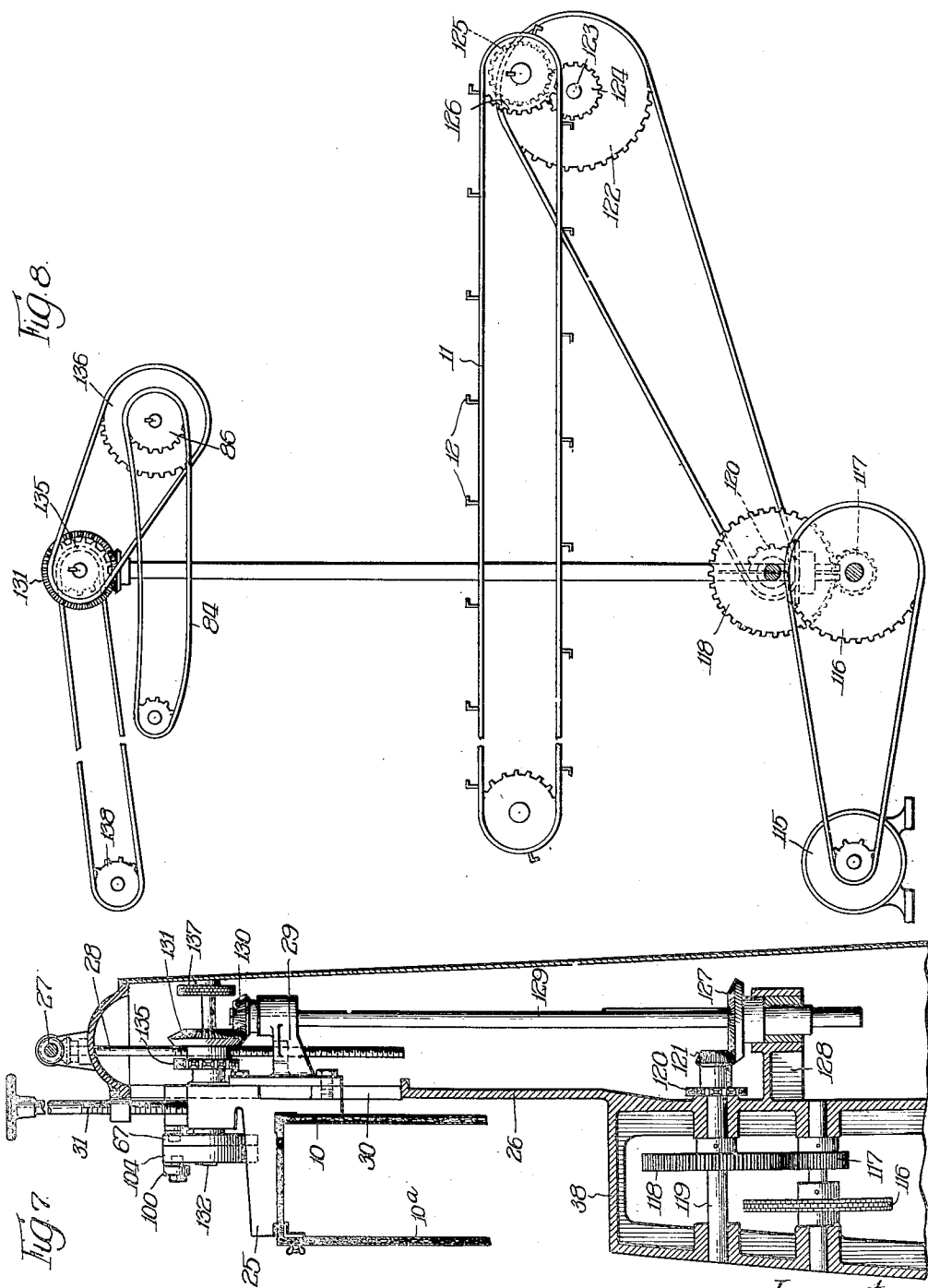
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1,920,539

PACKAGE SEALING METHOD AND APPARATUS

Filed Dec. 20, 1930

6 Sheets-Sheet 5



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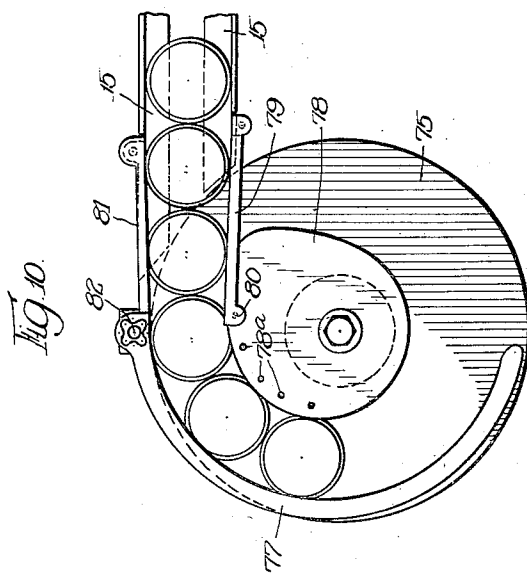
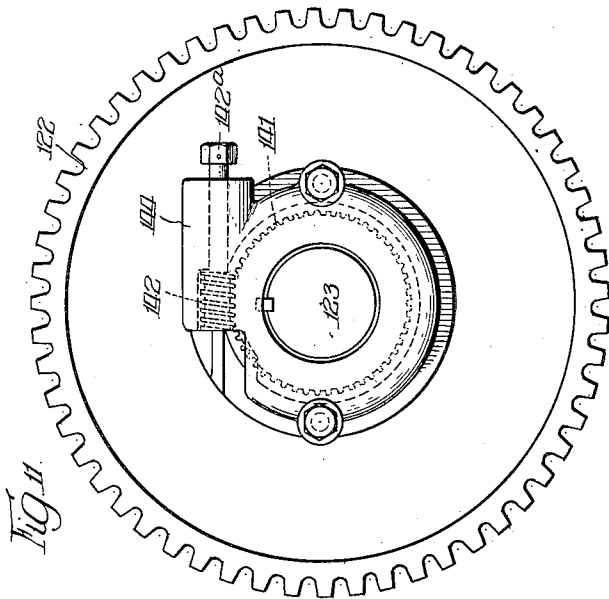
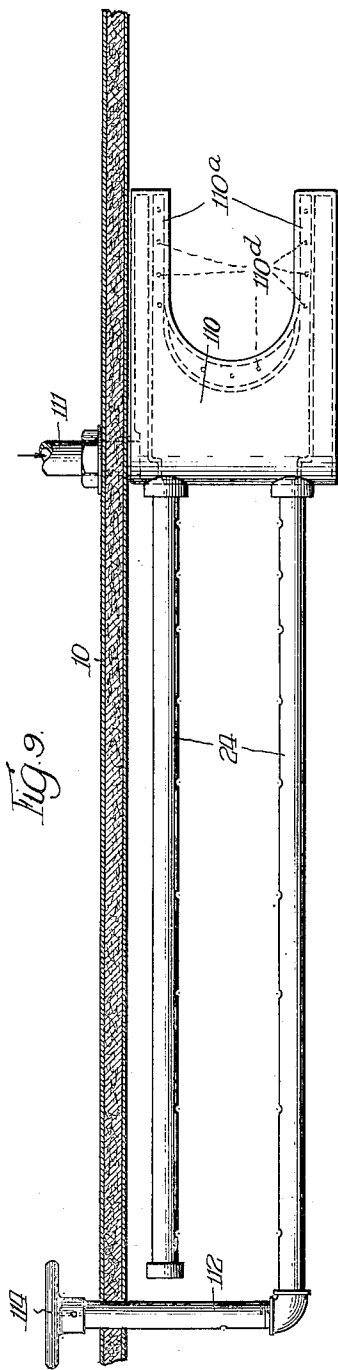
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PACKAGE SEALING METHOD AND APPARATUS

Filed Dec. 20, 1930

6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

1,920,539

PACKAGE SEALING METHOD AND APPARATUS

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Application December 20, 1930. Serial No. 503,715

34 Claims. (Cl. 226—82)

This invention relates to the packaging of foods and the like, and pertains particularly to the vacuumizing and sealing of packages in which the material is contained in jars, cans or similar receptacles. The present application is a continuation in part of my copending application Serial No. 434,236, filed March 8, 1930 for Package sealing.

A general object of the invention is the provision of a method and an apparatus whereby the vacuumizing and sealing of packages may be effected rapidly with certainty and with minimum handling, so that a large and uniform output may be obtained at low cost.

A particular object of the invention is the provision of such method and apparatus whereby the vacuumizing and sealing of packages may be carried on coincidentally with their continuous progressive movement at a rapid speed, and whereby upsetting of the containers or the spilling or slopping out of some of their contents are avoided.

Another particular object is the provision of such method and apparatus whereby the vacuumizing and sealing of the packages are carried on under sterilizing conditions which are effective to safeguard their contents against bacterial inoculation, and to obtain a desired sterilizing of the closure, the head space within the package, if any, and the portions of the container upon which the closure is seated.

Other objects include the provision of apparatus of simple and reliable nature which will operate automatically to carry on the vacuumizing and sealing process at a rapid rate, which occupies a small space, and which contains features of adjustability whereby it may be accommodated to packages and closures of different sizes.

Other objects reside in the provision in such apparatus of the various structural features and mechanisms hereinafter described.

Still other and further objects of the invention will be pointed out or indicated hereinafter or will be apparent to one skilled in the art upon an understanding of the invention or its employment in practice.

For aiding in disclosure of the invention I show in the accompanying drawings forming a part of this specification certain arrangements of mechanism by reference to which the method is described, but it is to be understood that these are presented for purpose of illustration merely and are not to be construed in any fashion calculated to limit the appended claims short of

the true and most comprehensive scope of the invention in the art.

In said drawings,

Fig. 1 represents a longitudinal sectional elevation of an exhausting and sealing apparatus, the showing being diagrammatic;

Fig. 2 represents a sectional elevation of one form of jar cap or closure appropriate for use in the apparatus;

Fig. 3 represents a side view of a modified form of apparatus, housing parts being removed in order to show enclosed parts;

Fig. 4 is a part sectional side elevation illustrating the closure applying mechanism and other parts associated therewith;

Fig. 5 represents a side elevation showing the sealing mechanism and parts associated therewith;

Fig. 6 is a transverse sectional elevation taken on substantially line 6—6 of Fig. 4;

Fig. 7 is a transverse sectional elevation of the main pedestal, on approximately line 7—7 of Fig. 3 and showing some of the adjusting and driving mechanism;

Fig. 8 is a diagram of the driving mechanism and connections;

Fig. 9 is a part horizontal sectional view on line 9—9 of Fig. 1, showing the steam distributor in plan;

Fig. 10 is a top view of a portion of the cap feeding mechanism under line 10—10 of Fig. 1; and

Fig. 11 is a detail illustrating in side elevation a portion of the conveyor adjusting means.

In the packing of various commodities, particularly perishable materials such as foodstuffs, it is desirable to seal the packages hermetically and with as little air in them as possible, and also to render the packaged material and the interiors of the containers as nearly sterile as possible, in order to avoid infection and spoilage of the contents. Herein I employ the term "vacuumizing" as a convenient term to indicate the reducing or rarefaction of the air contained in the packages, it being understood that I do not employ that term to indicate necessarily the complete removal of all air from within the packages. It is desirable also to carry on the vacuumizing and sealing as rapidly as possible, and with the greatest possible certainty, accuracy and uniformity, in order that large output may be maintained, and to render the vacuumizing and sealing operations as nearly automatic as possible, to minimize cost and variation.

The method and apparatus constituting the

subject matter of the present invention are such as to accomplish these objects in a very effective manner and degree. Described generally, the method constituting the invention involves the moving of the filled container or containers to pass their open mouths with a progressive movement through an atmosphere of steam or similar heated sterilizing vapor or gas, and the application to the mouths of the container or containers, and the sealing hermetically thereupon, of a closure or closures in the course of such progressive movement in the vapor atmosphere. Apparatus constituting the present invention contemplates means for progressively advancing the packing receptacles, which may be jars, cans, and the like, with their contents of the material which is being packed, through an atmosphere of a hot vapor or gas, such as hot steam, and means properly associated therewith whereby closures may be applied to and sealed on the receptacles in the course of their progressive movement, such closures being subjected to the hot atmosphere at the time of and prior to their application to the receptacles, and air being displaced from within the head space of the receptacles and from within the closures in such fashion that after sealing a negative or sub-atmospheric pressure will result in the sealed packages. The same vacuumizing, closure applying and sealing means are effective on all of the packages, the successive packages being moved into cooperation with and past said several means incident to the continuous progressive movement of the packages.

The nature of the invention will be ascertained in more detail from a consideration of the illustrative embodiments of the apparatus shown in the drawings, and which particular embodiments will now be described.

In the apparatus illustrated diagrammatically in Fig. 1, the reference numeral 10 designates a casing or chest extending longitudinally in a horizontal position and having openings at the ends. This chest is associated with an endless conveyor 11, which may be of known belt or link type, and the upper traverse of which runs longitudinally through the chest 10 in the direction indicated by the arrow. In the following descriptions I will refer to the feed end of the machine, that is, the end at which the receptacles are introduced, as the front, and the discharge end of the machine as the rear. The conveyor 11 is provided at regular intervals with the spacing flights or lugs 12 adapted to contact containers 14 which are placed upon the belt. Mounted upon the casing is a cap chute 15, having its upper end disposed above the casing for reception of closure caps C appropriate for application to the containers, and its lower end extending into the casing above the path traversed by the containers as they are transmitted by the conveyor. The lower end of the chute is arranged to present the lowermost cap C in a sloping or tilted position with its forward edge in the path of the upper portion of a container on the conveyor. Such cap is retained against sliding out of the chute by a detent device 16 which may be swung by pressure from the cap to permit the latter to escape from underneath it, the detent being suitably weighted so as to swing back into engagement with the succeeding cap when the lowermost one has been withdrawn. The lower side of the chute is open so as to permit the upper rim of a container on the conveyor to pass into engagement with the depending forward portion of the cap and, incident to the progressive

movement of the container, to withdraw the cap past the detent, such withdrawal from the chute leaving the cap resting upon the upper rim of the container. In rear of this cap applying means, there is arranged a movable sealing head 17. In the arrangement here illustrated, this sealing head is reciprocable horizontally and vertically, being carried on a horizontally reciprocable slide 18 which is actuated by means of a cam 19 and spring 20. This cam, which rotates on the axis 19^a, is of such profile, and its rotation is so timed with the movement of the conveyor 11, that it gives the slide 18 an advancing movement in the direction of the indicating arrow, at a speed exactly the same as that of the conveyor, and a retracting movement, in opposite direction, at a higher speed. The timing of the slide movement with the conveyor is such that at the start of the rearward movement, the sealing head 17 is above a container which is traveling with the conveyor in a position determined by a spacing lug 12. The sealing head is reciprocated vertically by means of a cam 20 which is so timed with respect to the advancing and retracting movements of the slide 18 that during the advancing movement of the slide the sealing head is forcibly lowered to the end of its downward stroke, and gradually raised again, remaining in the raised position during the retracting movement of the slide 18. Incident to the downward movement of the sealing head, it contacts the top of the cap on the subjacent container, and forces the cap to seated position, where it forms a hermetic seal and closure upon the container. It will be observed that this is accomplished while the container is being advanced progressively by the conveyor. Closures of a sort suitable for application and sealing on the container in this manner by the mechanism here shown, are described and illustrated in Fig. 2 and in my Patent No. 1,590,787 and my co-pending application Serial No. 340,414, although other sorts of closures may be used. In the position illustrated in Fig. 1, the sealing head has just started its upward movement under the action of its spring 21, such movement occurring toward the end of the advancing movement of the slide 18. This vertical movement of the sealing head, for the application of a cap of the sort referred to, need be only a matter of $\frac{1}{4}$ to $\frac{1}{2}$ of an inch. The raising of the sealing head removes it from contact with the container, leaving the sealed package free to continue its movement with the conveyor, and by the quick retracting movement of the slide 18, the sealing head is returned to a position above the succeeding container on the conveyor. Thus the sealing head performs the sealing operation on successive packages.

To support the package to the pressure of the sealing head, in the event the conveyor does not afford the necessary rigid support, a reciprocating platen 22 may be arranged below the path traversed by the sealing head. This platen may be formed as a rigid plate carried on rollers which permit it to be moved back and forth, and it may be actuated by suitable cams or other timed mechanism so that it will travel to and fro in exact synchronism with the reciprocating movement of the slide 18, its rearward movement being thus in exact synchronism with the progressive movement of the conveyor. Thus, as the progressively moving package receives the pressure from the sealing head, the platen will take the thrust and support the belt and the

package to the sealing pressure, the platen meanwhile moving rearwardly in consonance with the movement of the conveyor, the package and the sealing head.

5 Means is provided for maintaining the chest 10 filled with hot steam, the pipe 24 representing a distributor through which the steam may be constantly fed into the chest. The supply of steam should be such as to maintain a temperature of
10 close to 212° F. in the portion of the chest where the caps are applied to the containers, and from that location the temperature should be lower as the exit end of the casing is approached. The sealing of the cap on the container should be effected promptly after application of the cap to
15 the container, before there is substantial cooling of the trapped steam by the cooler product in the container. The caps and the containers within the chest are subjected to the sterilizing effect of the hot steam, and the steam is effective
20 also to displace air from the head space, if any, in the containers, and from within the caps before the latter are applied to the containers. When a cap is applied, therefore, instead of the
25 space enclosed between it and the container being filled with air, it is filled with the hot condensable vapor. While the cap is being forced to sealed position on the container by the sealing head 17, the package is being moved into a cooler zone, and as the cap is forced down to sealed position,
30 the reduction of the volume of the space occupied by heated vapor within the container induces a condensation of the trapped vapor, so that with the cooling of the package the internal pressure
35 is reduced to a value substantially below that of atmospheric pressure. For added certainty of result, the sealing pressure should be maintained on the seated cap for an appreciable time during its movement in the cooler zone. From the foregoing it will be observed that the seating and
40 sealing of the cap are effected without an internal pressure resulting in the sealed package. The shrinkage of the material in the package upon cooling has the effect of further increasing
45 the differential between the internal pressure and that of the atmosphere.

For the purpose of accommodating the apparatus to packages of different heights, the chest 10 or the conveyor may be provided with vertically
50 adjustable supports, so that relative vertical adjustment may be made as required to bring the sealing head and the cap applying devices to the desired elevation above the conveyor.

In the constructions illustrated in Figs. 3 to 11 inclusive, reference numerals as above applied are used to indicate corresponding parts, where feasible. The chest 10 (see Figs. 3, 6 and 7) has hollow walls filled with heat insulating material, the side wall 10^a being demountable or removable to
55 afford access to the chest for purpose of cleaning, adjustment and inspection. As seen in Fig. 7, the chest is carried on a bracket 25 which is vertically adjustable on the main pedestal 26. Such adjustment is effected through the medium of a crank
60 shaft 27 and screw 28 which are journaled on the top of the pedestal, the screw cooperating with a threaded opening in the arm 29 of the bracket, so that upon turning the screw in one direction, the bracket will be elevated, and upon turning the
65 screw in the other direction, it will be lowered. The bracket is guided on the flanges 30 forming the sides of the slot in which it rides on the pedestal. A limit screw 31 is also mounted on the pedestal for adjustment into contact with
70 the top of the bracket to hold it against elevation

from the selected position. By such adjustment of the bracket 25, the chest 10 and all parts carried on the same and on the bracket may be moved vertically with respect to the conveyor 11, the sides of the chest riding against flexible sealing strips 32 on the sides of the frame members 34 on which the conveyor sprockets 35 are journaled. In addition to the members 34, the conveyor frame comprises bed members 36 and end members 37, and said conveyor frame is mounted
80 in fixed position on the shelf 38 which is a part of the main pedestal, and on a suitable standard or legs 39. Mounted on the conveyor frame members 34 (see Figs. 3, 4 and 6) are rocker arms 40 adapted to oscillate in horizontal planes at suitable elevation above the conveyor 11. To the inner ends of these rocker arms are connected lateral guide bars 41, appropriately spaced above the conveyor, and extending longitudinally parallel to its direction of movement, one adjacent each side of the conveyor. To certain of these rocker arms are affixed the vertical shafts 42, which extend up through the top of the chest and at their upper ends carry the slotted lever arms 44. By swinging these lever arms, the shafts 42 may be rotated and the rocker arms 40 swung inwardly and outwardly so as to move the guide bars 41 toward and from the longitudinal median line of the conveyor. These guide bars are adapted to contact the sides of the receptacles, so as to guide them in proper alignment with the cap applying and sealing mechanism, in the course of their progressive movement. The upper ends of the shafts 42 are journaled in suitable bosses at the outer ends of a cross yoke 45 which has a slotted central portion 46. A clamping screw 47 carrying the hand wheel 48 operates slidably in the slotted portion 46 and in the slots of the lever arms 44, so that by moving the screw backwards or forwards in the slotted member 46, the lever arms 44 may be swung. The nut 49 threaded on the screw 47 cooperates with the hub of the hand wheel to clamp the lever arms 44 against the portion 46 for the purpose of holding them in the selected position. The adjustment of the guide bars 41 thus provided for, is for the purpose of accommodating them to receptacles of different widths or diameters, so that irrespective of the diameter of the receptacle, it will always be guided along the longitudinal median line of the apparatus. The cap applying mechanism of this embodiment (see Figs. 4, 5 and 6) is mounted on a bracket 50 which is fixed on the chest. This bracket affords an opening 51 through which the chute rails 15 extend into the chest. These chute rails are supported on slotted cross guides 52 which form part of the bracket 50 and are retained by transversely screw tapped blocks 54 having reduced necks which ride in the slots. Adjusting screws 55 are threaded in these blocks and journaled in the bracket, the threads for the left hand blocks being pitched opposite to the threads for the right hand blocks. Consequently, when the screws 55 are turned in one direction, the chute rails 15 will be moved toward each other, and when turned in the opposite direction, the chute rails will be moved apart. This adjustment is for the purpose of accommodating the chute to closures of different diameters. The extended ends of the screws 55 carry sprockets which are connected by a drive chain 53, so that the adjustment of both screws will always be uniform.

For controlling the feed of the closures down the chute, an escape mechanism is provided, which includes the lower detent 56 and the upper

detent 57 (see Fig. 4). The lower detent is journaled between the frame plates 58 which are carried on the bracket 50 over the middle of the conveyor. The lower detent has a nose portion 5 which depends below the lower ends of the chute rails in position to contact a closure resting on said rails so as to hold it in a position wherein its lower rim projects some distance beyond them. A rod 59 is pivotally connected adjacent the lower end of the detent 56, and extends upwardly through the top of the chest, where it is provided with a platform 60 upon which one or more weights 61 may be placed. The amount of weight to which the detent 56 may thus be subjected can thus be varied to correspond with closures of different weights, in order that the detent 56 may offer sufficient, but not excessive, resistance to the weight of the closure. A latch bar 62 is arranged to slide longitudinally between the frame plates 58, and at certain time in the operation, to contact the upstanding rear leg of the detent 56, so as to positively hold the nose of the detent against lifting. This latch bar is urged to effect this function by a spring-pressed plunger 64 which is mounted in a housing 65 carried on the frame plates 58, and is retracted against the plunger spring pressure, during certain time in the operation of the mechanism, by a tappet 66 which is rocked by a cam 67 through the medium of a bell crank 68 and connecting rod 69.

The upper detent 57 is carried on an adjustable block 70 which is slidable longitudinally on a rocker 71 that is pivoted at 72 between the frame plates 58. The block 70 carries a spring-pressed detent adapted to engage in notches in the upper margin of the rocker to hold the upper detent 57 in the selected position. The proper operative position of the detent 57 is determined by the diameter of the closures being used, and the function of that detent is to contact the top of the next to the lowest closure in the chute during the time that the lowest closure is being withdrawn from the chute, and then to release the held closure to permit it to slide downwardly in the chute when the lower detent 56 has been returned to its lowered position and is there held by the latch bar 62. The rocker 71 is rocked up and down to accomplish this holding and release of the next to the lowest closure by detent 57 in proper timing with the operation of the latch bar 62, such rocking of the rocker 71 being controlled by the tappet 66 and the downward rocking being induced by the spring-pressed plunger 64 and the upward rocking by the pressure of the tappet upon the upper arm 71^a of the rocker. Thus when the tappet 66 is swung clockwise in Fig. 4, the latch bar 62 will be retracted, leaving the detent 56 free to be swung upwardly by the pressure of the receptacle against the lowermost cap, thus to permit withdrawal of that cap by the progressive movement of the receptacle; while at that time the next to the lowest closure will be held by pressure of the detent 57 against sliding downwardly in the chute. When the lowermost closure has been withdrawn, the counterclockwise movement of the tappet 66 will permit the latch bar 62 to move forwardly and hold the detent 56 in its lowered position, whereupon the tappet will rock the rocker 71 to raise the upper detent 57 and permit the closure held by it to slide down until stopped by the detent 56.

The closures are fed into the chute 15 by the rotation of a table 75 carried on the bracket 76 which is mounted on the chest. This table rotates continuously and moves the caps which are

laid thereon along adjustable guide 77 which brings them into alignment with the chute 15, as illustrated in Fig. 10. An inner guide 78 is adjustably mounted above the table, remaining stationary while the latter rotates, and may be turned to different positions, in accordance with the adjustment of the chute rails 15, so as to accommodate adjustment of the guide link 79 to different positions in accordance with the radial spacing of the apertures 78^a, said guide link 79 being pivoted at its rearward end on the right hand chute rail and its forward end being secured in the selected position by engagement of its detent 80 in the appropriate aperture. The guide 77 may be adjusted radially with respect to the table by swinging it on its pivot 82, and the guide link 81 is pivoted at one end on the guide 77 and at the other on the left hand chute rail so that it will accommodate adjustment of the latter. The rotation of the table 75 carries the closures into the upper end of the chute 15, down which they slide by gravity and under the pressure of the following closures. The latter pressure is induced entirely by the friction between them and the table 75, and consequently, there can be no cramping of the closures in the chute on account of this feeding pressure, as when their movement is impeded the table continues to turn freely under them.

The sealing mechanism (Fig. 5) comprises an endless belt 84 made up of individually rigid links having flat outer faces and is arranged over the longitudinal center line of the conveyor 11. This belt is carried on two pairs of sprockets 85 and 86, the latter pair being driven so as to transmit the belt in the direction indicated by the arrow in Fig. 5. These sprockets are journaled in frame portions which are carried on supports 87 rigidly bolted to the bracket 25 through the top of the chest. The frame portion 88 is arranged for longitudinal adjustment for the purpose of properly tensioning the belt, while the forward frame member 89 is journaled at 90 for upward and downward swinging movement. The frame member 91 has pressure bars 92 mounted thereon adjacent its side margins by means of the pins 94, springs 95 being introduced to urge said bars downwardly away from the frame member 91. Against the lower surface of these guide bars ride the inner surfaces of the slats of the chain links, whereby the links in contact with said bars are guided in parallel relationship with the conveyor 11, but may yield upwardly therefrom upon compression of the springs 95. The shaft 96 of the pair of sprockets 85 passes through the frame member 89 and is journaled at its ends in the legs of a bifurcated yoke member 97. This yoke member is mounted on a rod 98 which extends through the top of the chest and slidably through a sleeve 99 that is carried on the outer end of the lever 100. This lever is journaled on the bracket 25 at 101 and on its forward end carries a roller 102 that rides in the face slot of a cam 104. A spring 105 on the rod 98 presses the sleeve 99 into abutment with the jamb nut 106. As a consequence of this arrangement, when the lever 100 is rocked, the yoke 97 will be reciprocated vertically to raise and lower the pair of sprockets 85 and consequently the forward end of the belt 84. Through the intermediation of the spring 105, the downward movement of the yoke is rendered yieldable with respect to the sleeve 99 and lever 100. With the vertical reciprocation of the yoke member 97, the frame member 89 oscillates on its pivot 90 and the forward end of the belt 84 is

likewise given upward and downward oscillatory movement.

The timing of the cam 104 with respect to the conveyor 11 is such that the forward end of the belt will be in an elevated position as a receptacle 14 is moved to a position under it by the conveyor 11. Such receptacle having picked up a cap from the cap applying mechanism, is thus ready to have the cap pressed downwardly to sealed position. The pair of sprockets 86 are timed so as to transmit the belt at the same rate as the conveyor 11 moves. Consequently, when the receptacle moves to a position under the elevated forward end of the belt 84, the ensuing downward movement of said portion of the belt, induced by the cam 104, will press the closure down to sealed position on the container as the container moves along in synchronism with the conveyor and the belt. The lower traverse of the belt 84 thus operates as a progressively moving sealing head whereby the sealing pressure is applied to the closure and the receptacle while they are moving progressively at the constant speed of the conveyor. As the belt and conveyor progress, the sealed package is carried along under the guide bars 92 and the closure held definitely in the seated position while the package is moving away from the sealing station. The yoke 97 carries baffles 106 which depend at the sides of the path traveled by the receptacles, which baffles may have hinged support so that they will yield if a receptacle contacts them. Another baffle 107 cooperates with the upper portion of the yoke 97. The purpose of these baffles is to limit so far as possible the passage of steam from the heated zone, where the closures are applied, to the cooler zone into which the packages are carried after the sealing of the closures thereon. The purpose of this is not only to concentrate the heat in the zone where it is desired, but also to subject the packages to cooling influence immediately the closures are sealed, so that there will be some contraction of the material and vapor sealed in them while the closures are being held down by the belt under the pressure bars 92. To expedite such cooling, cold water may be sprayed on the parts from a pipe 108. As the receptacles leave the rearward end of the belt 84, they are carried on out of the chest by the continuous movement of the conveyor 11, and removed from the latter by suitable take-off guides 109 or in other fashion.

The steam distributor shown in this embodiment (Figs. 4, 6 and 9) comprises a diffusing header 110, into which the hot steam is introduced by way of the inlet 111, the distributor pipes 24, which are screwed into and supplied from the header 110, and the adjustable pipe 112, which is rotatably threaded in and supplied from one of the pipes 24. This pipe 112 extends through one side of the casing where it is capped by a hand wheel 114, whereby it may be rotated for the purpose hereinafter explained. As seen in Fig. 4, the distributor pipes 24 are disposed at a level considerably above that at which the tops of the containers travel, and the outlet openings of the pipes 24 are arranged so that the steam emitted cannot be directed as jets into or upon the mouths of the containers. The diffusing header 110 is a hollow chest formed with the lateral legs 110^a having the depending flanges 110^b extending down to approximately the level at which the tops of the containers travel, and having at their bottom margins the inwardly extending baffle flanges 110^c. Over these baffle

flanges 110^c, the housing legs are provided with apertures 110^d directed so as to discharge steam against said flanges, so that the steam is diffused and any jet impulse is broken up and dissipated. The arrangement of the steam distributor is thus such as to provide an atmosphere of steam in the chest in and over the zone in which the tops of the containers travel, and to avoid the directing of any jets or steam impulses upon or into the mouths of the containers. This is of importance in order to avoid the blowing or splashing out of any of the containers' contents. The diffusing header is closest to the steam inlet and hence discharges the hottest steam, which steam is to a degree confined by the flanges 110^b in the zone where the closures are applied to the receptacles. This promotes the displacement of air from the receptacles and the closures and the filling of the head space and the space in the closures with very hot condensable vapor incident to the application of the closures to the receptacles. The adjustable pipe 112 may be utilized to obtain a desired baffling effect. There may be prevailing drafts or air currents in the room in which the apparatus is installed, which might have the tendency of moving the steam in the chest toward either the feed or discharge end. The effect of such drafts may be counteracted by adjusting the pipe 112 so as to present its discharge aperture in the direction counter to that of such draft or air movement. Thus, if there is a prevailing draft tending to enter the chest at the feed end, the pipe 112 may be adjusted to present its discharge opening toward that end of the chest, as shown in Figs. 4 and 9, to supply such counter-pressure as may be requisite to render the draft ineffective to blow the steam out of the chest. This aids in maintaining the desired uniformity of temperature at any given zone in the steam chest.

The driving trains are shown in Figs. 7 and 8. The motor 115 has a chain drive to a spur gear 116 which drives the coaxial spur gear 117, which in turn drives the spur gear 118, thus forming a speed-reducing train. The shaft 119 for the spur gear 118 carries a sprocket 120 and a beveled gear 121. The sprocket 120 has chain drive connection with sprocket 122 which is mounted on the shaft 123 with the spur gear 124 which in turn drives the spur gear 125 conjoined to the rear conveyor sprocket 126, whereby the conveyor 11 is transmitted. The beveled gear 121 drives the beveled pinion 127 which is journaled in a bracket 128. The shaft 129 is splined and movable longitudinally in the beveled pinion 127, and is journaled at its upper end in the bracket 29. Thus upon vertical adjustment of the bracket 29, vertical movement of the shaft 129 relative to the pinion 127 is accommodated and driving connection is maintained. Shaft 129 which is thus rotated by the beveled pinion 127 carries a beveled pinion 130 at its upper end, which pinion drives the beveled pinion 131 that is fixed on the shaft 132 to which the cams 67 and 104 are keyed. The shaft 132 also carries sprocket 135 which has chain drive connection with the sprocket 136 which is keyed on the shaft with the belt sprockets 86, thus constituting the actuating means for the belt 84. The shaft 132 likewise carries sprocket 137 which has chain drive connection with sprocket 138 keyed to the same shaft as the beveled pinion 139 which drives pinion 140 to rotate the feed table 75.

In order to adjust the timing of the conveyor with respect to the other mechanism, for ac-

commodation of containers of different width or diameter, rotational adjustment is provided between sprocket 122 and shaft 123, as illustrated in Fig. 11. The driving connection between sprocket 122 and shaft 123 is made through the medium of a worm gear 141, which is keyed to shaft 123, and a worm 142 which is carried in a housing 144 that is bolted to the outer face of sprocket 122, and that also serves as a housing for the worm gear 141. The worm 142 and worm gear 141 being thus maintained in mesh, these elements constitute a driving connection whereby rotation of sprocket 122 is imparted to shaft 123, and hence to spur gear 124. Worm 142 is rotatable in its housing by means of a wrench which may be engaged with the headed end 142^a which extends outside the housing, and such rotation of the worm will effect relative rotation of sprocket 122 and shaft 123. In this fashion, the timing of the conveyor, as to the point, in the cycle of cams 67 and 104, at which the flights 12 pass under the cap applying mechanism and the forward end of the sealing belt 84, may be varied to accord with different widths or diameters of receptacles.

In the operation of the apparatus, the filled receptacles are placed successively upon the conveyor at the front or feed end, one receptacle in front of and in contact with each of the flights 12, and the closures are placed on the table 75. The conveyor is operated at a constant speed to move the receptacles rearwardly through the machine, the receptacles being maintained at a proper alignment over the center of the conveyor by the guiding action of the guide bars 41, which are so positioned as to permit the receptacles to have free sliding movement therebetween. With the movement of the conveyor, the receptacles are carried into the chest 10, which is kept filled with hot steam introduced at 111 and distributed by the pipes 24 and header 110. The hot steam displaces the air from the head space of the receptacles, and as the receptacles advance from the entrance of the chest toward the header 110, they encounter increasing temperature in the steam atmosphere, which temperature in the vicinity of the header 110 should be in the neighborhood of 210° F., or more. This has the effect of sterilizing the surface of the material in the receptacles and the interior exposed surfaces in the head space, as well as their mouths and the areas upon which the closures are to be seated, as well as supplying a high temperature steam in the head space which is closed by application of the closure. Meanwhile the operation of the table 75 feeds the closures into the chute 15, down which they slide, the lowermost one being retained by the detent 56 in a position within the steam chest and extending somewhat below the end of the chute and into the path of the lip of the approaching receptacle. In this position the closure is bathed in the hot steam emitted from the header 110, so that its interior surfaces are sterilized and it is filled with the hot vapor. When the advancing receptacle engages the depending skirt of this lowermost closure, the continued progressive movement of the receptacle withdraws the closure from the chute, the detent 56 being swung upwardly by the pressure from the receptacle to permit such withdrawal of the closure. At that time the closure next above the one being withdrawn is held against sliding downwardly by the engagement of the detent 57 with it. The closure as it is withdrawn comes to rest upon the mouth of the receptacle, the enclosed

space being filled with the hot vapor. With the closure thus supported on it in sealing position, the receptacle proceeds to a position under the forward end of the belt 84, which at that time is held slightly elevated by the action of cam 104. The receptacle having reached the appropriate position, the forward end of the belt 84 is swung down, the belt meanwhile progressing in synchronism with the conveyor and with the receptacle, and by the downward pressure exerted upon the closure by the belt, the closure is forced down to sealed position on the receptacle. As the receptacle advances further, it comes under the pressure bars 92 which hold the belt, down to maintain the closure firmly in the sealed position on the receptacle. Upon passing the baffles 106 the receptacle moves into a zone of lower temperature, the effect of which is to cool to some extent, and hence induce contraction of, the heated vapor and contents of the receptacle, and hence produce a sub-atmospheric pressure in the sealed package. During such cooling, it will be observed, the closure is held definitely in the sealed position. As a consequence, when the sealed package leaves the rearward end of the belt 84, it is in a condition such that the closure is retained in place by the atmospheric pressure, as well as by its adhesive or frictional engagement with the sealing surface of the receptacle. The receptacle then passes out of the chest and is taken off laterally from the conveyor by suitable take-off guides 109, or otherwise.

In order to adjust the timing of the mechanism to receptacles of different widths or diameters, the relative adjustment between sprocket 122 and shaft 123 is made as above described so as to cause the flights 12 to bear the proper relationship to the timing of the cap applying and sealing mechanism, the guide bars 41 are adjusted to the proper spacing for the receptacle, the chute bars 15 are adjusted to the proper spacing for the closures, and the guides 77, 79 and 81 are adjusted correspondingly, and the block 70 is adjusted to proper position on the rocker 71, and the proper weighting is applied to the rod 59, in accordance with the weight of the closures used. The springs 98 and 95 are for the accommodation of slight variations in the height of the receptacles, the mechanism being set for the minimum height by appropriate vertical adjustment of the bracket 25.

From the foregoing it will be appreciated that the method constituting the present invention may be performed by filling a suitable packing vessel, or a series of packing vessels, with the material to be packaged, and then moving the charged vessel, or the plurality of charged vessels in a series, to pass the open mouth, or mouths, progressively through an atmosphere of hot vapor, in such fashion that the hot vapor atmosphere has free access to any unfilled head space in the vessel, or vessels. While the vessel is thus advancing or moving progressively with its open mouth in the hot vapor atmosphere, a closure, such as a cap, is applied to the mouth of the vessel, and then a sealing operation is performed on the closure to seal it hermetically on the vessel while the latter is moving progressively. The closure then may be submitted to cooling influence for the purpose of condensing or contracting hot vapor trapped in the sealed package, whereby to reduce the pressure within the vessel. A series of vessels may be thus vacuumized and sealed without interruption of the continuous progressive movement of the series.

What I claim is:

1. Packaging apparatus comprising, in combination, a conveyor operable to transmit a package with continuous progressive movement, a steam receptacle through which the conveyor moves, means for maintaining an atmosphere of steam in said receptacle, and sealing means operable in the receptacle to apply and seal a closure on a package incident to its progressive movement through said atmosphere. 80
2. Packaging apparatus comprising, in combination, a receptacle for confining an atmosphere of steam, a conveyor adapted to move a packing container through said atmosphere, and closure-applying and sealing means arranged to apply and affix a closure on the container while it is moving through said atmosphere. 85
3. Packaging apparatus comprising, in combination, a steam chest, means for maintaining an atmosphere of steam therein, feeding means for continuously moving a packing container to pass its mouth portion progressively through said atmosphere, and means for disposing and affixing a sealing closure on the mouth portion of the container during its progressive movement in said atmosphere. 90
4. Apparatus as specified in claim 3 and including means for maintaining the closure in said atmosphere preliminary to its application to the container. 95
5. Apparatus as specified in claim 3 and including a progressively movable sealing head arranged for sealing cooperation with the container and closure during progressive movement of the same. 100
6. Apparatus as specified in claim 3, including cap-applying means for cooperating with the container in a hot zone of said atmosphere, and cap sealing mechanism for cooperating with the container while it moves to a cooler zone. 105
7. Apparatus as specified in claim 3 and wherein the closure affixing means is disposed over the path of the containers for cooperation with successive continuously moving containers presented consecutively by the feeding means. 110
8. Apparatus as specified in claim 3 and wherein the steam chest and closure disposing and affixing means are conjointly adjustable vertically with respect to the feeding means to adapt the apparatus to packages of different heights. 115
9. Packaging apparatus comprising, in combination, a steam chest, means for maintaining an atmosphere of hot condensable vapor in the chest, a conveyor adapted to move a packing container through said chest in contact with said atmosphere, and closure-applying and sealing means operable to apply and affix a closure on the container while it is moving progressively through the chest. 120
10. Packaging apparatus comprising, in combination, a steam chest, means for maintaining an atmosphere of hot condensable vapor therein, closure-applying means arranged to position receptacle closures in said chest, sealing means arranged to seal closures on receptacles in said chest, and conveyor means operable to move receptacles to pass their mouth portions through said chest and past said closure-applying and sealing means with a continuous progressive movement. 125
11. Packaging apparatus comprising, in combination, a steam chest, cap-applying means arranged to support a receptacle closure in said chest, sealing means in said chest associated with the cap-applying means, steam supply means arranged to supply hot vapor into the chest to maintain a hot atmosphere therein, said steam supply means arranged to maintain said atmosphere hottest in the vicinity of said cap-applying means, and conveyor means for moving a container with uninterrupted progressive movement past said cap-applying means to receive a cap therefrom. 130
12. Packaging apparatus comprising, in combination, a steam chest, closure-applying means arranged to support a closure in said chest, steam distributor means arranged to discharge hot vapor in the chest in the vicinity of the closure-applying means and in advance of the same and to concentrate freshly admitted vapor in an area below said closure, closure sealing means rearwardly adjacent the closure applying means, and conveyor means for moving a container with uninterrupted progressive movement past the closure-applying means with its mouth below the same to receive a closure therefrom. 135
13. In packaging apparatus, in combination, a steam chest, means for moving receptacles progressively therethrough, closure-applying and sealing means in the chest, means for introducing hot vapor into the chest, and means adjustable to vary the direction in which hot vapor is discharged in the chest, to influence the flow of vapor therein. 140
14. Packaging apparatus comprising, in combination, means for moving a container progressively, means for maintaining an atmosphere of hot vapor over and about the open mouth of the container while it is moving progressively therethrough, and means for applying and hermetically sealing a closure on the mouth of the vessel while it is moving progressively through said hot vapor atmosphere. 145
15. Packaging apparatus comprising, in combination, a steam chest, arranged to accommodate passage of packaging vessels progressively therethrough, cap-applying means in the chest for supporting a closure cap therein at a position above the path of the vessels, means for introducing hot vapor into the chest and effecting concentration thereof in a zone in proximity to the cap-applying means, and means for moving a packing vessel past the cap-applying means to receive a closure therefrom while the mouth of the vessel is moving in the zone of vapor concentration. 150
16. In packaging apparatus, in combination, a pair of horizontally extending conduits spaced apart collaterally and provided with fluid outlets opening into the space between them, means for supplying hot vapor into said conduits, means for guiding closure caps downwardly into the space between said conduits, and means for moving packing vessels longitudinally of said conduits into engagement with caps therebetween. 155
17. In packaging apparatus, the combination of a diffusing member comprising collaterally spaced hollow leg portions extending in approximately horizontal position and provided with distributed fluid outlets, means for supplying hot vapor into said hollow leg portions, means for moving a packing vessel longitudinally of said leg portions with its mouth under the space therebetween, and means for supporting a closure cap in a position between said leg portions for application to the vessel. 160
18. Packaging apparatus comprising, in combination, a steam chest, means for maintaining an atmosphere of hot vapor therein, feeding means for continuously moving a packing con- 165

- tainer to pass its mouth portion progressively through said atmosphere, means for disposing a sealing closure on the mouth portion of the container during its progressive movement in said atmosphere, sealing means effective to seal the closure on the container during its progressive movement in said atmosphere, and means for subjecting the closure to cooling influence after it is sealed on the container.
19. Packaging apparatus comprising, in combination, a steam chest, means for maintaining an atmosphere of hot vapor therein, feeding means for continuously moving a packing container to pass its mouth portion progressively through said atmosphere, means for disposing a sealing closure on the mouth portion of the container during its progressive movement in said atmosphere, sealing means operable to apply sealing pressure to the closure to seal it on the container, and means for supplying cooling fluid to the closure while the sealing pressure is maintained thereon.
20. Packaging apparatus comprising, in combination, a housing, means for maintaining a hot atmosphere therein, feeding means for continuously moving a packing container to pass its mouth portion progressively through said atmosphere, means for disposing a sealing closure on the mouth portion of the container during its progressive movement in said atmosphere, sealing means operable to apply pressure to the closure on the container to force it to seated position thereon, and means for subjecting the closure to cooling influence while it is held in seated position on the container by the sealing means.
21. Packaging apparatus comprising, in combination, a steam chest, means for maintaining a hot atmosphere therein, feeding means for continuously moving a packing container to pass its mouth portion progressively through said atmosphere, means for disposing a sealing closure on the mouth portion of the container during its progressive movement in said atmosphere, a sealing member arranged to move progressively with the container and operable to seal the closure thereon during progressive movement thereof, and means for applying cooling fluid to the sealing member.
22. A method of packaging which comprises placing the material to be packaged in an open-mouthed container, enveloping the mouth of the container with an atmosphere of hot gas and moving the open mouth of the container progressively through said atmosphere in such fashion that said mouth is enveloped thereby and freely accessible thereto, applying a closure on the mouth of the container while it is moving through said atmosphere, and hermetically sealing the closure on the container immediately after its application and without cessation of its progressive movement.
23. A method of packaging which comprises placing material in an open container, moving the open mouth of the container progressively at a uniform speed through an atmosphere of hot vapor, applying a closure on the mouth of the container while it is moving progressively in the hot vapor atmosphere, applying extraneous pressure to the closure to reduce the head space in the container and seal the closure hermetically on the container while in the hot vapor atmosphere, and subjecting the closure to cooling influence while continuing the progressive movement of the container and while maintaining extraneous pressure on the closure to hold it seated.
24. A method of packaging which comprises charging an open-mouthed container with the material to be packaged, supplying an atmosphere of hot vapor, moving the container progressively at a uniform speed to travel its mouth through said atmosphere with said mouth freely open to access of said atmosphere, and applying and hermetically sealing a closure upon the mouth of the container while it is traveling progressively through said hot vapor atmosphere.
25. A method as specified in claim 24 and which includes the introducing of the closure into the atmosphere of hot vapor prior to application of the closure to the container mouth.
26. A method as specified in claim 24 and wherein the mouth portion of the container is subjected first to increasing temperature in the course of its movement through the atmosphere of hot vapor, and, after sealing, to decreasing temperature.
27. A method as specified in claim 24 and wherein the mouth portion of the container is subjected first to increasing temperature in the course of its movement through the hot vapor atmosphere, and then, after sealing, to decreasing temperature, the highest temperature being reached in the vicinity of the location at which the closure is applied to the container.
28. A method of packaging which comprises arranging a plurality of charged open-mouthed containers in a series and moving them serially into and progressively through an atmosphere of hot vapor with their open mouths freely accessible to said hot vapor atmosphere, introducing closures into said hot vapor atmosphere in succession, and applying and sealing the successive closures on the successive containers in the hot vapor atmosphere while the series of containers is moving progressively at uniform speed.
29. A method of packaging which comprises filling a container approximately brim full with the material to be packaged, enveloping the open mouth of the filled container with an atmosphere of hot vapor, moving the filled container progressively to travel its open mouth through said atmosphere with said mouth freely accessible to the hot vapor, and applying and hermetically sealing a closure on the mouth of the container while it is moving progressively through said atmosphere.
30. A method of packaging which comprises disposing a charged container and a closure for the same in an atmosphere of hot vapor with the open mouth of the container freely accessible to the hot vapor, moving the container progressively in the hot vapor atmosphere toward a zone of lower temperature, applying the closure to the container while the latter is in the zone of higher temperature, and hermetically sealing the closure on the container while in progressive movement to the zone of lower temperature.
31. A method as specified in claim 30 and wherein extraneous pressure is applied to the closure to seal it on the container and extraneous pressure is maintained on the closure until the temperature of the closure is reduced.
32. A method of packaging which comprises charging a container with the material to be packaged, supplying an atmosphere of hot vapor, introducing the open mouth of the charged container into the hot vapor atmosphere, applying and hermetically sealing a closure on the mouth of the container while in the hot vapor atmosphere, and maintaining extraneous pressure on

the closure to hold it seated on the container while subjecting the closure to cooling.

33. A method of packaging which comprises charging an open-mouthed container with the material to be packaged, moving the open mouth of the container progressively in an enveloping atmosphere of hot vapor with the open mouth freely accessible to the hot vapor, introducing a closure into the hot vapor atmosphere, applying the closure on the mouth of the container in the hot vapor atmosphere while maintaining the container and closure continuously in progressive movement, and hermetically sealing the closure on the container immediately after its application thereon.

34. A method of packaging which comprises charging an open-mouthed container with the material to be packaged, introducing the open mouth of the container into an enveloping atmosphere of hot vapor and moving it progressively through said hot vapor atmosphere in such fashion that the same may flow freely into and across the open mouth, introducing a closure into the hot vapor atmosphere and applying and sealing the closure on the container mouth while maintaining the latter continuously in progressive movement through the hot vapor atmosphere.

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