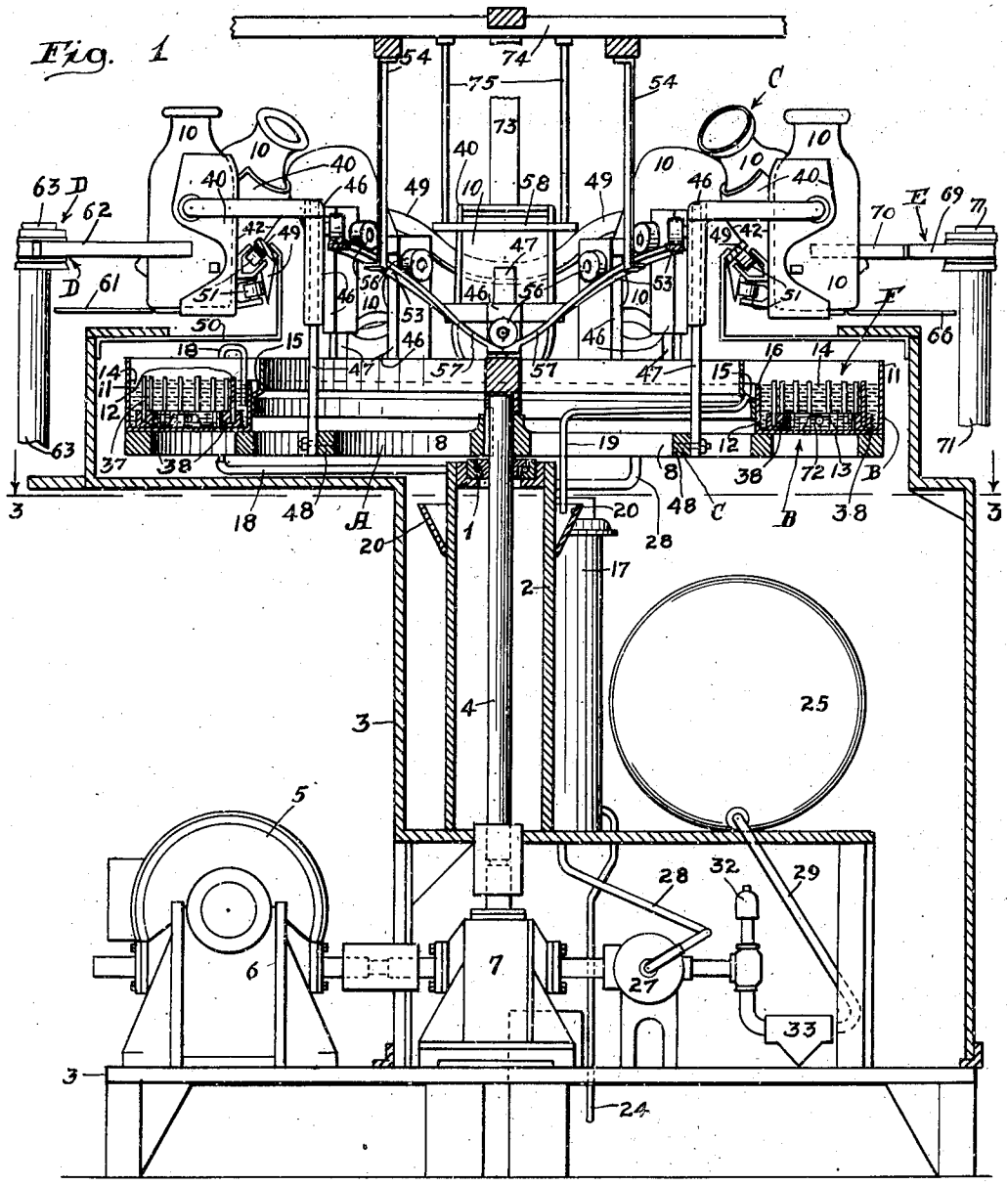
Oct. 18, 1949. W. O. FARRELL 2,485,373

APPARATUS FOR HOODING OR CAPPING BOTTLES

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Fig. 1



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APPARATUS FOR HOODING OR CAPPING BOTTLES

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Fig. 2

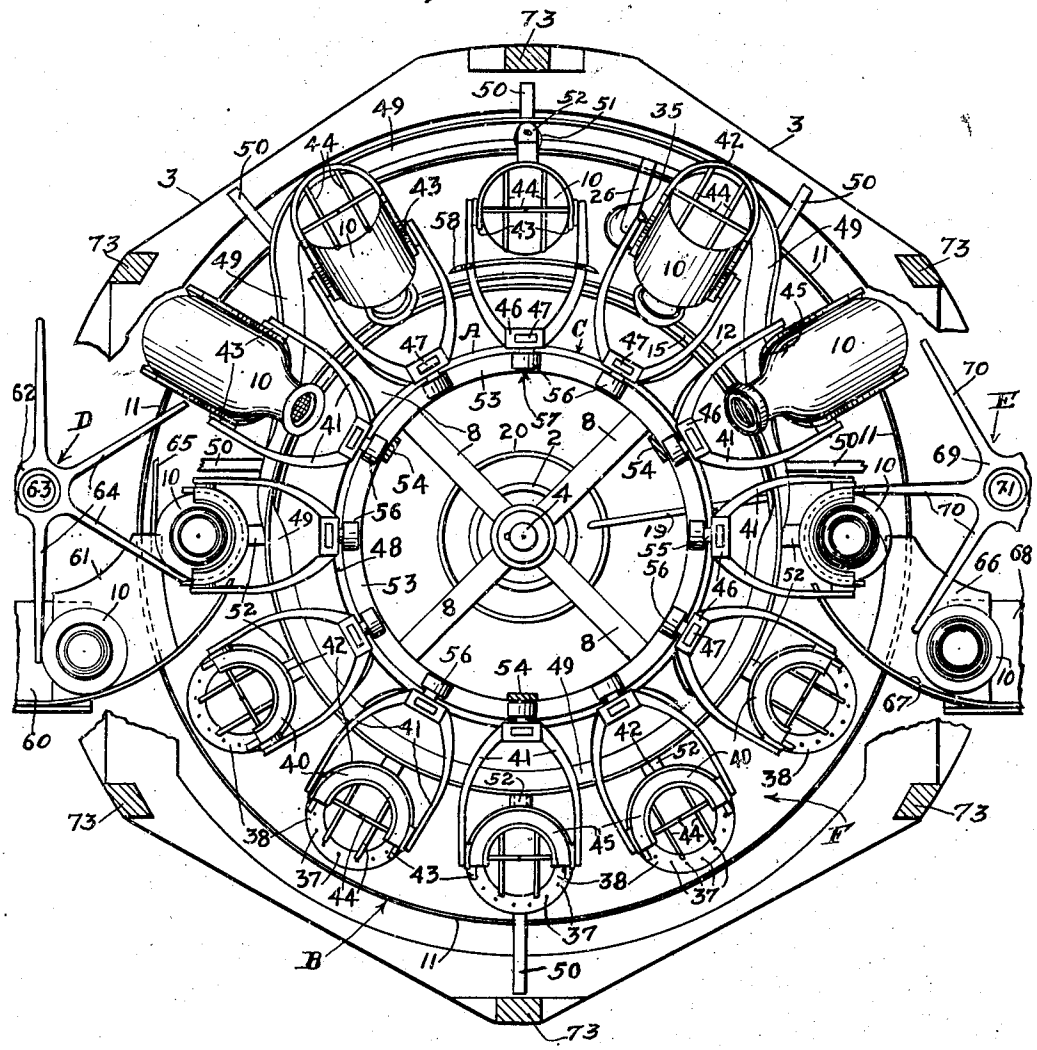
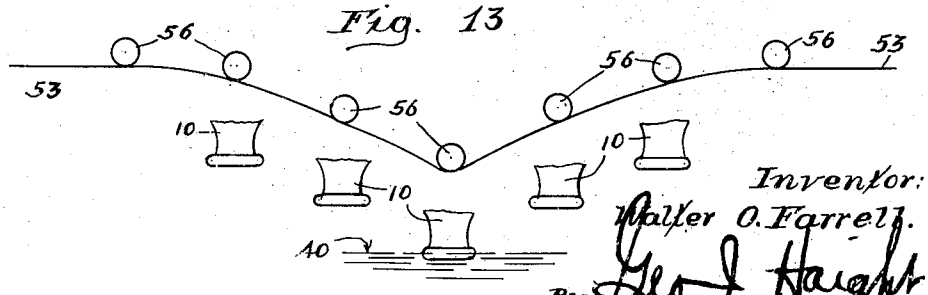


Fig. 13



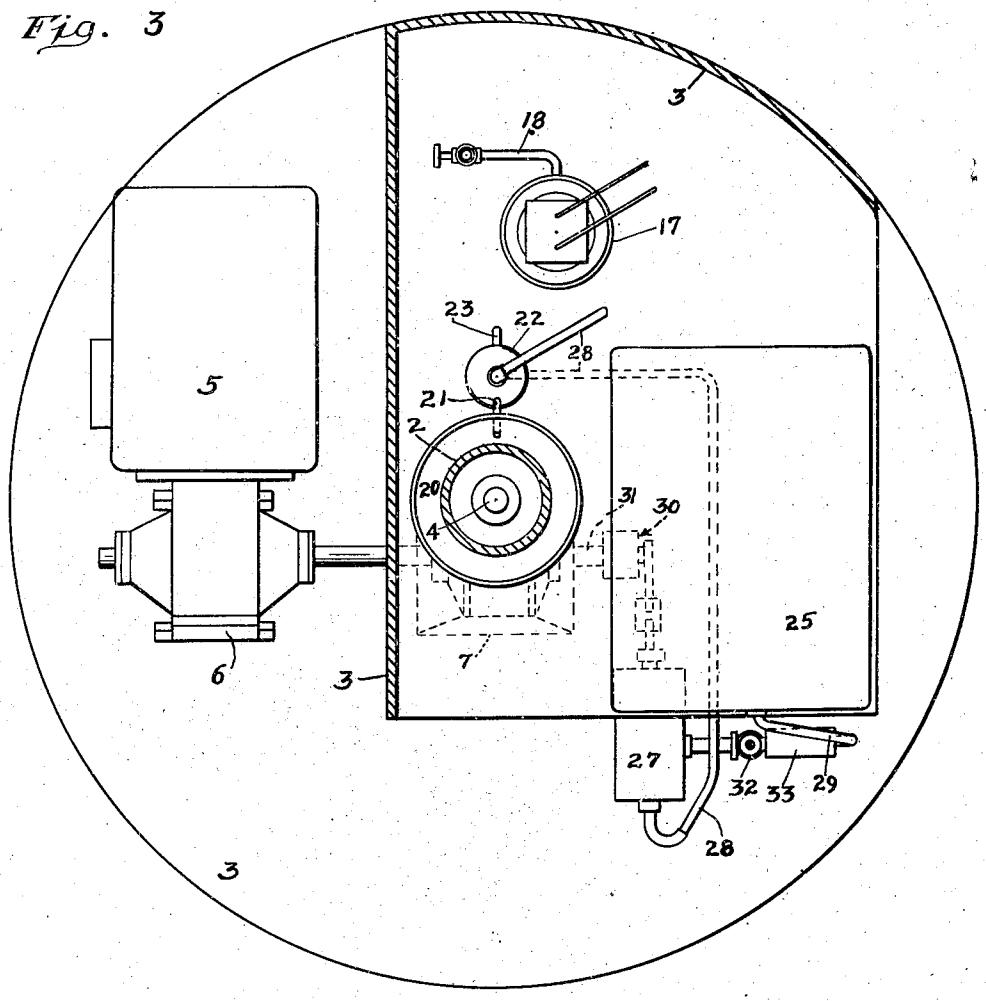
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APPARATUS FOR HOODING OR CAPPING BOTTLES

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Fig. 3



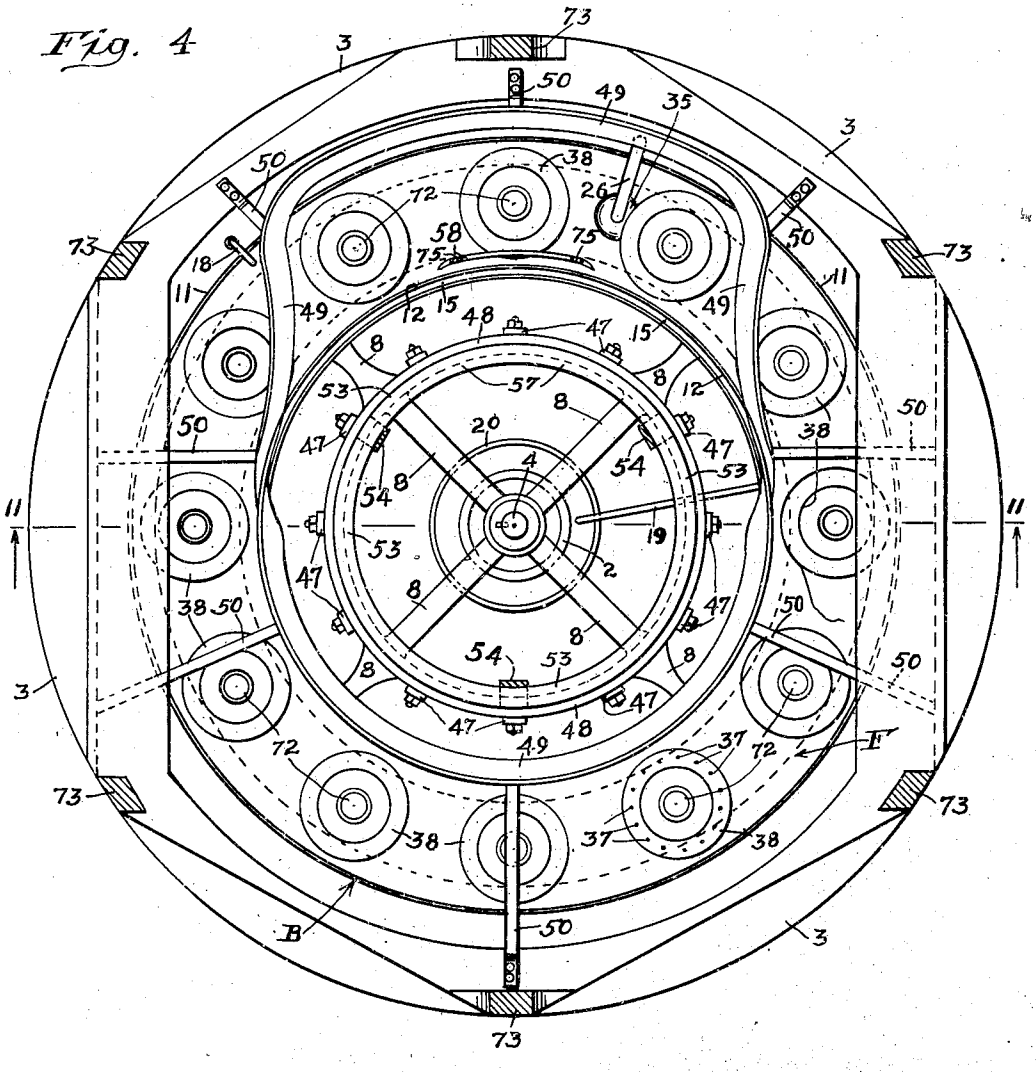
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APPARATUS FOR HOODING OR CAPPING BOTTLES

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Fig. 4



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APPARATUS FOR HOODING OR CAPPING BOTTLES

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Fig. 6

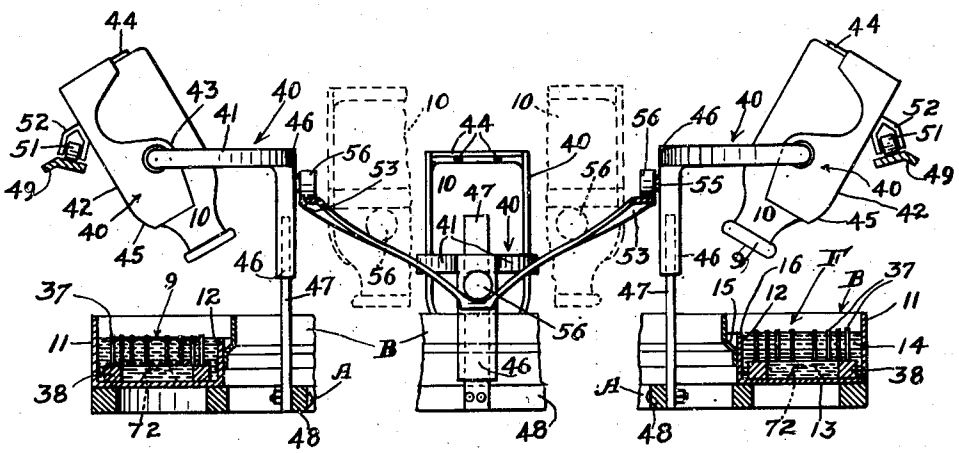


Fig. 7

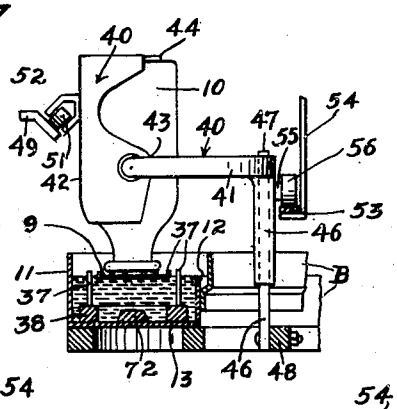


Fig. 8

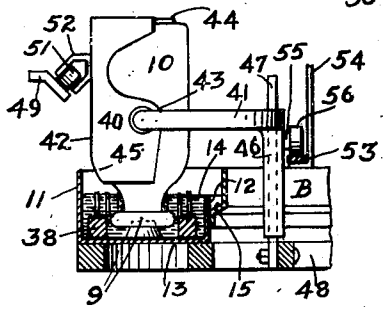


Fig. 9

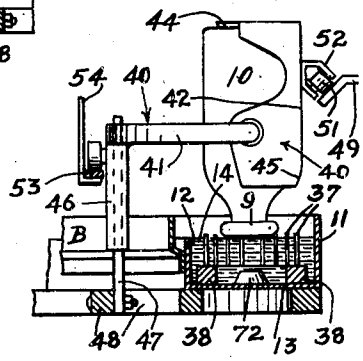
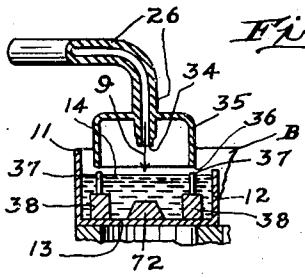


Fig. 5



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APPARATUS FOR HOODING OR CAPPING BOTTLES

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Fig. 10

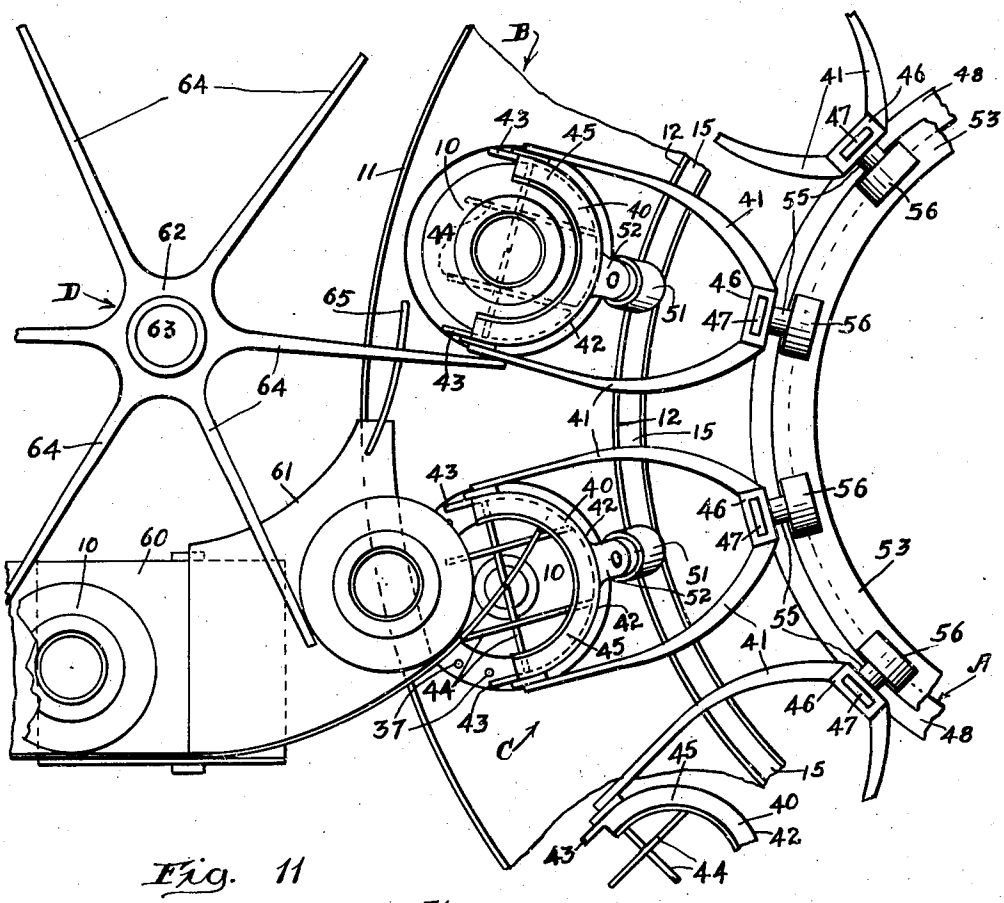
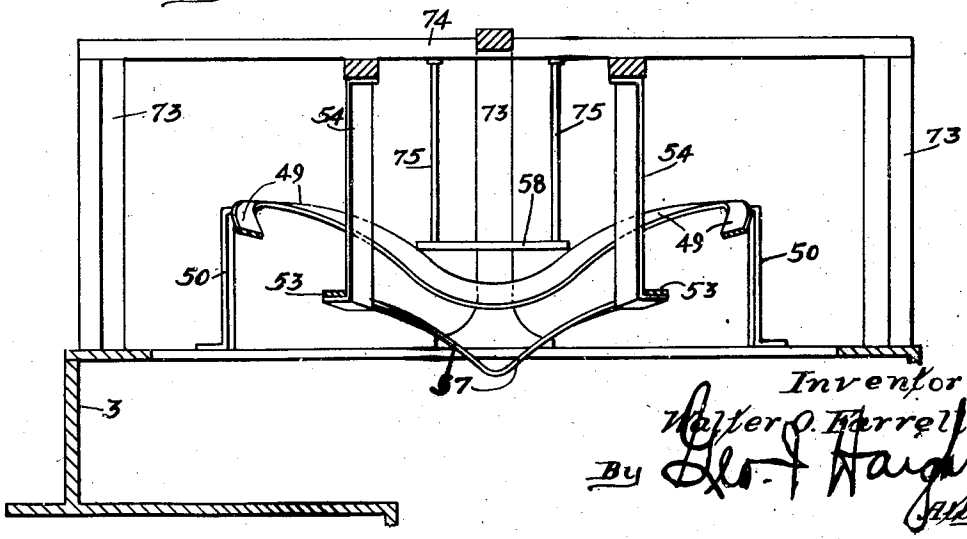


Fig. 11



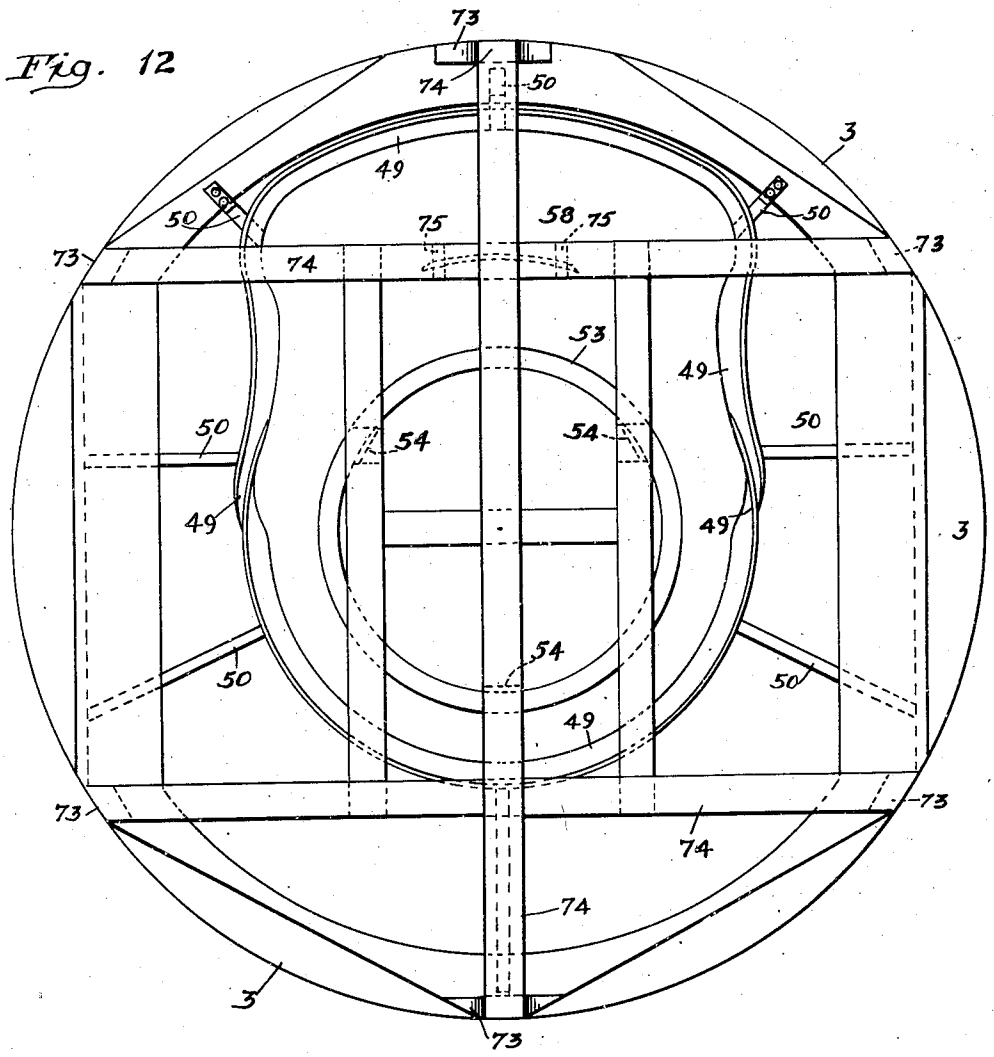
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APPARATUS FOR HOODING OR CAPPING BOTTLES

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Fig. 12



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Patented Oct. 18, 1949

2,485,373

UNITED STATES PATENT OFFICE

2,485,373

APPARATUS FOR HOODING OR CAPPING BOTTLES

Walter O. Farrell, Indianapolis, Ind., assignor to Rainfair, Inc., Racine, Wis., a corporation of Wisconsin.

Application March 29, 1946, Serial No. 657,997

6 Claims. (Cl. 18—1)

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My invention relates to improvements in bottle capping or hooding mechanism.

One of the objects of my invention is to provide an automatic machine for producing plastic resin film and applying the film to the bottle or similar container as a cap or hood seal protective against dirt or contamination for the mouth end of the bottle.

A further object is to provide a unitary machine which produces the caps or hoods and applies them to the bottles in one continuous cycle of operation so that the bottles are hooded at a rapid rate for commercial purposes.

Another object of the invention is to provide a mechanism for carrying out on a commercial scale the process of forming plastic resin film constituting the subject matter of my co-pending application, Serial No. 636,925, filed December 22, 1945.

Other objects of my invention will appear from the following description in connection with the accompanying drawings which illustrate one embodiment of the invention and in which

Fig. 1 is a vertical central view, partly in section and partly in elevation, of the film producing and bottle hooding or capping mechanism, illustrating the bottle inverting conveyor and the means for feeding the bottles and removing them from this conveyor;

Fig. 2 is a top plan view of the structure shown in Fig. 1 with the upper canopy structure omitted for clarity;

Fig. 3 is a sectional view on the line 3—3 of Fig. 1;

Fig. 4 is a top plan view of the structure shown in Fig. 1 with the bottle inverting carrier removed for purposes of clarity and with some of the uprights in section;

Fig. 5 is an enlarged detail of the ejector nozzle unit to deposit the resinous hood-forming substance in place and illustrates the means for preventing evaporating of solvent from the solution as it leaves the nozzle;

Fig. 6 is a view somewhat in skeleton form of the bottle inverting conveyor showing the progress of the bottles in the operation of being inverted, lowered into the water, and restored to upright position;

Figs. 7, 8 and 9 are detail views showing the bottle in several stages of its dipping and returning movement in the operation of applying the film;

Fig. 10 is an enlarged plan view of a portion of the bottle inverting conveyor and the bottle feeding mechanism;

Fig. 11 is a vertical central view of the upper

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portion of the embodiment with the entire rotary, horizontally disposed turntable omitted for clarity; and

Fig. 12 is a top plan view of Fig. 11.

Fig. 13 is a schematic view illustrating the progress of the milk bottles as affected by the dipping rail in the several positions illustrated in Figs. 7, 8 and 9.

The process of forming film of plastic resins embodied in the application hereinabove referred to, involves the preparation of a liquid solution of plastic material such as resins and solvents of proper viscosity and density, and the spreading or expanding of this solution upon the surface of a body of water to form a film of the thickness and area for the purpose for which the film is to be used. The solution is prepared by mixing the resins and other ingredients such as plasticizers and lubricants which affect the physical characteristics of the film, and dissolving these ingredients in suitable solvents in the proportion to give the proper viscosity to the solution. The film is formed by depositing a measured quantity of the solution upon the quiescent surface of a body of water, which causes the solution to spread out or expand the film by virtue of the surface tension of the solution on water. The expansion of the film upon this surface is controlled or restricted to the desired area by means of a fence which surrounds the area and which prevents the leading margin of the spreading film from further expansion beyond the fence. During the expansion of the film, and for a predetermined period thereafter, the solution is dried and solidified by the evaporation of the solvent. The formed film is then removed from the surface of the water and applied to whatever use intended.

The present machine employs this process for producing caps or hoods suitable for closing and sealing the mouth end portions of standard milk bottles. This machine automatically produces, in timed succession, a series of individual films and automatically brings successive bottles into contact with the individual films and forms the films around the mouth ends and neck portions of the bottles. In this machine, the filled bottles are received in upright position with their mouth ends capped. They are then inverted, their mouth ends lowered into contact with the film on the water surface, and then submerged below the water surface sufficiently to form the film around the bottle end. The bottles are then withdrawn from the water, with the cap or hood formed thereon, restored to upright position and then discharged from the machine. These operations

are all performed in a single continuous cycle at a rapid rate.

Referring to the accompanying drawings, the machine has a rotary, horizontally disposed turntable A (Fig. 1) which is mounted on suitable bearings 1 on a post or standard 2, constituting part of the frame 3 of the machine. This turntable is rotated at the proper rate of speed by means of a shaft 4 which is driven by a suitable motor 5 through suitable gear-reducing mechanisms 6 and 7.

The turntable comprises in general a spoked wheel 8 carrying an annular water trough B and a bottle-inverting carrier or conveyor C, all of which rotate in unison with the turntable. At the receiving side of the turntable, the machine is provided with a bottle-feeding mechanism D for successively inserting the bottles 10 into tipping cradles 40 of the bottle-inverting mechanism on the turntable. At the opposite or discharge side of the turntable, there is provided a discharging mechanism E, similar to the feeding mechanism D, for successively discharging the capped or hooded bottles from the bottle-inverting carrier.

The annular water trough B on the turntable has outer and inner vertical walls 11 and 12, and a bottom wall 13, which form a circular receptacle or container for a body of water 14 upon the surface of which the solution is deposited for the formation of the individual films. An annular overflow gutter 15 is provided on the inner wall 12 of the trough, with its lip or edge 16 sufficiently below the upper margins of the trough walls for the purpose of maintaining a fixed level of the body of water in the trough throughout the entire annulus of the trough. In the present structure, the water in the trough is slowly replaced for the purpose of maintaining the water surface clean and free of contamination, reduce solvent concentration, and for the purpose of supplying heat to facilitate the drying of the film. The water is supplied to the trough from a suitable water heater 17 positioned in the frame of the machine below the turntable and connected by the pipe 18 (Fig. 4) to the trough. The temperature of the water can be maintained by means of a suitable thermostatic control device. The overflow gutter 15 has a drainpipe 19 which leads to and drains into a basin 20 surrounding the turntable standard 2, and this drain basin is connected by a pipe 21 (Fig. 3) which leads to a solution pre-heater 22 for the purpose of utilizing the heat of the water to pre-heat the solution of film-forming material. The water, after circulating through the solution pre-heater, is connected to a suitable drain by the pipe 23. The water is supplied to the water heater 17 through the pipe 24 which is connected to a source of water supply.

The film-forming solution is contained in a suitable tank or container 25 (Fig. 1) and is supplied to a nozzle 26 (Fig. 4) through a suitable measuring device which determines the quantity of solution deposited upon the water surface for each individual film to be formed. In the present structure, this measuring device is preferably a reciprocating pump 27 (Fig. 1), the outlet of which is connected by the pipe 28 to the nozzle 26 (Fig. 4) and the inlet of which is connected by the pipe 29 (Fig. 1) with the tank or container 25. The pump has an adjustable crank 30 (Fig. 3) and can be driven through the shaft 31 by a suitable mechanism associated with the gear-reducing mechanism 7. Pumps of this type for accurately determining and regulating the liquid delivered at each stroke of the piston are well known and need no further description, except that it is accurately timed to intermittently eject through the nozzle a measured quantity of solution in relation to the rotation of the turntable. The solution is fed to the measuring pump by gravity through the pipe 29 (Fig. 1) which contains an air vent 32 to bleed off air caught when the line is empty, and a screen 33 to screen off any dried or gelled resin particles or other foreign matter.

The nozzle 26 has an orifice 34 (Fig. 5) therethrough, the end of which is preferably positioned about one-half inch above the surface of the water in order to direct the solution upon said water surface. This nozzle is enclosed by a hood 35 which is open at the bottom with its rim 36 positioned very close to the water surface so that a chamber is provided around the nozzle. The purpose of this is to provide a saturated atmosphere of solvent around the stream of solution from the nozzle to prevent the solution drying and building up a cake beyond the orifice.

The nozzle is located at a point just beyond the point where the bottles are inverted and dipped in the water for applying the previously-formed film and specifically immediately beyond the point where the film has been removed from the water surface. The solution is deposited on the water at this point so that it will have time to spread, to dry and to solidify during almost a complete revolution of the turntable.

The turntable is provided with a series of film-controlling devices F (Fig. 6) for retarding or restricting the expansion of the solution upon the water surface to the area desired. These devices are positioned within the trough and are equally spaced apart throughout the entire annulus of the water trough. Each of these devices comprises a series of wires or pickets spaced apart and forming a circular fence surrounding the area representing the diameter of the film to be formed. The wires or pickets 37 of the fence are preferably mounted in a ring-shaped member 38 positioned on the bottom wall of the trough from which they project upwardly above the water surface.

The rotation of the turntable is timed with respect to the ejection of solution from the nozzle, so that the solution will be deposited upon the surface of the water within the area of the fence.

The ejection is timed so that the stream of solution starts slightly before the center of the fence area and the nozzle orifice coincide and so that it continues beyond said center of coincidence. Since the turntable is moving at a constant rate of speed relatively to the nozzle, this establishes a relative movement of the water surface and the stream of solution which is equivalent to bodily moving the stream relatively to the water surface. This facilitates the spreading of the film upon the water surface by spreading the stream of solution over the water surface. As the solution is deposited upon the water surface, it rapidly spreads out as a thin film, more or less radially by virtue of the surface tension of the water and solution, and this spreading or expanding area of film or solution continues until its leading margin reaches and contacts the pins or pickets of the fence. These fence pickets prevent or retard the further expansion of the film and thus determine the size of the film. The spreading or expanding of the film, and the solidification of the film by the drying out or evaporating of the solvents, occurs while the turntable travels through almost a complete revolution to

a point where the films are to be applied as hoods or caps to the bottles.

The bottle-inverting conveyor C (Fig. 10) comprises a series of bottle-holding cradles **40**, equal in number to the number of fences on the turntable and positioned above these fences to hold the bottles axially in alignment with the center of the film and the fence area. These cradles are trunnioned on horizontal axes in yokes or forks **41**, so that they can be rotated for the purpose of inverting the bottles. Each cradle has a vertical wall **42**, semi-circular in cross section, with its vertical edges **43** extending beyond the diameter so as to provide a half-round receptacle open at its outer side for the reception and removal of the bottles. At the upper part of the receptacle, the housing is slightly more than half-round so as to embrace the upper portion of the bottle. The lower end of the wall is provided with a grid formed of crossed-wire bars **44** forming a bottom for the receptacle upon which the bottom of the bottle is supported. The upper end **45** of the cradle wall is curved inwardly to conform to the curvature of the bottle and forms a shoulder upon which the bottle rests when the cradle and bottle are inverted, to prevent the bottle from dropping from the cradle by gravity. The cradle is provided with a slight vertical clearance between the cradle interior and the bottle so that the bottle may slide into the cradle and still permit the upper portion of the cradle to embrace the bottle. The forks are radially disposed and have vertical right-angled tubular extensions **46** (Fig. 6) which telescope over upright posts **47** which are mounted at their lower ends on a portion **48** of the turntable so that the yokes and cradles may move vertically to lower and raise the bottles with respect to the films and water in the trough.

The bottles are received in these cradles and discharged therefrom in upright position and are turned upside down or in an inverted position by rotating the cradles about their horizontal axes. This is accomplished by an annular tipping rail **49** (Figs. 1, 2, 4, 6 and 11) which is held stationary and mounted upon a series of brackets **50** secured to the frame of the machine. Each cradle has a roller **51** on its inner side, mounted in a suitable bracket **52** and adapted to bear against the tipping rail **49**. The tipping rail has a portion which is curved outwardly and upwardly so that as the cradles and bottles move with the turntable this curved portion of the tipping rail swings the cradles about their horizontal axes in the forks through 180° to turn the bottles into an upside down position, with the mouth ends downward as the cradles approach the dipping position, and to restore the cradles and bottles to a normally upright position after they leave the dipping position.

In the dipping position, the bottles are lowered into contact with the film **9** formed on the surface of the water within each fence, and then raised up to their normal level (Figs. 7, 8, and 9). This is accomplished by a stationary annular dipping rail **53** which is mounted upon overhanging brackets or members **54** (Figs. 1 and 11) secured to the frame of the machine, and thereby held stationary. Each of the extensions **46** has an inwardly extending arm **55** (Fig. 10) carrying a roller **56** which rides upon the dipping rail **53**. The major portion of this dipping rail is positioned at a high enough level to support the yokes and cradles above the trough as the turntable rotates. In the dipping position, however, the dipping rail has a depression or downward loop portion **57** (Figs. 8 and 11) into which the rollers **56** ride and which allows the yokes to telescope downwardly on the posts **47** and lower the inverted bottle into contact with the film. These parts are all so proportioned that the mouth end of the inverted bottle, during its lowering movement, contacts the film and moves sufficiently lower to submerge the bottle end and the film into the water below the surface. As the bottle is thus submerged, the pressure of the water beneath the film folds or molds it around the bottle mouth and adjacent the neck portion to conform to the shape thereof and thus applies the hood or cap to the bottle to which the film firmly adheres. Upon completion of this submerging and film-applying movement, the yoke and cradle ride up out of the dipping loop or depression **57** to the normal level of the dipping rail (Fig. 9), after which the tipping rail again swings the cradle and restores the capped bottle to normally upright position ready to be discharged from the conveyor (Figs. 1 and 2).

The film **9** may be made of sufficient size so that, in dipping, its peripheral edge will not be submerged. Then, upon subsequent withdrawal, the peripheral edge will fold back upon itself to make a double thickness edge for the hood.

A baffle member **58** (Fig. 2) is provided to prevent the milk bottle **10** from falling out of the cradle **40** when the milk bottle is in an inverted position.

A bumper **72** is mounted upon the bottom wall **13** of the turntable. It should be located in the center of the circular opening defined by the ring-shaped member **38**. This bumper **72** serves to press the resin hood inwardly toward the cap of the milk bottle **10** as the bottle is lowered (Fig. 8), thus forcing most of the entrapped air out from between the cap of the milk bottle and the resin hood.

The bottles are fed to the cradles of the bottle-inverting conveyor by the feeding mechanism D located at one side of the turntable or discharged at the opposite side of the turntable by the discharge mechanism E. The feeding mechanism D (Fig. 10) comprises a conveyor belt **60** which moves the bottles in a row from the source of supply to the turntable, and at the inner end of the conveyor adjacent the turntable a curved chute **61** is provided to direct the bottles into the cradles. This guide is curved on an arc which intersects the arc of movement of the cradles carried by the turntable so as to guide the bottles into the cradles as the turntable rotates. Adjacent the turntable, a sprocket wheel **62** is positioned and mounted upon a vertical shaft **63**. This wheel has long radial arms **64** spaced apart at their outer ends corresponding to the spacing of the cradles on the turntable. This wheel is rotated in a proper-timed relationship to the rotation of the turntable and is arranged so that its arms engage the end bottle on the conveyor and are carried along the curved chute **61** so as to move the bottle into the cradle as the cradle approaches the feeding position. In order to insure the bottles being properly seated in the cradles, a baffle **65** is provided which the bottles engage in their movement and which moves the bottles radially into the cradles. The shaft **63** of the rotary feeding wheel **62** may be driven by any suitable mechanism timed to rotate the feeding wheel in relation to the turntable.

The bottle-discharging mechanism E (Fig. 2) is similar in construction to the bottle feeding

mechanism D, above described. A curved chute **66**, with its curved guide wall **67**, engages the bottles as they arrive in discharging position, and directs the movements of the bottles outwardly onto a moving conveyor belt **68**. A rotary sprocket wheel **69**, having spaced long arms **70**, is rotated by a shaft **71** in proper-timed relation to the turntable, so that as the bottles reach the discharge position the arms engage the bottles and move them along the curved chute **66** and onto the conveyor.

A stationary annular dipping rail **53** and the baffle **58** may be supported in any convenient manner so that each will remain stationary while still permitting rotation of the rotary, horizontally disposed, turntable A. One such means is the provision of a lattice-like canopy **74** (Figs. 11 and 12) mounted over the machine proper upon a plurality of vertical supporting columns **73**. These supporting columns **73** may be mounted upon the upper surface of the base **3**. The lattice-like canopy **74** thus forms a convenient support for the overhanging brackets or members **54** which are used to support the stationary annular dipping rail **53**. Depending supporting brackets **75** may be secured to the lattice-like canopy **74** to maintain the baffle **58** in place.

While I have herein shown and described what I consider the preferred embodiments of my invention, the same is merely illustrative, and I contemplate any changes and modifications that may come within the scope of my invention.

I claim:

1. In a machine of the class described, the combination of a receptacle containing a body of water, means for forming a flat film of plastic material upon the surface of said body of water, and means for pressing the mouth end of a bottle on to the film, thereafter submerging both the mouth end of the bottle and the film in the water to conform the film to the mouth end of the bottle and subsequently removing the film from the water surface.

2. In a machine of the class described, the combination of a receptacle containing a body of water, means for depositing a solution of plastic matter upon the surface of said body of water and causing the solution to spread as a flat film upon the surface of said body of water, and means for applying the film to the mouth end of a bottle by pressing the mouth end of the bottle on to the film and thereafter submerging both the mouth end of the bottle and the film into the water, thereby forming the film into a hood enclosing the mouth end of the bottle.

3. In a machine of the class described, the combination of a receptacle containing a body of water, means for depositing a solution of plastic matter upon the surface of said body of water and causing the solution to spread as a flat film upon the surface of said body of water, and means for pressing the mouth end of a bottle on to the film and thereafter plunging both the mouth end of the bottle and the film into said body of water to form the film into a hood enclosing the mouth end of the bottle.

4. In a machine of the class described, the combination of a moving receptacle containing a body of water, means for intermittently depositing measured quantities of plastic material solution upon the surface of the water to form flat films, means for successively feeding bottles to a position adjacent said moving body of water, and means for successively inverting the bottles and plunging the mouth ends thereof in contact with the flat films into the water to form the films into hoods enclosing the mouth ends of the bottles.

5. In a machine of the class described, a body of water, means for successively forming a flat film of plastic material upon the surface of said body of water, means for moving said body of water and said flat film of plastic material in an orbit about a central axis, means for linearly moving a plurality of bottles into said machine, means for moving each of said bottles over said body of water and over said flat film in an orbit about said central axis, means for tipping each of said bottles into an inverted position at a given place while moving in its orbit about said central axis, means for dipping the mouth of each of said bottles, while in an inverted position, into contact with said flat film of plastic material, for submerging the mouth of said bottle and said film below the surface of said body of water and for withdrawing said bottle from said body of water with the plastic material affixed to the bottle, means for tipping each of said bottles into an upright position, and means for linearly moving each of said bottles away from said machine.

6. In a machine of the class described, the combination of a receptacle containing a body of water, means for depositing a solution of plastic matter upon the surface of said body of water and causing the solution to spread as a flat film upon the surface of said body of water, means for plunging the mouth end of the bottle and the center portion of the film into said body of water while still permitting the periphery of said plastic matter to remain upon the surface of said body of water, and means for withdrawing the mouth end of the bottle and the film from said body of water whereby the periphery of the flat film will double back upon itself to form a reinforcing edge upon a hood enclosing the mouth end of the bottle.

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