Sept. 18, 1928. 1,684,827

I. R. HIPPENMEYER

BOTTLE WASHING APPARATUS

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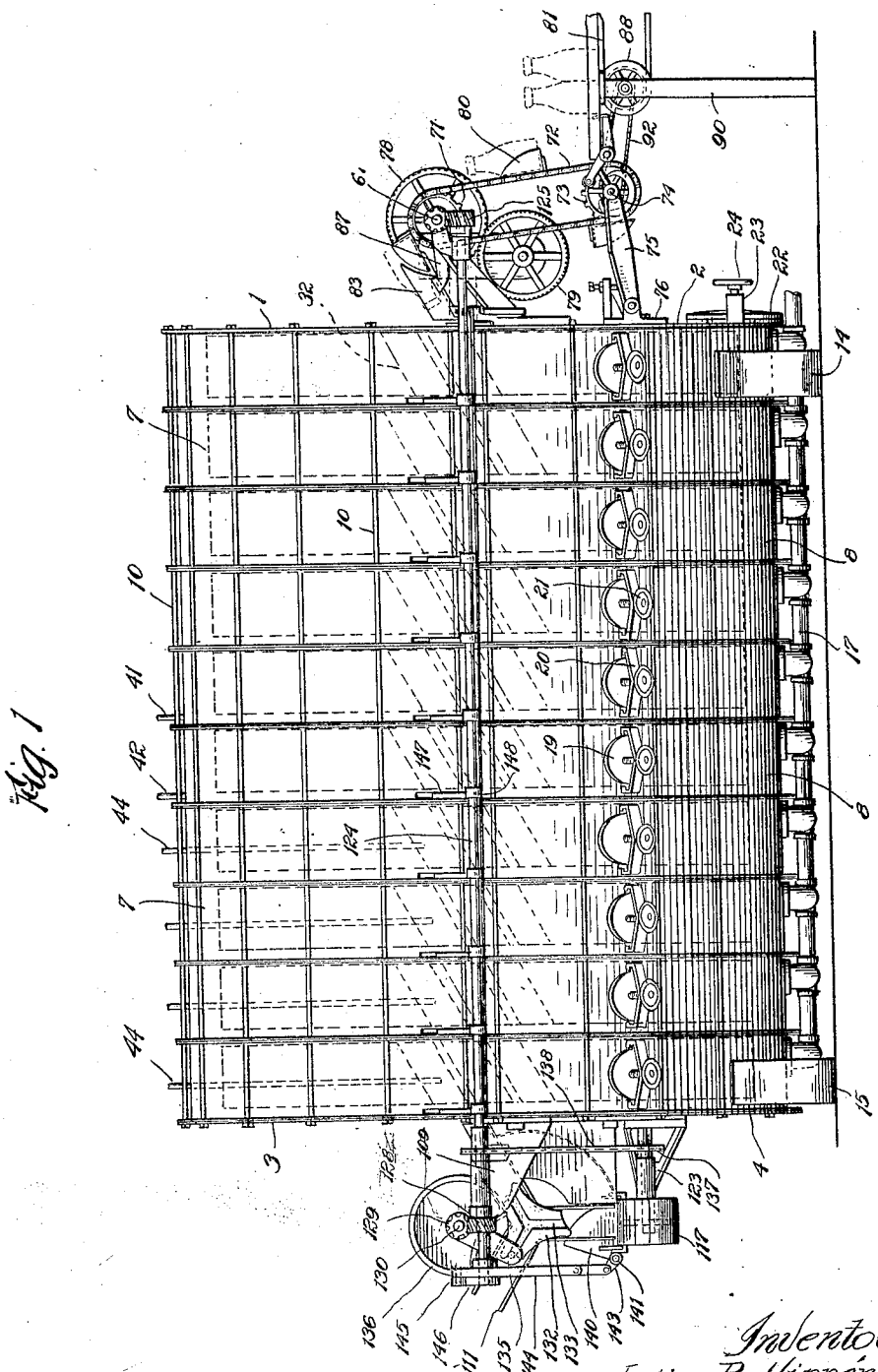


Fig. 1

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Fig. 2

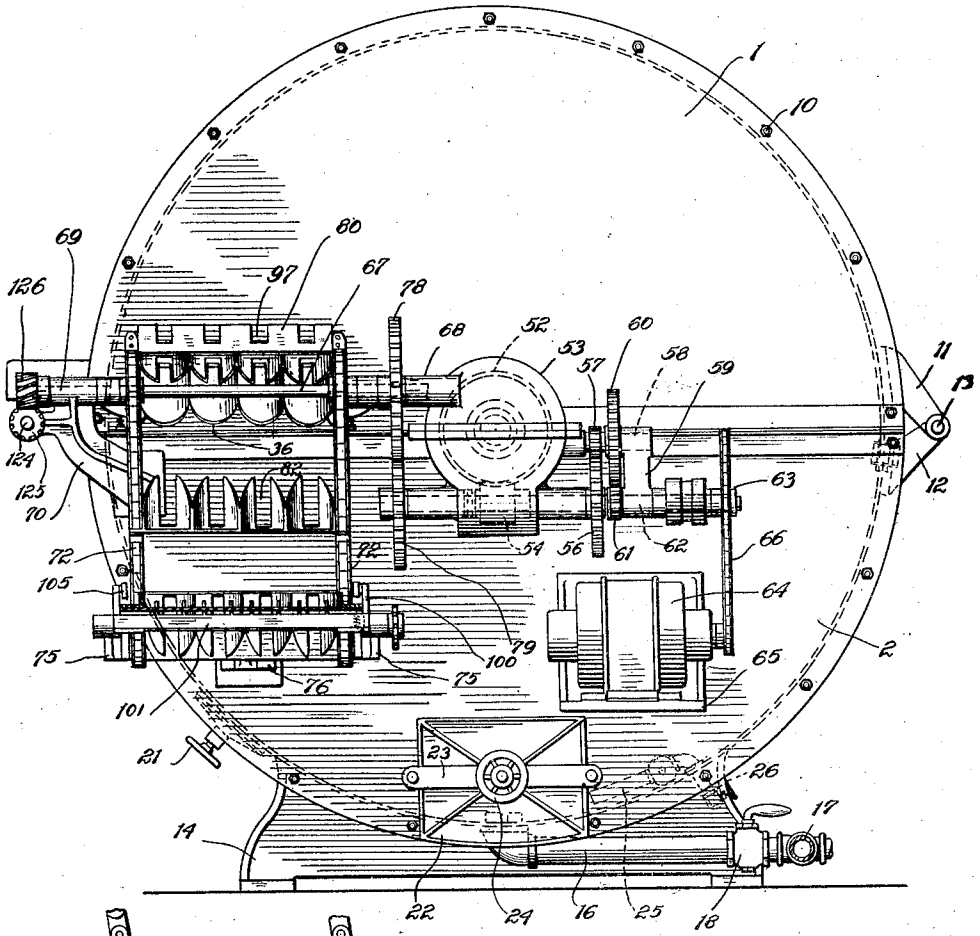
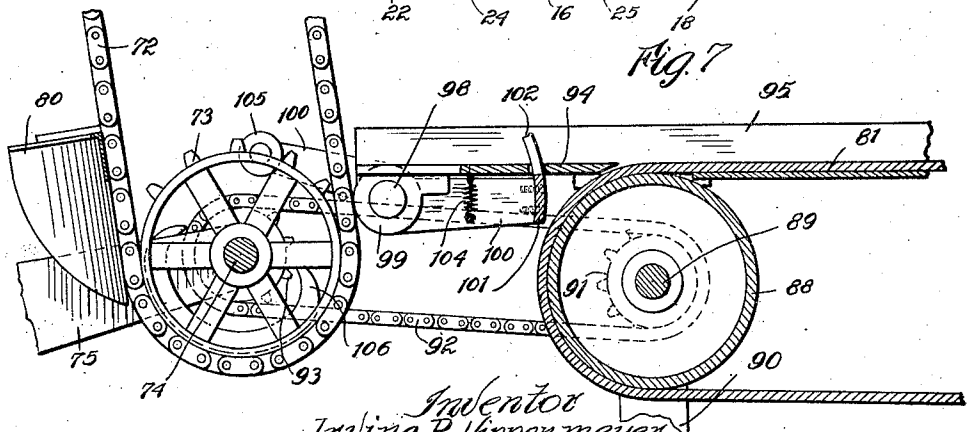


Fig. 7



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Fig. 3

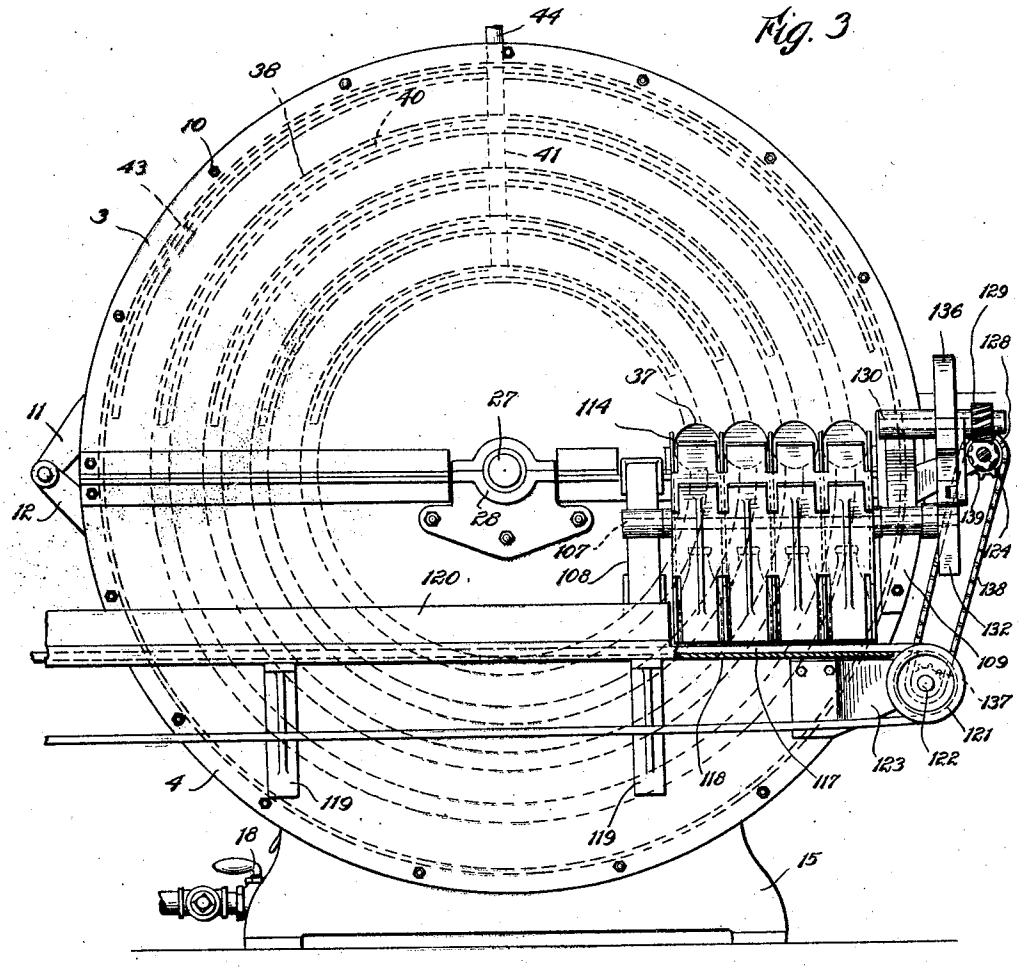
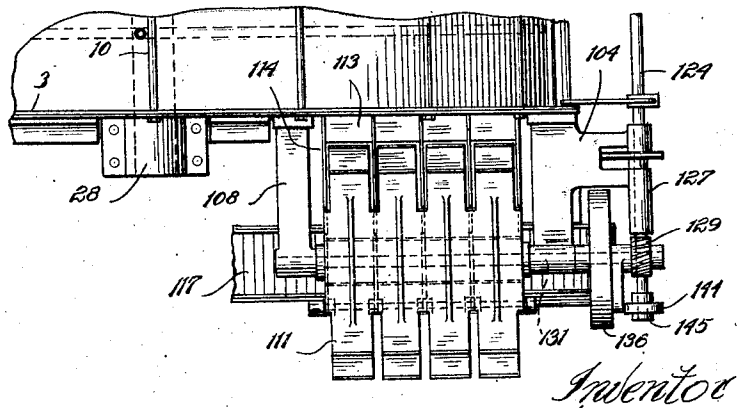


Fig. 8



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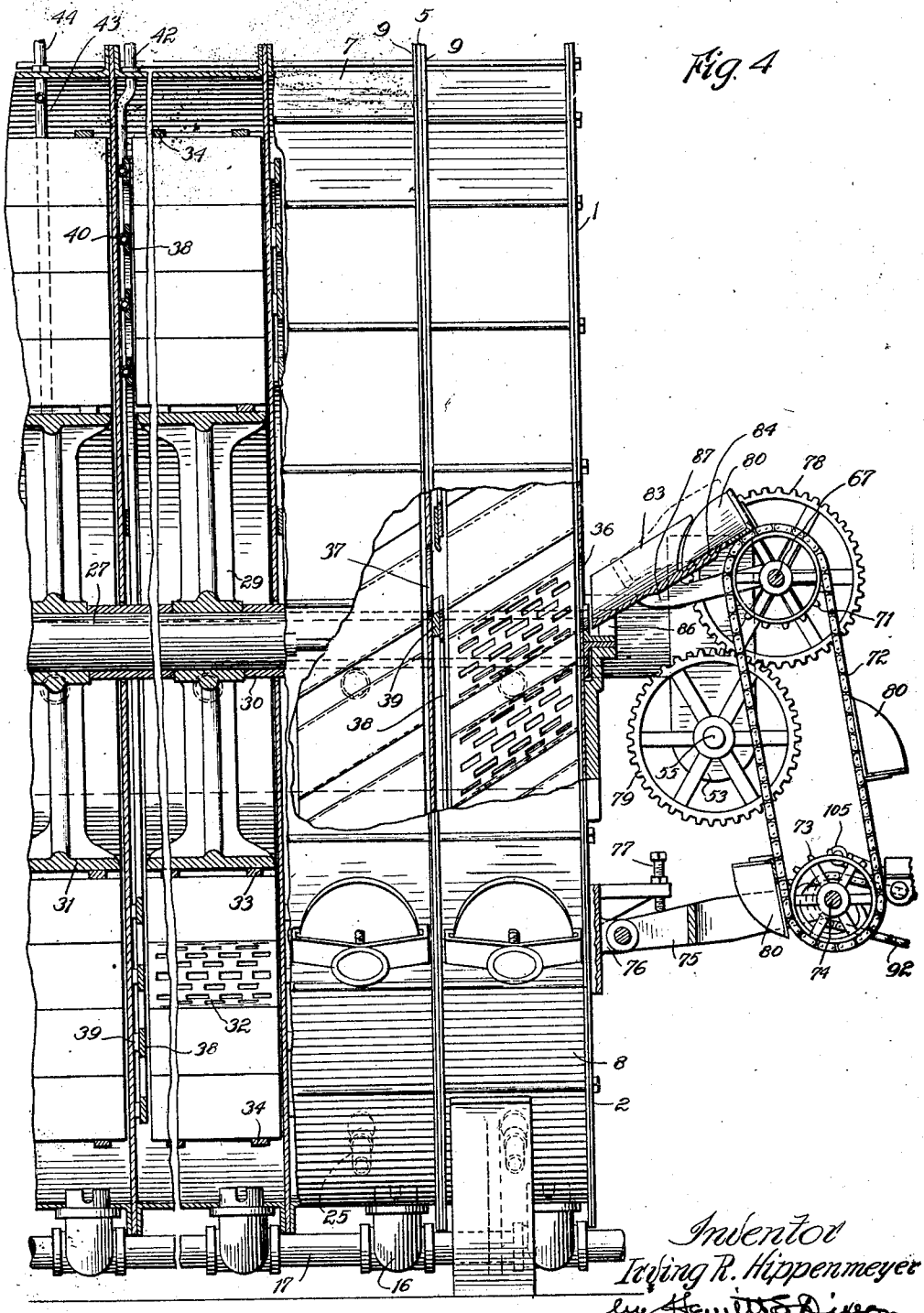
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BOTTLE WASHING APPARATUS

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Fig. 4



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BOTTLE WASHING APPARATUS

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Fig. 5

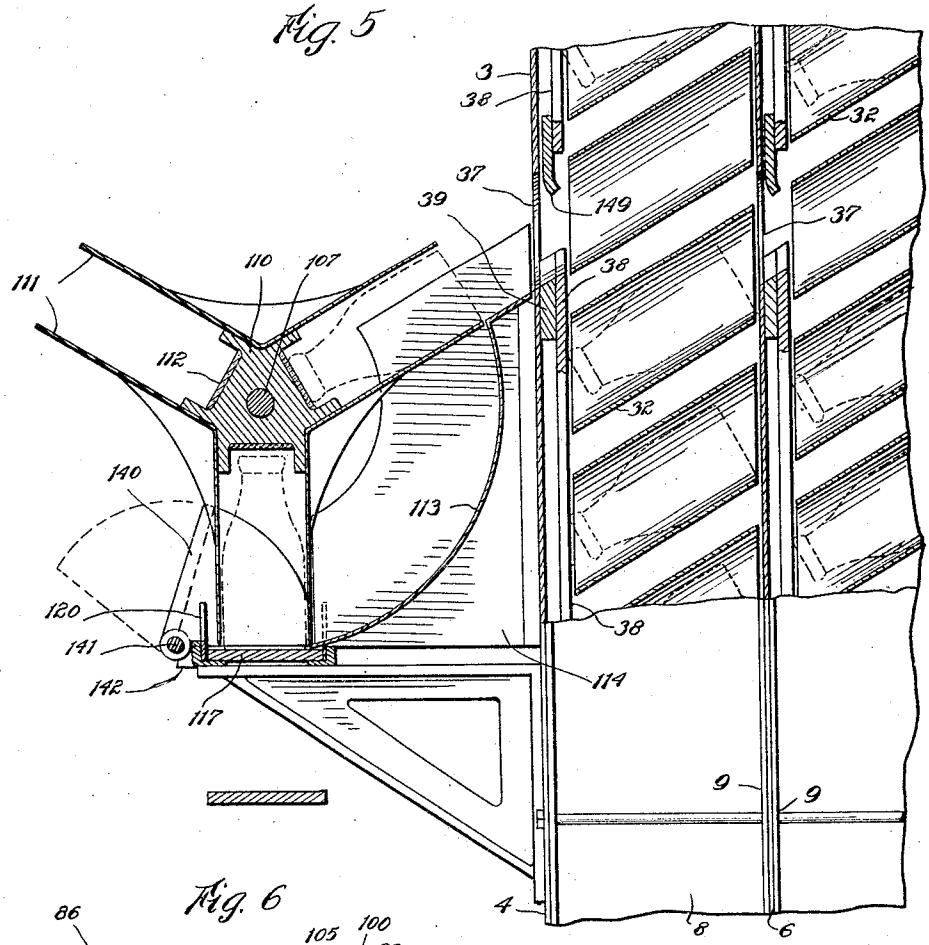
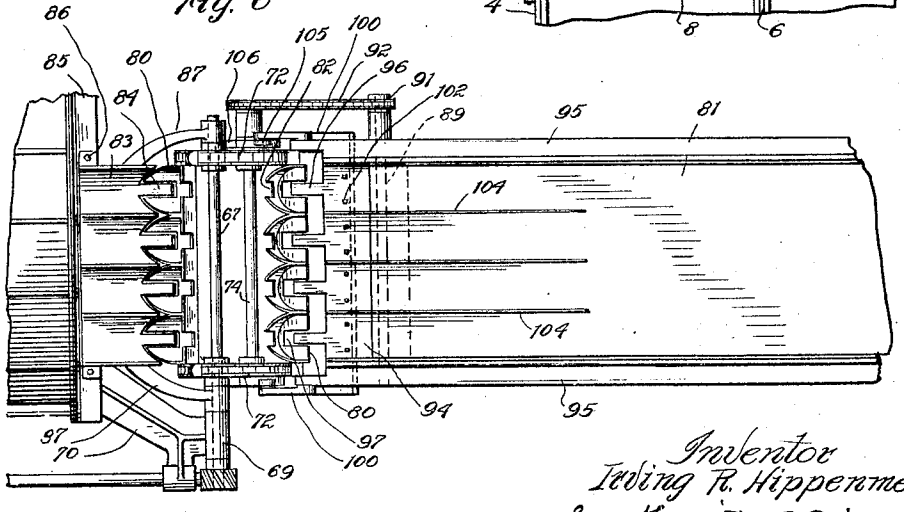


Fig. 6



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Fig. 9

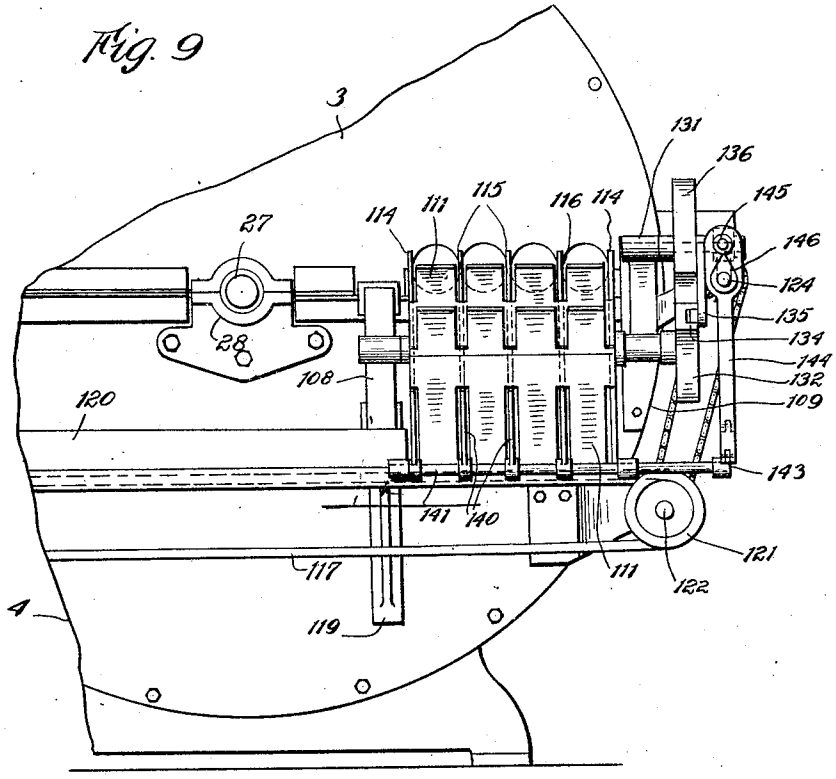
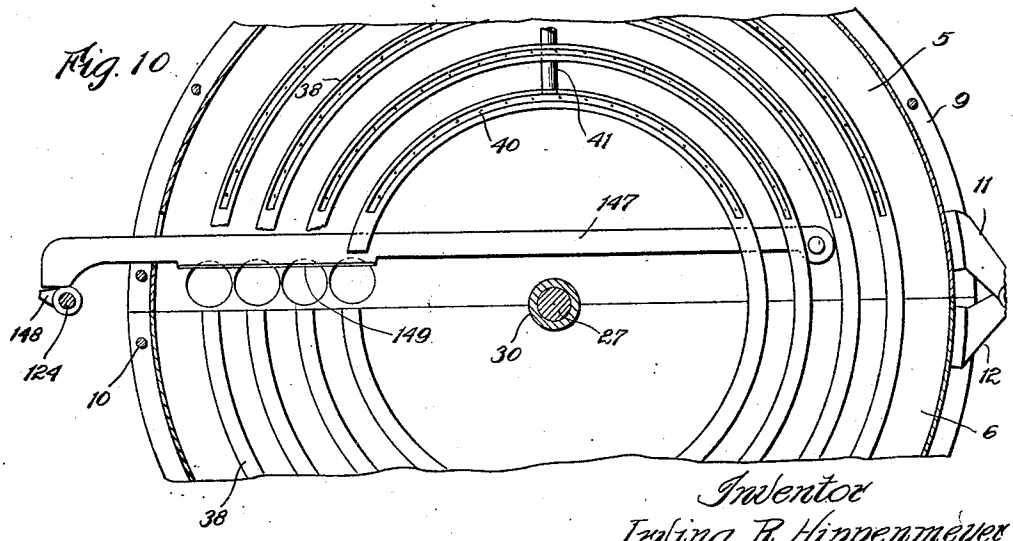


Fig. 10



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BOTTLE WASHING APPARATUS

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Fig. 11

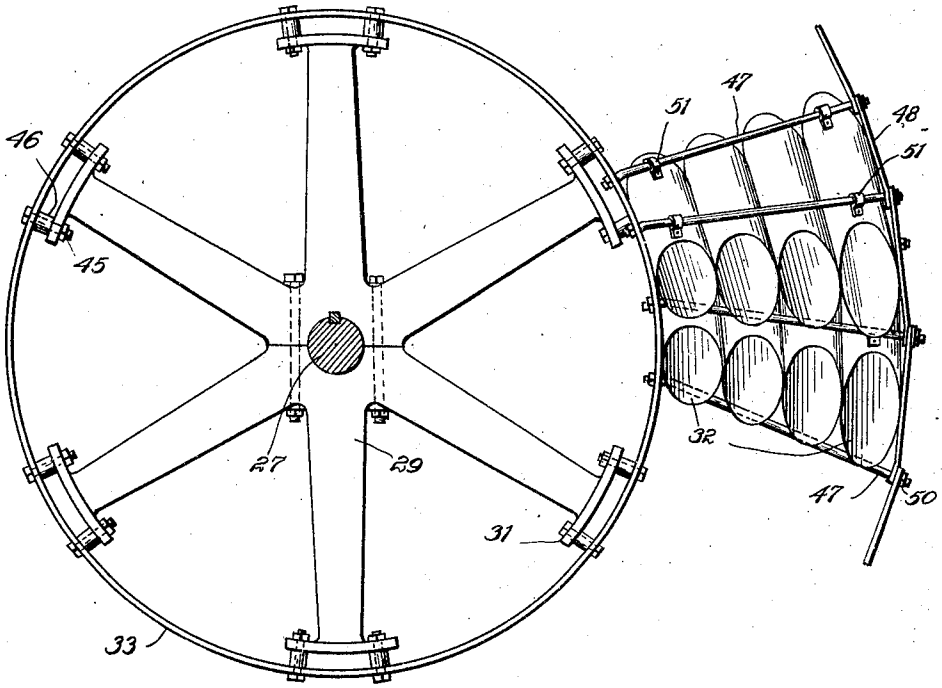


Fig. 12

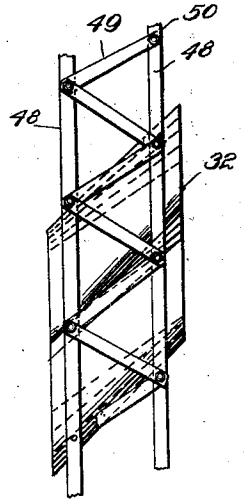


Fig. 13

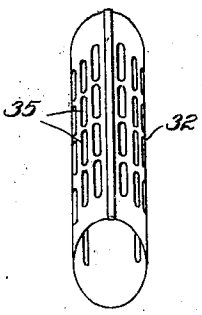
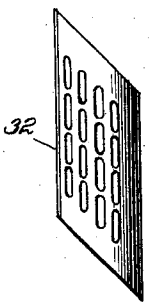


Fig. 14



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UNITED STATES PATENT OFFICE.

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BOTTLE-WASHING APPARATUS.

Application filed June 9, 1924. Serial No. 718,688.

The invention relates to machines for washing bottles, more particularly to machines adapted for washing milk bottles.

The proper treatment of milk bottles in their preparation for re-filling after their return empty from milk consumers, requires that all trace of their former contents be washed from them, and that they be then rinsed and sterilized in readiness for immediate delivery with a cool temperature to the re-filling apparatus. Soaking the bottles in hot cleansing solution, preferably a succession of soaking baths, followed by hot rinsing and sterilization by heat, is desirable. Such hot treatment involves immediately cooling the bottles to filling temperature by means which will not break them in consequence of sudden cooling, nor negative their sterilizing treatment.

It is the principal object of this invention to provide a machine by which the several steps above enumerated are efficiently and economically accomplished, and in which the bottles automatically progress through a series of compartments wherein they are subjected to a succession of soaking baths in hot cleansing solution, rinsed, sterilized and progressively cooled.

Another object is to provide a machine for the purposes specified having a compact sectional arrangement of compartments with simply constructed readily accessible operating parts, facilitating cleaning and repairs.

Further objects include the provision of automatic devices for introducing the bottles into the washing compartments, and for receiving the cleansed bottles therefrom, which devices are adapted to cooperate with continuous conveyors for handling the bottles to and from the machine.

Other objects and advantages will be apparent in the following detailed description of a preferred embodiment of the invention, which I have selected for illustration in the accompanying drawings. It will be understood, however, that various changes in form, construction and arrangement may be made by those skilled in the art without departing from the spirit and scope of the invention as expressed in the appended claims.

Referring to the drawings, Fig. 1 is a side elevation of the machine. Fig. 2 is a front end elevation. Fig. 3 is a rear end elevation showing the bottle receiving device partially in section. Fig. 4 is a side elevation of fractional longitudinal portions of the machine partly illustrated in section. Fig. 5 is a fractional side elevation of a portion of the rear end of the machine showing portions thereof in vertical section. Fig. 6 is a detail plan view of the bottle introducing device. Fig. 7 is a sectional detail of a portion of the latter. Fig. 8 is a detail plan view of the bottle receiving device at the rear of the machine. Fig. 9 is an end elevation in full of the bottle receiving device. Fig. 10 is a cross sectional view through one of the compartments. Fig. 11 represents a modified construction of one of the bottle carrying wheels. Fig. 12 is a fractional side view of the bottle pocket supporting structure in the modified form of wheel shown in Fig. 11. Figs. 13 and 14 are detailed views of the bottle retaining pockets.

Stated generally, the machine comprises a sectionally constructed tank having a series of compartments. Each compartment houses a wheel, the several wheels being mounted on a common shaft and rotatable in synchronism. Groups of bottle retaining pockets are carried by each of the wheels, the pockets of each group being arranged in substantially radial formation and inclined to the plane of rotation of the wheels. An alined series of openings through the partitions between the several compartments provides for the passage of the bottles from the pockets of one wheel to those of the next succeeding wheel, as the pockets move into register with the openings. At the front end of the machine is provided a device for receiving the bottles from a continuous conveyor, the device being operable to elevate the bottles in groups corresponding to the pockets of the wheels and slide them in timed sequence, through the openings provided in the end wall of the tank, into the successive groups of pockets moving past the openings. The bottles so positioned in the pockets of the first wheel are carried through one revolution of the wheel, during which movement they are passed through a bath of cleansing solution contained in the lower portion of the tank, and drained during their movement through the upper arc of the revolution of the wheel. As the bottles successively reach the openings in the first partition, the inclined position of the pockets causes them to slide by gravity through the

openings into the registering pockets of the wheel in the second compartment. The second wheel carries them through a full revolution and drops them in like manner into the third wheel, and so on through the machine.

The compartments are arranged to provide, first, a succession of soaking baths in cleansing solution, then a rinsing spray bath, followed by a sterilizing bath of live steam. The succeeding compartments are provided with cooling sprays of progressively lowered temperature which gradually cool the bottles to the desired finishing temperature.

At the rear end of the machine is a receiving device into which the groups of bottles are dropped through the openings in the end wall of the machine, and by which they are lowered into upright position upon a belt conveyor arranged to conduct the bottles to the filling machines.

More specifically stated, and with reference to the drawings, the machine comprises a sectional tank constructed of a series of upright spaced plates, preferably circular in form and horizontally divided into upper and lower halves. The upper and lower half sections forming the front end wall of the machine are indicated at 1 and 2 respectively. Those forming the rear end wall of the machine are indicated at 3 and 4. The intermediate partition walls are commonly indicated by the numerals 5 and 6. The spaces between the several upright walls are enclosed by annular lateral walls, horizontally divided on the line of division between the halves of the upright walls. The upper and lower lateral walls, indicated respectively at 7 and 8, are preferably provided with outwardly flanged marginal portions 9 which abut the peripheral margins of the upright plates and may be joined thereto with suitable packing to form water-tight joints. The side and upright walls are preferably secured together by the spaced rods 10, which extend longitudinally through the marginal portions of the several walls about the periphery of the tank, and carry screw threaded nuts at their ends by which the several compartment sections are secured together in a rigid structure.

Suitable hinge members 11 and 12 are rigidly secured to the upper and lower halves respectively, of the end walls and such of the intermediate walls as are necessary, each pair of hinge members having a pivotal connection 13, thus providing for the swinging upwardly of the upper half of the walls of the several compartments. The assembled structure is supported upon cradle standards 14 and 15 positioned respectively at the front and rear ends of the machines.

Each of the several compartments communicates in its lower portion with a branch pipe 16 leading laterally to a longitudinally arranged main pipe 17 which serves both as an inlet and outlet connection for the several tank compartments, each of the branches having a controlling valve 18.

The machine may be constructed with any number and arrangement of compartments. As illustrated herein the first four of the compartments from the front end of the machine are adapted to be partially filled with a cleansing solution, the others of the tank being provided with spraying devices from which the spent water is collected in the bottoms of the tanks and drained away through the outlet connections. With the beginning of the operation of the machine the soaking compartments are filled through the pipe 17 from a suitable source of water supply. Thereafter the water supply is cut off and the pipe 17 put in communication with a drain, the valves 18 controlling the soaking compartments being closed to retain the solution therein, and the valves 18 controlling the other compartments being opened to permit drainage therefrom.

It is preferable also to provide each of the compartments with lateral openings for the cleaning of the compartments when necessary, such openings being normally closed by the removable covers 19 in Fig. 1, secured in position by suitable clamping yokes 20 and hand screws 21. An auxiliary cleaning opening may be provided in the front end wall for the cleaning of the first compartment as indicated by the removable cover 22, normally secured over the opening by the clamp yoke 23 and hand screw 24. Means for heating the solution in the soaking compartments may be provided as by the steam injectors 25 positioned in the lower portion of each of the washing compartments and connected through the lateral wall of the compartments by the valve controlled pipes 26 severally connected with a steam line leading to a source of steam supply (not shown).

A horizontal shaft 27 is positioned axially of the several compartments and provided with suitable bearings mounted on the end walls of the tank structure, as indicated at 28 in Fig. 3, the bearings being secured to the lower halves of the walls to permit the lifting of the upper half of the tank structure as previously described. In each compartment is a wheel 29 mounted on the shaft 27, the wheels being keyed or otherwise rigidly secured thereto and spaced one from the other by suitable spacer sleeves 30, assuring the positioning of the wheels for free rotation between the walls of the several compartments. The wheels are preferably of spoke construction, the outer ends of the spokes carrying concentric flanges 31.

Each of the wheels 29 carries a series of radially positioned groups of open-end bottle pockets. As illustrated herein, each group comprises four bottle pockets 32 secured laterally to each other and supported inwardly

by a pair of annular bands 33 fastened to the flanges 31 and to the inner one of each group of pockets, and outwardly supported by a pair of annular binding bands 34, (Fig. 4) to which the outer one of each group of pockets is secured, the whole comprising a rigid structure rotatable by the shaft 27. The pockets are positioned with their longitudinal axes in substantially concentric relation to the axis of the shaft, but angularly inclined to a plane perpendicular to the axis of the shaft. The pockets are preferably provided with a plurality of lateral openings 35 permitting access to the bottles contained in the pockets for the soaking solution and spray baths by which the bottles are treated in their progress through the machine.

The upper portion 1 of the front end wall is provided with a horizontally arranged series of openings 36, with which the passing retainer pockets 32 on the first wheel successively register in their movement around the first compartment. Similar openings 37 are formed in each of the partition walls 5 and in the rear end wall 3, all of the openings 37 being horizontally alined with the openings 36 in the front end wall. By means hereinafter described, groups of four bottles each are dropped through the openings 36 in the front end wall at the moment the successive groups of four retaining pockets register with the openings 36. The inclination of the retaining pockets 32 is such that when the upper ends of the pockets in each group are in register with the openings 36, the lower ends of the pockets are below the alined openings 37 in the adjacent partition wall, the bottles thereby being retained in the pockets until they have completed a revolution through the compartment and their lower ends pass successively into register with the opening 37.

Mounted on the frontward side of each partition wall and the rear end wall are concentric series of abutment plates 38 positioned respectively opposite the rear ends of the pockets 32, and preferably spaced from the walls by cushioning members 39. The abutment plates are so positioned that when the bottles are admitted to the pockets they slide through into contact with the abutment plates, and the resilient support of the latter prevents chipping of the mouths of the bottles. They also serve the function in their contact with the corners of the angularly positioned bottles, to rotate the latter in the pockets and facilitate the free application of the washing solution and spray to all portions of the bottles.

While thus retained in the pockets, the bottles are carried downward and immersed in the cleansing solution in the soaking tanks, and then upward and through the upper arc of revolution where the solution is drained from the bottles. As the bottles reach the openings 37 in the first partition wall, they slide through into the retaining pockets 32 carried by the supporting wheel in the second compartment, the pockets in the second compartment being so positioned on their support that their upper ends will be in register with the openings 37 in synchronism with the lower ends of the retaining pockets of the wheel in the first compartment. After a soaking and draining treatment in the second compartment, the bottles progress similarly into the third and fourth soaking compartments.

The fifth compartment, as illustrated herein, is provided within its upper portion with concentrically arranged spray pipes 40, as shown in Fig. 10 and in the similarly arranged sixth compartment of which the portion adjacent to the spray pipes is illustrated in Fig. 4. The spray pipes 40 are positioned between the abutment plates 38 and the partition wall, and have lateral spray openings directed inwardly upon the bottles through suitable slots provided in the abutment plates. The several concentric spray pipes 40 are connected with a supply pipe 41, leading outwardly through the top wall of the compartment and connected with a suitable source of hot rinsing water, preferably by a detachable or flexible connection, (not shown) permitting the lifting of the upper portion of the tank structure when desired. In the passage of the bottles through the rinsing compartment, they are drained in the lower portion of the empty compartment of what remains of the solution applied in the preceding compartment, and are then subjected in the upper arc of their movement in the rinsing tank to the inward and outward application of the hot rinsing spray. The bottles then automatically progress into the sixth compartment, wherein is provided similarly arranged and supported spray pipes 40, and having a similarly connected supply pipe 42, receiving a supply of live steam from a suitable source. In this compartment the bottles are drained of the rinse water in the lower portion of the compartment and then subjected to the inward and outward application of continuously flowing jets of live steam, which effectively accomplishes the sterilization of the bottles.

The remaining compartments of the machine are each provided with a single spray pipe 43 positioned centrally and outwardly of the pockets 32, and having a supply connection 44, the latter being severally connected with sources of pure water supplied at varying temperatures, progressively cooler toward the last compartment. In the last mentioned compartments the bottles are cooled by successive stages, without danger of breakage, to a temperature which permits of their being immediately filled with cold milk.

Figs. 11 and 12 show a modified form of construction of the supports for the retaining pockets which is advantageous in permitting the ready disassembling of the supporting structure to enable the cleaning and repair of the retaining pockets when such may be necessary.

The wheel 29 carries the inner pair of supporting bands 33 secured to its concentrically flanged spokes preferably in spaced relation thereto the bands being secured by bolts 45 passing through spacer sleeves 46. Outwardly extending rods 47 are secured at their inner ends to the respective bands 33, and at their outer ends are radially secured in position by elements 48 of a lattice structure, forming, when assembled, a spaced pair of concentric binding bands, inter-connected and supported by other staggered elements 49, the ends of the respective elements being apertured to receive the rods 47, the latter having threaded end portions of reduced dimensions forming a shoulder for the abutment of the attached lattice elements, and upon which the latter are secured by the nuts 50.

Each group of retainer pockets 32 are inter-connected, as by riveting or welding, in proper angular relation to one another to form, with the corresponding pockets of the adjacent wheels, a helical arrangement of concentric passages through the several compartments. The inner and outer end pockets are provided with detachable clamps 51, preferably bolted to the pockets and embracing the rods 47 on each side and at each end of the respective end pockets.

The pockets 32 are preferably constructed as illustrated in Figs. 13 and 14, being formed of sheet metal, provided with the previously described perforations 35, and of cylindrical cross section with their ends cut angularly for parallel relation to the adjacent walls of the compartments when assembled in their helical arrangement. In the construction illustrated in Figs. 11 and 12 it will be apparent that by the removal of the outer retaining elements 48 and 49 over any group of pockets which it may be desired to remove, and the loosening of the clamps 51, the entire group of pockets may be withdrawn and a new group replaced.

The rotation of the shaft 27, with the bottle carrying wheels supported thereon, is accomplished as illustrated herein, by a worm wheel 52 mounted on the front end of the shaft exteriorly of the tank and enclosed within a casing 53, secured to the lower portion of the front end wall of the tank. The casing 53 also encloses a worm 54 engaging the worm wheel 52 and mounted on a shaft 55, the latter being journalled in the casing and carrying at its outward end a spur gear 56.

A pinion 57 mounted on a stub shaft 58, having its bearing in a bracket 59, is rotatable in rigid relation to the spur gear 60, also mounted on the stub shaft 58, the gear 60 being driven by a pinion 61, mounted on a shaft 62 having its bearing in the bracket 59 and carrying at its opposite end a sprocket 63. An electric motor 64, suitably mounted on a bracket 65 secured to the end wall of the tank, supplies power through the chain 66, to the sprocket 63.

The bottles are introduced into the first soaking tank by means of a feeding device located at the front end of the machine and adapted to take the bottles from a belt conveyor, elevate them in groups of four, and intermittently slide them through the openings 36 in the front end wall, synchronously with the successive passing of the groups of bottle pockets 32. The feeding device comprises a shaft 67, journalled at its inner end in a bearing 68, preferably formed on the worm gear casing 53. The outer end of the shaft is supported in a bearing 69, carried by the bracket 70, secured to the lower portion 2 of the front end wall. A pair of sprockets 71, secured on the shaft 67 intermediate of its bearings, carry respectively a pair of sprocket chains 72. The sprocket chains 72 are supported at the lower ends of their runs on a pair of sprockets 73, mounted on a shaft 74, journalled in the arms of a bearing yoke 75, pivotally supported on a bracket 76, secured to the end wall 2. The yoke 75 is arranged to be swung on its pivotal support to take up any slack developing in the chains 72, and is adjustably positioned by means of a set screw 77, bearing on the upper side of the yoke and supported in a rigid extension of the bracket 76.

The shaft 67 carries a rigidly mounted gear 78, adjacent its inner bearing 68, which is in driven engagement with a gear 79 mounted on the extended end of the worm shaft 55, thereby receiving power from the motor 64 for the operation of the chains. The chains 72 are provided at spaced intervals with cross connected elevating members 80. Each of the latter is arranged to receive and support a group of four bottles taken from a conveyor belt 81 as the bottles are advanced thereon into engagement with the cross members 80. The latter are each constructed with a bottom supporting plate and with an upright curved lateral support forming four pockets for the reception of the bottles, the lateral support having vertical slots 82 positioned centrally of the respective pockets. As the bottles are propelled into the pockets on the members 80, they are elevated by means of the chains 72, and pass over the upper sprockets 71, whereby they are turned rearwardly downward at a sufficient angle for the bottles to slide by gravity from the members 80 onto a guide member 83, having four channels adapted to receive the bottles and direct them through the openings 36 into

the rotating pockets in the first soaking compartment.

To assure the sufficient under-support of the bottles to avoid their tipping back upon the elevating members 80, the guide member 83 is provided with extended tongues 84, positioned centrally of each of the channels in the guide member and protruding into the path of the elevating members 80, passing through the slots 82 in the latter as the elevating members are carried over the upper sprockets. The guide member 83 is supported at its inner edge upon a flange 85 mounted on the end wall of the tank, and may be adjusted in relation to the openings 36 by means of a pair of set screws positioned in the lateral lugs 86 carried by the member 83, the set screws bearing upon the flange 85. The guide member 83 is outwardly supported by means of a pair of brackets 87, positioned laterally of the member 83 in fixed attachment thereto and having outer bearings on the shaft 67. Thus supported the member 83 is always in correct relation to the elevating members 80 as they pass over the sprockets 71.

As illustrated herein the adjacent end of the conveyor belt 81 is operatively supported on a roller 88 carried by a shaft 89 having its bearings in suitable standards 90. The shaft 89 carries at its outer end a sprocket 91, having driven connection through the chain 92 with a sprocket 93 mounted on the outer end of the shaft 74.

Associated with the conveyor is a stationary receiving plate 94, positioned on the same plane with the conveying run of the conveyor belt and secured to a pair of lateral guide members 95 supported on the standards 90. The edge of the receiving plate 94 facing the elevating device is provided with a series of spaced tongues 96, which protrude into the path of the bottle elevating members 80, in the bottom plates of which latter are provided slots 97 through which the tongues 96 pass in the movement of the elevating members. The bottles are propelled by the conveyor belt 81 across the receiving plate 94, and over the tongue portions 96 into position for engagement by the elevating members as they are carried upward on their supporting chains.

The bottles are advanced in time with the passage of the respective bottle elevating members by means of a reciprocating stop mechanism, which operates to normally hold back the bottles and release them in groups of four for advancement into position for engagement by the elevating members. The stop mechanism comprises a pair of stub shafts 98 secured in a pair of brackets 99 mounted on the respective guide members 95, each stub shaft carrying a centrally pivoted lever 100. A cross bar 101 is secured to the front ends of the two levers 100, the bar extending beneath the plate 94 and having upwardly projecting prongs 102 operable through apertures in the plate 94 into the path of the bottles passing over the latter. The prongs 102 are normally maintained in upper position by means of a pair of springs 103 secured to the plate 94 and attached to the respective levers 100. Intermediate spaced guides 104, secured to the plate 94 and extending over the conveyor belt 81, are preferably provided to divide the space between the lateral guides 95 into four runways leading to the elevating device. A pair of the prongs 102 are positioned in each runway.

Mounted on the opposite ends respectively of the levers 100, are a pair of pivoted rollers 105 positioned for engagement respectively by a pair of cams 106, rigidly mounted on the lower chain supporting sprockets 73. The prongs 102 normally extend through the receiving plate 94 and prevent the advancement of the bottles by the conveyor through the runways. As each of the bottle elevating members pass around the lower sprockets and approach the receiving plate 94 on their upward run, the cams 106 engage the rollers 105, swinging the levers 100 and bar 101 into position to withdraw the prongs 102 from above the receiving plate, and permit the advancement of one bottle in each of the four runways, whereupon the rollers 105 are released from the cam and the prongs raised again in the path of the succeeding bottles to prevent their further advancement until the approach of the next bottle elevating member.

The feeding device just described accomplishes the wholly automatic feeding of the bottles into the machine from the continuous conveying belt, timing the delivery of the bottles to the passage of the successive groups of pockets 32 in the first soaking tank.

A receiving device is provided at the rear end of the machine to receive the bottles from the final cooling compartment and deliver them in upright position upon a continuous conveyor for carrying the bottles to a filling machine. The receiving device comprises a shaft 107, having end bearings respectively in the brackets 108 and 109, secured to the rear end wall of the machine.

Rigidly supported on the shaft 107 is a hub member 110 to which are secured radially arranged pocket forming plates 111, which operate with the rotation of the shaft to successively present their open ends before the openings 37 in the rear end wall of the machine, in position to receive the successive groups of bottles as they are discharged from the final cooling compartment.

A cushion 112 mounted on the hub 110 at the inner end of each of the receiving pockets may be provided to prevent chipping of the bottles as they slide into the pockets and abut the hub member.

The bottles are retained in the radial

pockets during the rotation of the latter, by means of a concentric plate 113, positioned outward of the path of the ends of the pocket walls 111 and supported by end plates 114 secured to the end wall of the tank. Partition plates 115 are also provided, which form individual runways for the bottles of the groups of four as discharged from the machine, and which extend into slots 116 provided in the walls 111 forming the radial pockets.

Adjacently beneath the ends of the radial pockets in their lowermost position is a conveyor belt 117, travelling upon the supporting plate 118 mounted on the brackets 119 secured to the end wall 4, the supporting plate 118 preferably having side guide members 120 attached thereto. The conveyor belt 117 is operatively supported upon a roller 121 mounted on a shaft 122, having its supporting bearing in a bracket 123 mounted on the end wall 4. The conveyor 117 travels beneath the pockets in the direction of the axis of the shaft 107, and operates to remove the bottles laterally from the pockets when they are lowered into position over the conveyor.

The bottle receiving device is operated by means of a shaft 124 extending longitudinally of the machine and supported at its front end in a bearing formed in an extension of the bracket 70, mounted on the front end wall of the machine.

A spiral gear 125 rigidly mounted at the front end of the shaft 124 is in driven engagement with a spiral gear 126 secured on the outer end of the drive shaft 67, in the bottle feeding device. The rear end of the shaft 124 is supported in a bearing 127, carried by a lateral extension of the bracket 109. A spiral gear 128 rigidly mounted on the rear end of the shaft 124, engages a spiral gear 129 mounted on a stub shaft 130, having its bearing 131 in an upward extension of the bracket 109.

The intermittent movement of the receiving pockets carried by the shaft 107, is effected by means of the star shaped member 132 rigidly mounted on the outer end of the shaft 107, and having radially arranged lateral slots 133. The member 132 is intermittently moved through a portion of a revolution by means of a roller 134, pivoted on the lever arm 135, rigidly mounted on the stub shaft 130 and engaging successively the slots 133 in the rotation of the stub shaft 130. The intermediate positions of rest of the star member 132 are maintained by means of the arcuately recessed cam 136, carried by the shaft 130. The normal circular periphery of the cam 136 engages the concentrically recessed periphery of the star wheel 132, except during the engagement therewith of the roller 134, when the cam recess is in position for the passage therethrough of the adjacent arm of the star wheel. By this means the radial pockets formed by the walls 111 are successively presented to the discharge openings 37 in the end wall in time to receive the bottles therefrom, as they slide out of the respective pockets in the final cooling compartment. and are then swung downwardly into upright position upon the conveyor belt 117.

The conveyor belt 117 is operated by means of the sprocket 137 mounted on the roller supporting shaft 122 and in driven connection through the chain 138 with a sprocket 139 mounted on the shaft 124. The speed of the conveyor belt 117 is so arranged that the bottles will be removed from the radial pockets during the period of rest of the latter.

As the bottles are lowered in the radial pockets and deposited on the conveyor belt 117 there is a tendency to upset the bottles in their first contact with the conveyor. The bottles are prevented from being so upset by means of a series of movable wings 140 which are operable through the slots 116 in the walls of the radial pockets, the wings being swung into position between the several bottles across the conveyor belt at the moment the bottles are deposited on the conveyor, and immediately thereafter withdrawn.

The wings 140 are each supported on a shaft 141 having suitable bearings 142 mounted on the outer guide rail 120 of the conveyor. The shaft 141 carries a rocker arm 143 rigidly secured thereto. to the free end of which is pivotally connected a bar 144, extending upwardly and having a longitudinally slotted end portion embracing the extended end of the shaft 124. A pivoted roller 145 is mounted on the bar 144 above the slot adapted for engagement by a cam 146, rigidly mounted on the shaft 124, and so arranged that in the rotation of the latter, the bar 144 is lifted and the shaft 141 operated to swing the wings 140 across the conveyor 117 at the moment the bottles are deposited thereon, thus preventing their falling laterally.

Due to the shape of the standard milk bottle with its larger lower diameter forming a shoulder, it is desirable to provide for the release of the bottles for passage from one compartment to another in such time that they will slide freely through the openings in the partition walls without engagement of their shoulders with the margins of those openings. To accomplish this end there is provided over each of the openings for the passage of the bottles a bar 147 (see Fig. 10) pivoted to the partition wall at its inner end and extending through the lateral walls of the respective compartments. The outer ends of the respective bars extend over the shaft 124 where they are operatively engaged by cams 148, mounted on the shaft 124. Each of the bars 147 is provided with a curved lip 149, extending downwardly over a

portion of the openings 37. As the bottles approach the opening 37 they slide from engagement with the retaining bars 38 into engagement with the curved lips 149 on the bars 147 with the effect that they are moved slightly inward and retained in the pockets until they have passed sufficiently by the margins of the openings as not to be engaged thereby when released. The cams 148 on the shaft 124 are so timed that when the bottles are positioned centrally of the openings 37, the bar 147 is quickly raised and the bottles released thereby for passage through the openings into the next compartment.

I claim as my invention:

1. A machine of the class described, comprising a tank having a series of partitions forming compartments, a wheel in each of said compartments, said wheels being axially alined and synchronously rotatable, and a plurality of inclined bottle pockets carried by each of said wheels, the pockets of adjacent wheels being endwardly in register for the gravital passage of bottles from one to the other of said registering pockets, said partitions normally retaining the bottles in said pockets but having openings permitting their passage therefrom at intermittent intervals.

2. A machine of the class described, comprising a plurality of serially arranged tank compartments, a plurality of axially alined wheels operatively positioned in said tank compartments respectively, a plurality of bottle pockets mounted in each of said wheels, said pockets being inclined to the planes of rotation of said wheels and those of each wheel being arranged in serial endward relation to the pockets of the adjacent wheels to form helical passages from end to end of said series of compartments, and stationary means between said wheels adapted to retain bottles in the pockets of the respective wheels, said means having openings to permit the gravital passage of the bottles from the pockets of one wheel to the pockets of the adjacent wheel.

3. A machine of the class described, comprising a tank having a series of compartments, a wheel in each of said compartments having pockets adapted to receive individual bottles, said pockets being arranged for the gravital passage of the bottles from one to the next of said wheels, means normally retaining said bottles in said pockets but permitting the passage thereof at intermittent intervals, the compartments at one end of said tank being adapted to contain cleansing solution for the immersion of said bottles therein by the rotation of said wheels, spray means in each of the intermediate compartments adapted to spray rinsing and sterilizing fluids upon said bottles, and spray means in the compartments at the other end of said tank adapted to spray cooling fluids upon said bottles.

4. A machine of the class described, comprising a tank having a series of compartments, a wheel in each of said compartments having pockets adapted to receive individual bottles in inclined position, said pockets being arranged for the gravital passage of the bottles from each to the next of said wheels, means normally retaining said bottles in said pockets but permitting the intermittent passage thereof, means for conveying bottles to said machine, and automatic means for intermittently feeding said bottles from said conveyor to the first of said wheels.

5. A machine of the class described, comprising a tank having a series of compartments, a wheel in each of said compartments having pockets adapted to receive individual bottles in inclined position, said pockets being arranged for the gravital passage of the bottles from each to the next of said wheels, means normally retaining said bottles in said pockets but permitting the intermittent passage thereof, means for conveying bottles from said machine, and automatic means for receiving bottles from the last of said wheels and depositing them in upright position upon said conveying means.

6. In a machine of the class described, a tank, a wheel revolubly mounted in said tank, a pair of laterally spaced series of rods arranged in circumferentially spaced relation secured to the periphery of said wheel and extending in a substantially radial direction therefrom, connecting members removably secured to the outer ends of said rods, said connecting members being arranged to form a pair of laterally spaced sectional supporting bands extending circumferentially around said wheel and having removable cross connections between said bands, and a plurality of bottle pockets removably secured to said rods.

7. In a machine of the class described, in combination, a tank, a wheel revolubly mounted in said tank, a plurality of outwardly extending spaced rods secured to the periphery of said wheel, a plurality of inclined bottle pockets positioned between said rods, means for clamping said pockets to said rods and retaining members removably connecting the outer ends of said rods to retain said bottle pockets therebetween, said retaining members being removable in sections to permit access to and removal of said pockets.

8. In a machine of the class described, a tank, walls dividing said tank into a series of compartments, a wheel revolubly mounted in each of said compartments having inclined pockets adapted to receive bottles, said walls being positioned proximately to said wheels and adapted to normally retain the bottles in said pockets, each of said walls having an opening to permit the gravital passage of the bottles from the pockets in the wheel at one side of the said wall to those

in the wheel at the other side of said wall, a movable stop normally positioned partially over said opening adapted for the abutment of said bottles therewith, and means for quickly removing said stop from said opening to permit said bottles to pass freely therethrough.

9. In a machine of the class described, a tank having a plurality of serially arranged compartments, partition walls between said compartments, a plurality of axially alined wheels revolubly mounted in said compartments respectively, a plurality of inclined bottle pockets carried by each of said wheels, the pockets of adjacent wheels being endwardly in register for the gravital passage of bottles therebetween, said partition walls normally retaining said bottles in said pockets and each having an opening for the passage of said bottles when said pockets are in register with said opening, a lever pivotally mounted on each of said partitions and extending outwardly of said wheels, a stop formed on said lever normally positioned in partial closure of said opening, and cam means operative to intermittently lift said lever and remove said stop from said opening permitting the free passage of the bottles therethrough.

10. In a machine of the class described, in combination, a tank having a plurality of serially arranged partitions forming compartments, a wheel revolubly mounted in each of said compartments, a plurality of inclined pockets carried by each of said wheels, the pockets of adjacent wheels being endwardly in register for the passage of bottles therebetween, said partition walls between said wheels having openings to permit the passage of bottles therethrough at intermittent intervals, and rails resiliently mounted on said partition walls in concentric relation respectively with the path of movement of the ends of said pockets, said rails being adapted for abutment by the bottles in said pockets to retain them therein.

11. In a machine of the class described, in combination, a tank having a plurality of serially arranged compartments, a wheel revolubly mounted in each of said compartments, a plurality of inclined pockets carried by each of said wheels, the pockets of adjacent wheels being endwardly in register for the passage of bottles therebetween, the partition walls between said wheels having openings to permit the passage of bottles therethrough at intermittent intervals, rails resiliently mounted on said partition walls in concentric relation respectively with the path of movement of the ends of said pockets, said rails being adapted for abutment by the bottles in said pockets to retain them therein, and spraying means positioned adjacent said rails adapted to throw jets of fluid upon said bottles.

12. In a machine of the class described, a sectional tank, comprising a series of spaced upright walls, each of said walls being horizontally divided, lateral walls enclosing the spaces between said upright walls and having flanges in abutment with the peripheral margins of said upright walls, said lateral walls being divided into upper and lower sections, spaced tie rods extending longitudinally through said peripheral margins and flanges of said walls to secure said walls in rigid upper and lower structures, hinge members mounted respectively on the upper and lower portions of said assembled structure, said hinge members being pivotally connected for the upward swinging of upper portion of said structure, and means for conveying bottles to be washed successively through said compartments.

In witness whereof I have hereunto attached my signature.

IRVING R. HIPPENMEYER.