

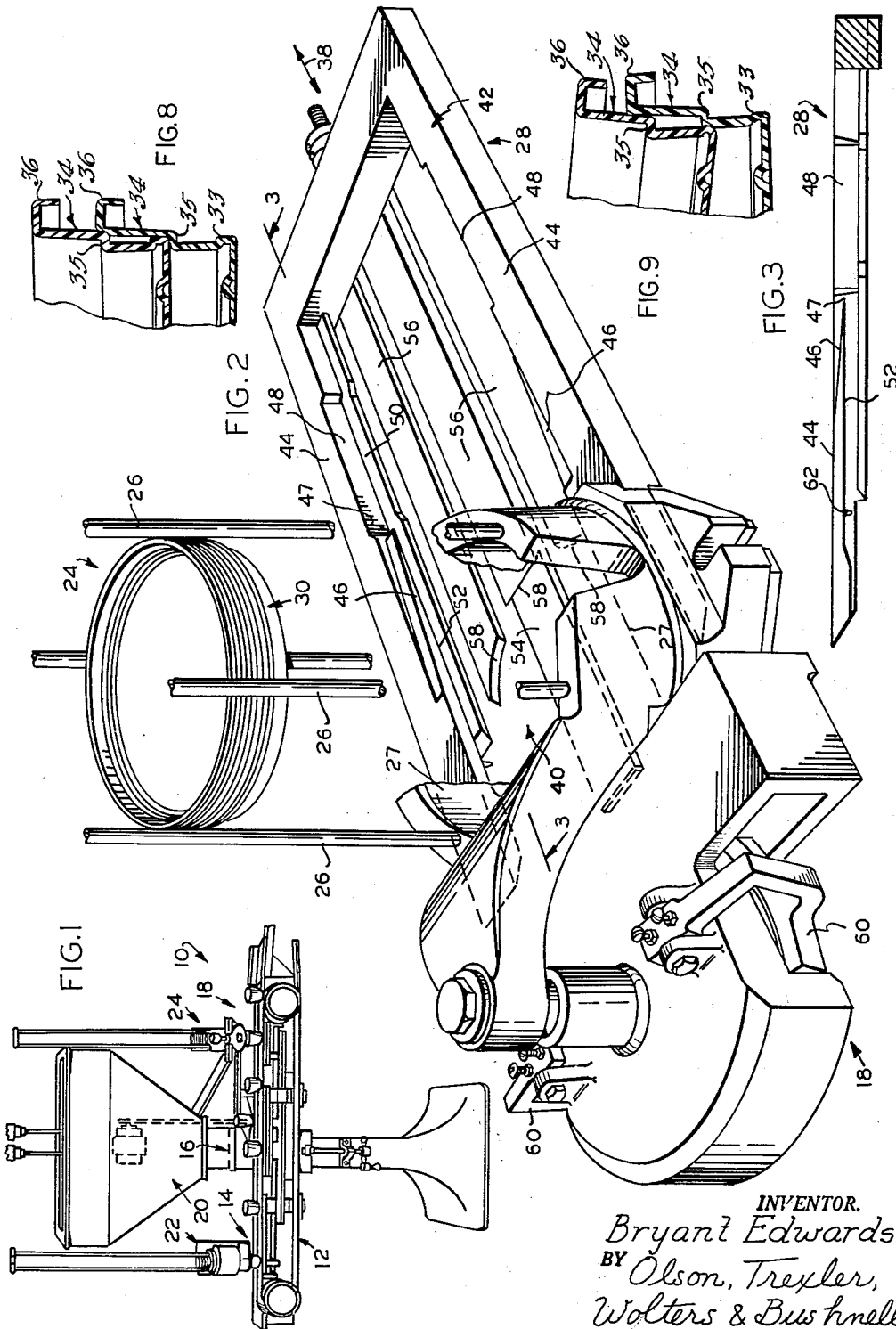
Feb. 25, 1964

B. EDWARDS
METHOD AND APPARATUS FOR SEPARATING A FLEXIBLE
LID FROM A STACK OF LIDS

3,122,267

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2 Sheets-Sheet 1



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FIG. 4

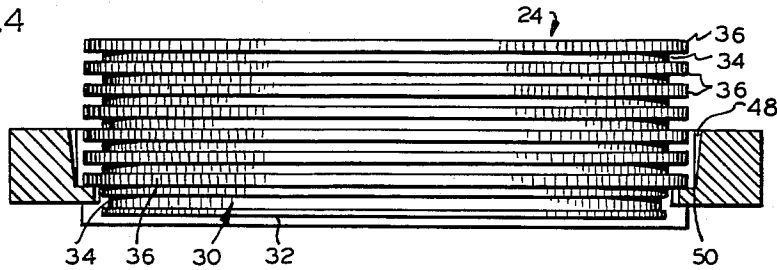


FIG. 5

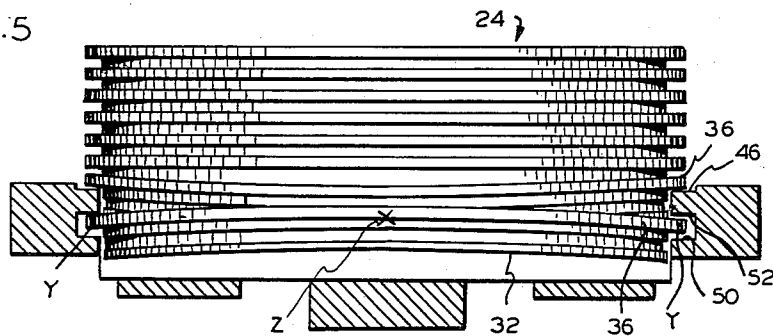


FIG. 6

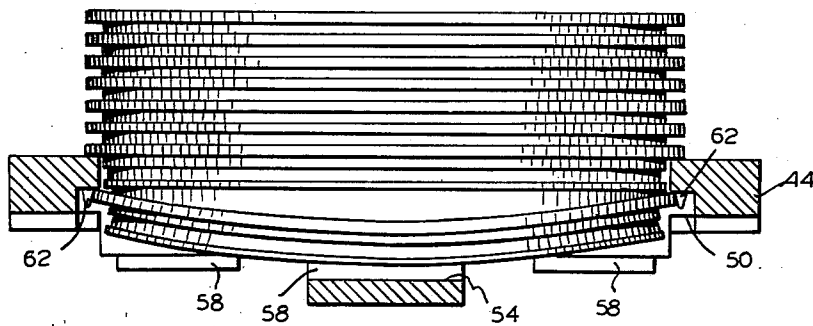
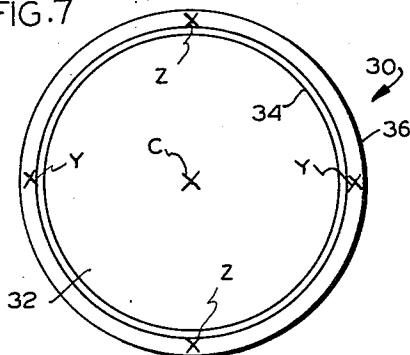


FIG. 7



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METHOD AND APPARATUS FOR SEPARATING A FLEXIBLE LID FROM A STACK OF LIDS

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7 Claims. (Cl. 221-1)

This invention relates in general to a method and apparatus for separating a flexible lid from a stack of lids and more particularly relates to a method and apparatus for separating a flexible plastic lid from a stack of lids wherein each lid is in the form of a very shallow cup having a small axial height to width ratio.

In associating plastic lids with filling and capping apparatus, a problem has been encountered relative to positive stripping of the bottom-most lid from a stack of lids. This is particularly true of plastic lids which have a large surface area and a very small axial height and which are made of such thin materials as to impart great flexibility to the lids. More particularly, in attempting to strip a lid from the bottom of a stack of lids with a pair of separating cam members which engage the lids at the periphery at two diametrically opposed points, a problem has been encountered in that the lid has a tendency to buckle at 90° from the points where the cam members engage the lids. This buckling action is in a reverse direction to stripping and causes an interfering or binding action which makes stripping difficult with consequent jam-ups in the capping of machinery.

It is a general object of this invention to provide a method and apparatus for positively stripping a flexible lid from a stack of lids.

More particularly, it is an object of this invention to provide a method and apparatus for imposing a transverse force to the stripping force to cause a flexible lid to have a clacker-like action for positive stripping.

Still another object of this invention is to impart a transverse force to a flexible plastic lid so as to cause the center of the lid to snap over center so that interfering nesting surfaces with the next adjacent lid are cleared.

Still another object of this invention is to provide a shuttle mechanism which will accomplish the foregoing objects in a mechanically expedient manner and which is otherwise well adapted for the purposes for which it is designed.

The novel features that are characteristic of the invention are set forth with particularity in the appended claims. The invention itself, both as to its organization and its method of operation, together with additional objects and advantages thereof will best be understood by the following description of a specific embodiment when read in connection with the accompanying drawings in which:

FIG. 1 is a somewhat semidiagrammatic perspective view of filling and capping machinery with which the instant invention may be associated;

FIG. 2 is a semidiagrammatic perspective view, partially in section, showing part of the capping mechanism;

FIG. 3 is a sectional view along lines 3-3 of FIG. 2;

FIG. 4 is a semidiagrammatic view illustrating the coaction of the shuttle in FIG. 2 with a stack of lids;

FIG. 5 is a view similar to FIG. 4 indicating the coaction of the shuttle with the stack of lids at a later stage in stripping operation;

FIG. 6 is a sectional view similar to FIGS. 4 and 5 indicating the coaction of the shuttle with a stack of lids at still a later stage in the stripping operation;

FIG. 7 is a top plan view of the lid shown in the other figures; and

FIG. 8 is a fragmentary section showing adjacent nested lids; and

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FIG. 9 is a similar fragmentary section showing an interfering position between adjacent lids as for example in the area marked Z in FIG. 5.

Returning now to FIG. 1 of the drawings, a filling and capping machine 10 is shown somewhat semidiagrammatically, and essentially comprises endless conveyor belts 12 which are operable to receive containers at a container dispensing station 14, move the containers to a filling station 16 and then sequentially move the containers to a capping station 18, the flow of materials being from left to right as viewed in FIG. 1. A suitable hopper means 20 is shown immediately above the filling station for receipt of the material to be placed within the containers and a suitable dispensing means 22 is provided for the containers at the left hand portion of the machine as viewed in FIG. 1.

This invention is essentially concerned with the stack of lids 24 and the method and apparatus for positively stripping the bottom-most lid from the next adjacent lid in the stack. As shown in FIGS. 1 and 2, a stack of lids 24 is confined between four upright rods 26, which are fixed to a suitable frame member 27, the stack of lids being essentially vertically aligned on the machine for a gravity feed operation. A suitable shuttle means 28, to be discussed in detail hereinafter, performs the separating operation and is movable relative to the frame 27 and the stack of lids 24.

The individual lids 30 are identical to each other, thin walled in nature and flexible and preferably are made of a plastic material such as polystyrene, polyethylene or the like. The cross sectional thickness of the lids is generally in the neighborhood of a few thousandths to a few hundredths of an inch, which together with geometrical configurations imparts the flexibility. The lids are each generally formed with a bottom wall portion 32 of rather large diametrical extent and each have side walls 34 of relatively short axial height which terminate in an open top which is surrounded by a rim portion 36. The rim portion 36 preferably is radially larger than the side walls 34 as shown.

The side walls 34 of the individual lids preferably have a stepped configuration to provide shoulder portions for nesting purposes. As more clearly shown in FIGS. 8 and 9, the side wall 34 of each lid is illustrated as including an outward peripheral bottom shoulder 33 and an intermediate shoulder portion 35. In FIG. 8, the bottom shoulder 33 of the upper lid rests upon the internal surface of the shoulder portion 35 of the lower lid and the intermediate shoulder portion 35 of the upper lid is nested within the rim portion 36 of the lower lid. Thus, in FIG. 8, the side walls are in predetermined telescoped relationship. To illustrate one interfering or binding position, reference is made to FIG. 9 wherein the bottom shoulder 33 of the upper lid has been forced within the inner surface of the shoulder portion 35 of the lower lid and shoulder portion 35 of the upper lid has been correspondingly shifted inwardly of the rim portion 36 of the lower lid. Thus, in FIG. 9, the side walls have an increased relative telescoped relationship as compared to that of FIG. 8. As can be best perceived in FIG. 4, the lids 30, when aligned in a stack 24, have the rim portions 36 separated from each other by a predetermined distance known as the stacking height of individual lids, this stacking height being determined by the disposition of the shoulder portion in the side wall of each lid relative to the bottom thereof. There are other ways of providing a stack height for nested lids, and for purposes of this invention it does not matter how the stack height is obtained as long as identical portions of each of the lids in a stack are separated by a predetermined distance so that there is a spacing between the radially larger rim portion (or some other portion) so

that a cam surface may be inserted between adjacent lids.

In the apparatus shown in FIGS. 1 and 2, the shuttle means 28 is actuated by a suitable actuator 38 shown semidiagrammatically by the arrow to the right of FIG. 2. The shuttle means 28 reciprocates back and forth in a suitable slide (not shown) and separates the bottom-most lid from the next adjacent lid at a separating station 40 which is spaced from the capping station 18.

The shuttle means 28 is in the form of a U-shaped frame 42 having spaced apart legs 44. The shuttle means 28 is essentially symmetrical about the longitudinal center line thereof and the inboard portion of each leg 44 is formed with an inclined surface 46 which terminates in a rather sharp point 47. The inboard portion of legs 44 are additionally formed with a cutout area 48 to allow the lids to drop onto a supporting surface 50, said surface 50 being coextensive with a portion of the length of the legs, said surface 50 being located intermediate the height of leg 44 of the shuttle.

As the shuttle is moved forward from the position shown in FIG. 2, the bottom-most surfaces of the rim portion 36 of the bottom-most lid rides down surface 46 on each of the legs 44 until the bottom-most lid is resting on surface 50 in the vicinity of the cutout portion 48 of the arms. The entire stack 24 then rests on surface 50 as shown in FIG. 4. As the shuttle is then moved back by its actuating means 38, cam surfaces 52 on the underside of and together with the inclined surface 46, progressively impose a separating force between the bottom-most lid and the penultimate lid adjacent thereto. As shown in FIG. 7, these forces are being applied at diametrically opposed portions Y on the rim of the lid. Due to the flexibility of the lid, the center C of the lid and the diametrically opposed portions Z on the lid (which are at 90° to portions Y) are forced by a buckling action in the opposite direction to a separating direction as shown in FIG. 5.

In order for the lid to be positively stripped at station 40, so that it will drop down onto tongue portion 54 of the central support strips 56 for ultimate movement to the capping station 18 by the surfaces 58 on the support strips 56, it is necessary to have the interfering or binding portions of the rim 36 on the bottom lid at points Z move in a reverse direction so as to clear the adjacent lid. The structure for accomplishing this is the cam means 62 in the form of tapered pins. The tapered pins are located on each surface 52 and each has its axis aligned with the axis of the stack 24. The two pins are spaced apart a dimension less than the diametrical dimension of the outer edges of the rim portion 36 so that when the shuttle means 28 as it moves by the stack of lids, when they are in the position as shown in FIG. 5, engages the edge surfaces of the bottom-most lid and imposes a transverse force upon the lid to the force imposed by cam surfaces 46 and 52. This transverse force imposed by the pin 62 causes the center C and the portions Z on the bottom-most lid to snap over center so that as the shuttle 28 goes by the stack, the bottom-most lid will drop off and onto tongue 54 for movement to capping station 18 for gripping by the clamp means 60.

Suitable means are provided at station 18 for then capping the filled containers and the shuttle 28 operates in timed relation to the movement of the filled containers past the capping station.

The capping means shuttle 28 on each stroke thereof causes a positive stripping of a flexible lid from the stack of lids in a fast, repetitive, trouble-free manner.

Although a specific embodiment of the invention has been shown and described, it is with full awareness that many modifications thereof are possible. The invention, therefore is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the appended claims.

What is claimed as the invention is:

1. A shuttle for separating the bottom-most lid from the next adjacent lid of a stack of flexible lids having a vertical axis, said individual lids each having an axial height so as to provide interfering surfaces with adjacent lids in a plane normal to the axis of said stack when the lids are in stacked relation comprising first and second cam surface portions spaced apart a dimension greater than said interfering surfaces on said lids and less than other surfaces of said lids and operable to impose a separating force between the bottom-most lid and the next adjacent lid in a first direction along the axis of said stack and simultaneously cause the front and rear portions of the rim of said bottom-most lid to move in a second direction opposite to said first direction, and third and fourth cam surface portions on said shuttle disposed adjacent to said first and second cam surface portions respectively and operable to engage said bottom-most lid to impose a force thereon normal to the axis of said stack and thereby cause said front and rear portions of the rim of said bottom-most lid to reverse its direction of movement from said second direction of movement whereby a flexible lid may be positively stripped from a stack of lids.

2. A shuttle for separating the bottom-most lid from the next adjacent lid of a stack of flexible lids having a vertical axis, comprising first cam means operable to impose a separating force between the bottom-most lid and the next adjacent lid in a first direction along the axis of said stack and simultaneously cause at least a portion of said bottom-most lid to move in a direction opposite to said first direction, and second cam means operable to engage said bottom-most lid to impose a force thereon normal to the axis of said stack and thereby cause said portion of said bottom-most lid to reverse its direction of movement whereby a flexible lid may be positively stripped from a stack of lids.

3. A shuttle for use with filling and capping machinery and operable to strip the bottom-most lid from a stack of lids, said stack of lids having an axis, said individual lids of the stack of lids each having side walls of relatively short axial height, a relatively large bottom wall portion, and a lip portion of greater diameter than said side walls, said individual lip portions of the individual lids being initially spaced apart when the lids are in stacked relation, comprising shuttle means having a pair of spaced apart cam means insertable between the bottom-most lid and the next adjacent lid of the stack of lids on opposite sides of said stack, each of said cam means presenting first and second opposed cam surfaces operable to engage the lip portions of the bottom-most and next adjacent lids to impart a separating force in a first direction and along said axis and simultaneously cause portions of said bottom-most lid to move in a direction opposite to said first direction, each of said cam means having a third cam surface engageable with said rim surface of said bottom-most lid and operable to cause a radially inward force on said bottom-most lid and in a direction transverse to the axis of said stack to thereby cause said portions of said bottom-most lid to snap over center and move in said first direction to thereby provide positive stripping of the bottom-most lid from said stack of lids.

4. The shuttle set forth in claim 3 wherein said third cam means associated with each of said rails is in the form of a tapered pin associated with said second cam surface of each of said cam means, the axis of each of said tapered pins being essentially aligned with the axis of said stack of lids and spaced apart so that the inboard surface of said pins are spaced apart a dimension less than the diametrical dimension of the rim portions of the individual lids.

5. A shuttle for separating the bottom-most lid from the next adjacent lid of a stack of flexible lids, compris-

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ing first means operable to impose a separating force on first portions of the bottom-most lid and the next adjacent lid to cause movement thereof in a first direction and simultaneously cause second portions of said bottom-most lid to move in a second direction opposite to said first direction, and means operable to engage said bottom-most lid to impose a second force thereon and thereby cause said second portions of said bottom-most lid to change its direction of movement from said second direction of movement to said first direction of movement whereby a flexible lid may be positively stripped from a stack of lids.

6. A method of separating the bottom-most lid from a stack of thin flexible lids in nested stacked relationship, each lid having a shallow cup-like configuration with a relatively large bottom wall surface and a relatively short side wall surface comprising the steps of imposing a first separating force at two spaced points between the penultimate lid and the bottom-most lid in a first direction along the axis of the stack of lids in a manner to cause portions of the bottom-most lid to move in a direction opposite to said first direction imposed by said first force, and then imposing a second force to said bottom-most lid in a direction transverse to said first force to cause

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said portions to snap over center and move in the same direction of said first direction whereby a thin flexible lid may be positively separated from a stack of nested lids.

7. A method of separating the bottom-most lid from a stack of nested thin flexible lids having peripheral side walls in a predetermined position of telescoped relationship comprising the steps of imposing a first separating force between the penultimate lid and the bottom-most lid in a manner to cause portions of the side walls of the bottom-most and penultimate lids to assume a binding position of increased telescoped relationship with respect to said predetermined position and then imposing a second force to at least said bottom-most lid in a direction transverse to said first force to cause the side wall portions of said lids in binding position to become non-binding whereby a thin flexible lid may be positively separated from a stack of nested lids.

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