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CAP LIFTING MACHINE

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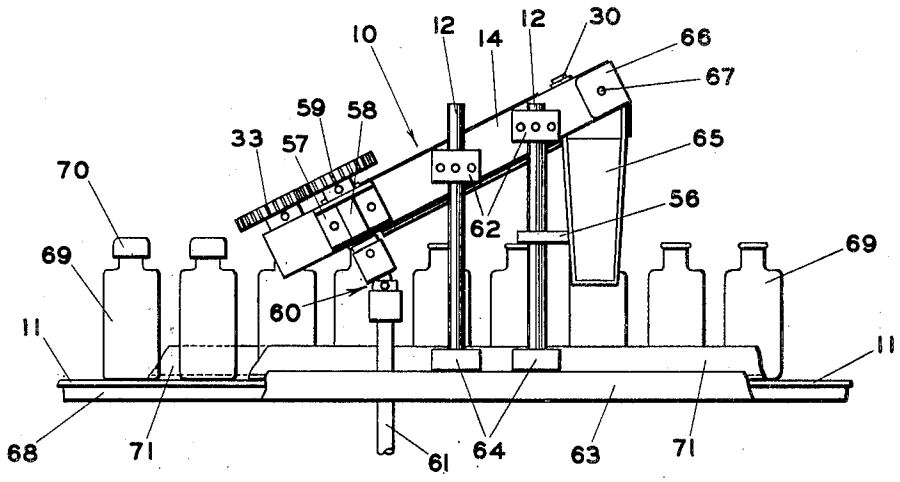


FIG. 1

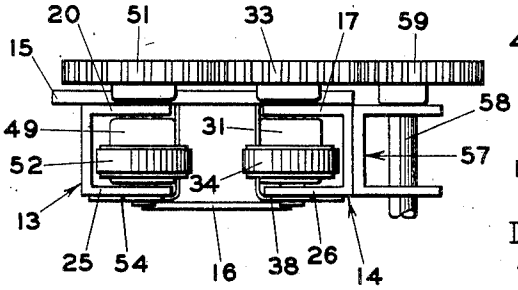


FIG. 3

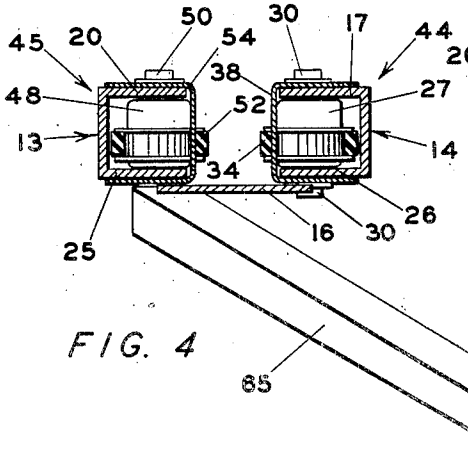


FIG. 4

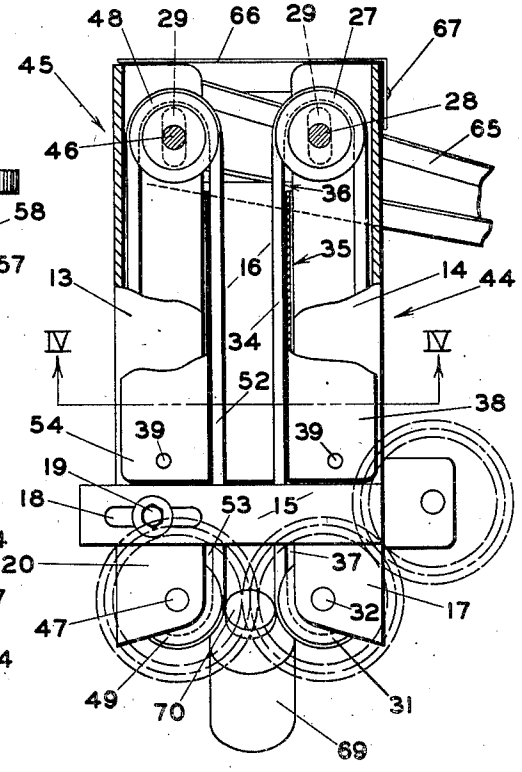


FIG. 2

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CAP LIFTING MACHINE

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2 Claims. (Cl. 226—129)

1

This invention relates to a cap lifting machine whereby a loosely fitted cover may be automatically removed from a container while said container is being transported by a conveyor.

In handling many chemicals, foods and pharmaceuticals, it is of prime importance to maintain the most sanitary conditions possible. Such sanitary conditions require the elimination of every possible human contact and its resultant contamination wherever practicable. Accordingly, it is customary in commercial practice, where said materials must be placed in suitable containers, such as glass bottles, to sterilize said bottles, which are covered with convenient, slidably fitting caps. Often, however, this said sterilization operation is of limited value because said caps are usually removed manually at a point immediately ahead of the filling station thereby exposing not only the containers, but also the filling apparatus, to contamination by the operator who is removing said caps.

Persons acquainted with container filling apparatus will recognize at once the desirability for having a completely automatic cap lifting machine which can be synchronized to cooperate with conveyor means and particularly with an endless belt type of conveyor.

Consequently, a major object of this invention is to provide a cap lifting machine which will automatically remove loosely fitted covers from over the mouths of containers.

A further object of this invention is to provide a cap lifting machine as aforesaid whose operation can be readily synchronized with that of an endless belt type of conveyor system.

A further object of this invention is to provide a cap lifting machine as aforesaid whereby contamination of sterilized containers is positively prevented prior to the operation in which said containers are filled.

Other objects and purposes of this invention will become apparent to persons familiar with this type of equipment upon referring to the accompanying drawings and upon reading the following specifications.

In order to meet those objects and purposes set forth above as well as others incidental thereto and associated therewith, I have provided a cap lifting machine comprising a longitudinally split, two part body member which is spaced from and held at an inclination with respect to a supporting platform.

Said supporting platform preferably includes a conveyor means for the purpose of transporting the containers with loosely fitting covers over their mouths.

Said cap lifting machine is so positioned with respect to said conveyor that the containers carried thereon are obliged to pass between the lower ends of the said two portions of said inclined

2

body member, whereupon said covers are engaged by a pair of laterally opposed, lifting belts, one supported in each portion of said body member. The speed of movement of said lifting belts is controlled so that the horizontal component thereof is equal to the movement of the conveyor.

A chute may be associated with the high end of said inclined, two part body member into which said covers are automatically dropped when the opposed lifting belts reach their turning points at the said high end of the body member.

Construction

For one preferred, but by no means the only, embodiment of the invention herein described, attention is directed to the drawings in which:

Figure 1 is a side elevation view of the cap lifting machine to which this invention relates.

Figure 2 is a top plan, partially broken view of said cap lifting machine, showing the operating gears in phantom.

Figure 3 is an end view of said cap lifting device.

Figure 4 is a cross sectional view taken along the line IV—IV of Figure 2.

For convenience in the hereinafter following description, directions and parts of the apparatus will be referred to as "upper" and "lower." This will assume the apparatus to be positioned in its normal condition of use. The terms "outward" and "centerward" will also be used and these will refer to directions away from and toward the geometric center of the machine. These terms are intended for purposes of convenience in reference and are not limting.

The body member 10 of the preferred embodiment of said cap lifting machine illustrated in Figure 1 may be held in an angular disposition with respect to any suitable conventional conveyor means, such as the belt 11, by means of the support rods 12 in a manner hereinafter described in detail. As shown in Figure 2, said body member 10 is comprised of a pair of substantially similar and parallel channel members which shall hereinafter be referred to as the driven side channel member 13 and drive side channel member 14. Said channel members may be adjustably held and spaced as desired with respect to each other in any convenient, conventional and suitable manner such as, for example, by means of the adjusting bar 15 and the base plate 16.

Said adjusting bar 15 may be secured adjacent to its one extremity to the top flange 17 of the said drive side channel member 14 near to the lower end thereof in any suitable manner such as welding, riveting or bolting. A slotted opening 18, longitudinally disposed with respect to said adjusting bar 15, is provided adjacent to

the other extremity thereof for slidable association with an adjusting bolt 19 which is secured to the top flange 20 of the driven side channel member 13 near to the lower end thereof.

The said base plate 16 may preferably, but not necessarily, be provided with slotted bolt holes, not shown, by means of which said base plate is adjustably secured to the bottom flanges 25 and 26 of the said channel members 13 and 14, respectively. Said base plate may be as long or as short as required to provide adequate strength, and for other purposes hereinafter disclosed.

A driven pulley wheel 27 of any conventional type is affixed to and rotatable with a driven pulley shaft 28 which extends between and throughout the longitudinally slotted openings 29 in the said top and bottom flanges 17 and 26, respectively, of the drive side channel member 14, adjacent to the upper end thereof. Said pulley shaft 28 is rotatably supported at its extremities within the bearings 30 which are adjustably secured to said top and bottom flanges 17 and 26.

A driving pulley wheel 31, preferably identical with said pulley wheel 27, is affixed to and rotatable with a driving pulley shaft 32 which extends through and is rotatably supported within suitable openings in the said top and bottom flanges 17, and 26, respectively, of the drive side channel member 14, and adjacent to the lower ends thereof. The upper extremity of said driving pulley shaft 32 extends through the top flange 17 of said drive side channel 14 so that it may be properly engaged by and rotatable with a primary driven gear 33 whose function will be disclosed hereinafter.

Said driven pulley 27 and said driving pulley 31 are mutually and operably engaged by a lifting belt 34 which may be made of any suitable material such as reinforced, soft rubber. The said pulley shafts 28 and 32 are so positioned with respect to the free edges 35 of the flanges 17 and 26 of the said drive side channel member 14 that a space 37 is provided between the inside surface 36 of that portion of said lifting belt 34, lying outside of the drive side channel member, and a plane defined by said free edges 35 of the said flanges 17 and 26.

In this particular embodiment of the invention, and as illustrated in Figures 2 and 4, the said space 37 is sufficient to permit the insertion of an appropriate guide member 38, herein shown as a U-shaped piece of sheet metal, which preferably fits over the open side of said drive side channel member 14 between said pulley wheels 27 and 31 and is of such length and strength as may be required for purposes hereinafter disclosed in detail.

The said guide member 38 may be adjustably and removably secured to said top flange 17 by means such as screws 39, and is adjustably secured between said bottom flange 26 and the base plate 16 by means of the bolts attaching said base plate 16 to said bottom flange 26.

The above description, although referring specifically to the construction of the drive side portion 44 of the said body member 10 which is supported upon the drive side channel member 14, applies in substance to the driven side portion 45 of the said body member 10 which is supported upon the driven side channel member 13, and the said portions 44 and 45 are substantially mirror images of each other.

Therefore, it may be briefly stated that a driven shaft 46 and driving shaft 47 rotatable with and secured to a pair of pulley wheels 48 and 49, respectively, which are preferably identical to the said pulley wheels 27 and 31, are rotatable within and extend through suitable openings in the said flanges 20 and 25 of the said driven side channel members 13, one adjacent to each end thereof. As aforesaid with respect to the said drive side portion 44, the upper pulley shaft 46 is adjustable longitudinally of said driven side channel member 13 and rotatably supported within a pair of adjustable bearings 50, whereas the lower pulley shaft 47 extends through the top flange 20 for proper engagement by and rotation with a secondary driven gear 51.

Said pulley wheels 48 and 49 are mutually engaged by a lifting belt 52, preferably identical with the first named lifting belt 34, in such manner that a space 53, approximately equivalent to the space 37, is provided between the said lifting belt 52 and the edges of the flanges 20 and 25. The U-shaped, sheet metal guide member 54 is advantageously identical to the guide member 38 and lies between its respective lifting belt 52 and the edges of the driven side channel member 13 in a manner similar thereto. Said guide member 54 may be secured to said channel member 13 in the same manner as said guide member 38 is secured to said channel member 14.

For the purposes of the particular embodiment of the invention to which this description relates, the mutually engaged primary and secondary driven gears 33 and 51, respectively, are identical in diameter, conventional in structure and selectable in size so that the distance between the longitudinally opposed, substantially parallel portions of the lifting belts 34 and 52 may be varied as desired by appropriate choice of gear size.

A drive shaft bracket 57, which may be a portion of a structural channel as illustrated in Figure 3, is provided with suitable openings in its upper and lower flanges for rotatable support of the upper drive shaft section 58 and is adjustably secured to the web side of the drive side channel member 14 near the lower end thereof in any suitable manner, such as by bolting. A conventional drive gear 59, which may be similar in diameter to said driven gears 33 and 51, is secured to and rotatable with the upper extremity of the upper drive shaft section 58 so that said drive gear operably engages said primary driven gear 33. Said upper drive shaft section 58 may be associated, by means of any conventional, convenient universal joint 60, with a lower drive shaft section 61 which may in turn be driven by any suitable means, not shown, such as an electric motor.

A pair of suitable support brackets 62, appearing in Figure 1 as steel blocks, are attached to said web side of said drive side channel member 14 in any suitable manner, such as by bolting or welding, and provided with vertical openings for slidable reception of, and adjustable securement to, said support rods 12. Said support rods 12 may be anchored to an appropriate base, such as the counter 63 which flanks the longitudinal edges of said conveyor belt 11, by means of any convenient, conventional, metal post lock connections 64.

The body member 10 of said cap lifting machine is preferably, but not necessarily, equipped with a discharge chute 65, which may be fabricated from any appropriate material, such as sheet metal, and which may be of any size, length or shape depending upon the particular application of the cap lifting machine. Preferably, and as viewed in Figures 1 and 2, one extremity of

said chute 65 is removably secured, as by bolting, beneath the upper end of said body member 10 for reception of said covers as they are released by the moving belts 34 and 52. Additional support means such as the support arm 56, adjustably secured to a support rod 12, may be provided as desired to steady the lower portion of said discharge chute 65.

An end piece 66, which may be fabricated from any suitable material, such as sheet metal, and which may be secured to said drive side channel member 14 by means such as a screw 67, advantageously extends across the upper open ends of said channel members 13 and 14, thereby enclosing them.

For illustrative purposes only, said conveyor belt 11 is shown as supported by a conveyor belt bed 68 which extends between and may be integral with, or secured to, said flanking counters 63. Said conveyor belt 11 is also illustratively shown as conveying a plurality of bottles 69, individually covered by sanitary caps 70, between guide-rails 71.

The lower edge of said base plate 16 terminates at such a point spaced from a line connecting the centers of the lower pulleys 31 and 49 that at a normal angle of operation, such as 30° with respect to the horizontal, bottles with their caps removed will pass under said edge without interference with same. The upper edge of said base member 16 terminates at a point spaced slightly downwardly from the line connecting the centers of the uppermost pulleys 27 and 48 but only sufficiently so that caps being dropped at and beyond said line will not strike said base plate. Said base plate is, however, as long as possible within the limits of permitting the bottles to pass under the lower edge thereof and permitting caps to pass the upper edge thereof in order to minimize the possibility of dirt falling into the uncapped bottles as pointed out hereinafter.

Adjustments

The body member 10 must first be adjusted to such height above the conveyor belt 11 that the caps 70 of the bottles 69 will be engaged by and between the two lifting belts 34 and 52 at a point with respect to said body member 10 approximately between said driving pulleys 31 and 49. When such height adjustment is made and said body member 10 is inclined at a normal slope of about 30 degrees to the horizontal, the bottles, their caps having been removed, will pass under the lower edge of said base plate 16 without interference.

The drive side portion 44 and driven side portion 45 are then laterally adjusted with respect to each other by means of the adjusting bar 15 and the base plate 16 so that the adjacent parallel portions of the belts 34 and 52 will be correctly spaced from each other throughout their lengths for positive and sustained engagement of said caps 70.

The said lifting belts 34 and 52 are maintained at the proper tension by adjusting the driven pulleys 27 and 48 and their respective shafts 28 and 46, longitudinally with respect to said body member 10 within the slotted openings 29, and by means of the adjustable bearings 30 and 50.

Said guide members 38 and 54 are adjusted, laterally with respect to the channel members 14 and 13, respectively, so that they slidably engage, and provide back support for, the inside surfaces of the belts 34 and 52 without impeding them during their normal movement.

Since the body member 10 is inclined to the conveyor bed, suitable adjustment must be made in the speed of said belts 34 and 52 whereby the horizontal component thereof will be substantially equal to the speed of the conveyor belt 11. Such relative equality in the horizontal speeds is necessary because the cap 70 is engaged both by the neck of the bottle and by the belts 34 and 52 of the cap lifting machine during an appreciable period of time in the cap removing operation.

The speeds of each of the lifting belts 34 and 52 will be identical which may be accomplished by selecting the gears 33 and 51 with identical diameters and the same number of teeth.

Operation

In operation, the sterilized containers, herein referred to illustratively as bottles 69, covered with sterile, loosely fitting caps 70, are fed by said conventional conveyor belt 11 towards said cap lifting machine. The manner in which said bottles are sterilized and/or placed upon said conveyor belt 11 is of no consequence insofar as this invention is concerned and, therefore, will not be described.

Said drive gear 59, which is driven through the drive shaft sections 58 and 61 in any convenient manner, engages and drives said primary driven gear 33, which gear in turn engages and drives said secondary driven gear 51. The pair of driving pulleys 31 and 49, rotatable with said primary driven gear 33 and secondary driven gear 51, respectively, actuate the said lifting belts 34 and 52, respectively.

When a bottle 69 reaches the point where its neck passes between the drive pulleys 31 and 49 in the lower end of said body member 10, as illustrated in Figure 2, the cap 70 is gripped by the opposing belts 34 and 52. As the conveyor belt continues to transport said bottle in a rightwardly direction, as appearing in Figure 1 said cap is gradually lifted from said bottle neck. Said bottle is then conveyed to the next station on the conveyor system which, for example, may be a bottle filling station.

Each cap is thus removed from each bottle, as it passes between the lower ends of the two portions 44 and 45 of said body member 10. Said caps are carried by said belts to the upper end of said body member 10 where, upon the turning of said belts away from each other, the caps are released and dropped into the said discharge chute 65 provided therefore.

It will be observed that the guide members 38 and 54, by preventing the belts 34 and 52, respectively, from being deflected laterally away from each other by the caps 70 which they are conveying, provide additional assurance that said caps 70 will be positively engaged by said lifting belts 34 and 52.

It will be apparent that the base plate 16 not only provides means for lateral adjustment between said drive side portion 44 and driven side portion 45 but also catches particles of foreign matter which may be disturbed by the moving parts of the body member 10, or might be rubbed off the belts by the caps, and which might otherwise fall into the open bottles.

Although the above mentioned drawings and description apply to one particular preferred embodiment of the invention, it is not my intention, implied or otherwise, to eliminate other variations or modifications which do not depart from the scope of the invention unless specifically

stated to the contrary in the hereinafter appended claims.

I claim:

1. In a device for removing caps from bottles moving in single file, the combination comprising: an elongated base plate; a pair of U-shaped channel members affixed on the opposite longitudinal edges of said base plate with the open sides of said U-sections respectively facing each other; a pair of pulleys within each of said U-shaped channel members arranged in a common plane parallel to said base plate and a belt around each of said pairs of pulleys, and each of said pulleys so positioned with respect to the free edges of the flanges of said U-shaped members that said belts will each extend slightly beyond said respective free edges; means rendering one of said U-shaped channel members adjustable toward and away from the other U-shaped member; gear means driving said pulleys so that adjacent courses of said belts travel in a common direction and at the same speed with respect to each other; means adaptable for mounting said device adjacent said row of bottles and for supporting same directly over said bottles and at a substantial angle in a vertical plane with respect to the horizontal one end of said device being positioned adjacent the upper ends of said bottles and the other end of said device being positioned substantially higher than said one end and one of said pulleys within each U-shaped channel member being positioned adjacent said other end of said device; said base plate terminating at said other end of said device at a point intermediate the centerward half of said last named pulleys and a chute positioned underneath and between said last named pulleys for catching and delivering to other means caps reaching the end of said belts and dropping between said U-shaped channel members.

2. The device defined in claim 1 wherein there is provided also a further pair of U-shaped guide members oppositely facing with respect to each other and respectively embracing the flanges of each of said U-shaped channel members, the web of said U-shaped guide members being positioned between each of said respective pairs of pulleys and under the portion of each belt extending therebetween, whereby to provide a positive backing for the adjacent courses of said belts.

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