

[54] CAPPING DEVICE FOR CONTAINERS

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[51] Int. Cl. .... B65b 7/28

[58] Field of Search.....53/319, 320, 321, 322, 328, 53/367

[56] References Cited

UNITED STATES PATENTS

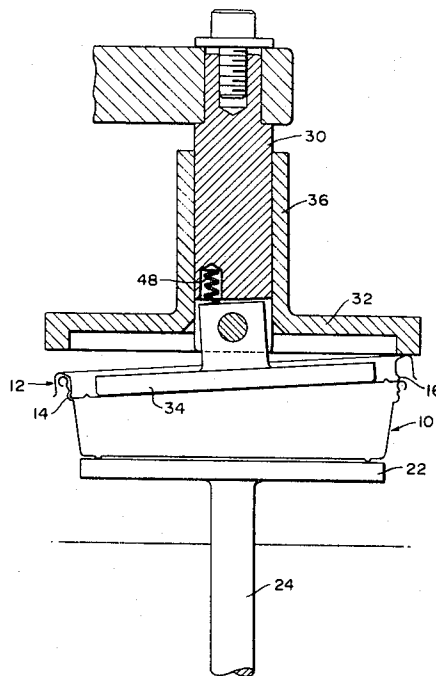
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[57] ABSTRACT

A mechanism for seating lids on containers including as one embodiment a vertically movable container support and a capping head having a plate and an inner disc pivotally carried on a post above the support. As the container with a lid resting on its rim moves upwardly, the plate is carried upwardly on the lid and the disc seats one side of the lid and then seats the other side on the container, thereby minimizing distortion of the lid and container, and allowing air to escape from the container. In another embodiment the container remains stationary, and the pivotally mounted disc without the plate is vertically movable toward and away from the container and the lid.

12 Claims, 8 Drawing Figures



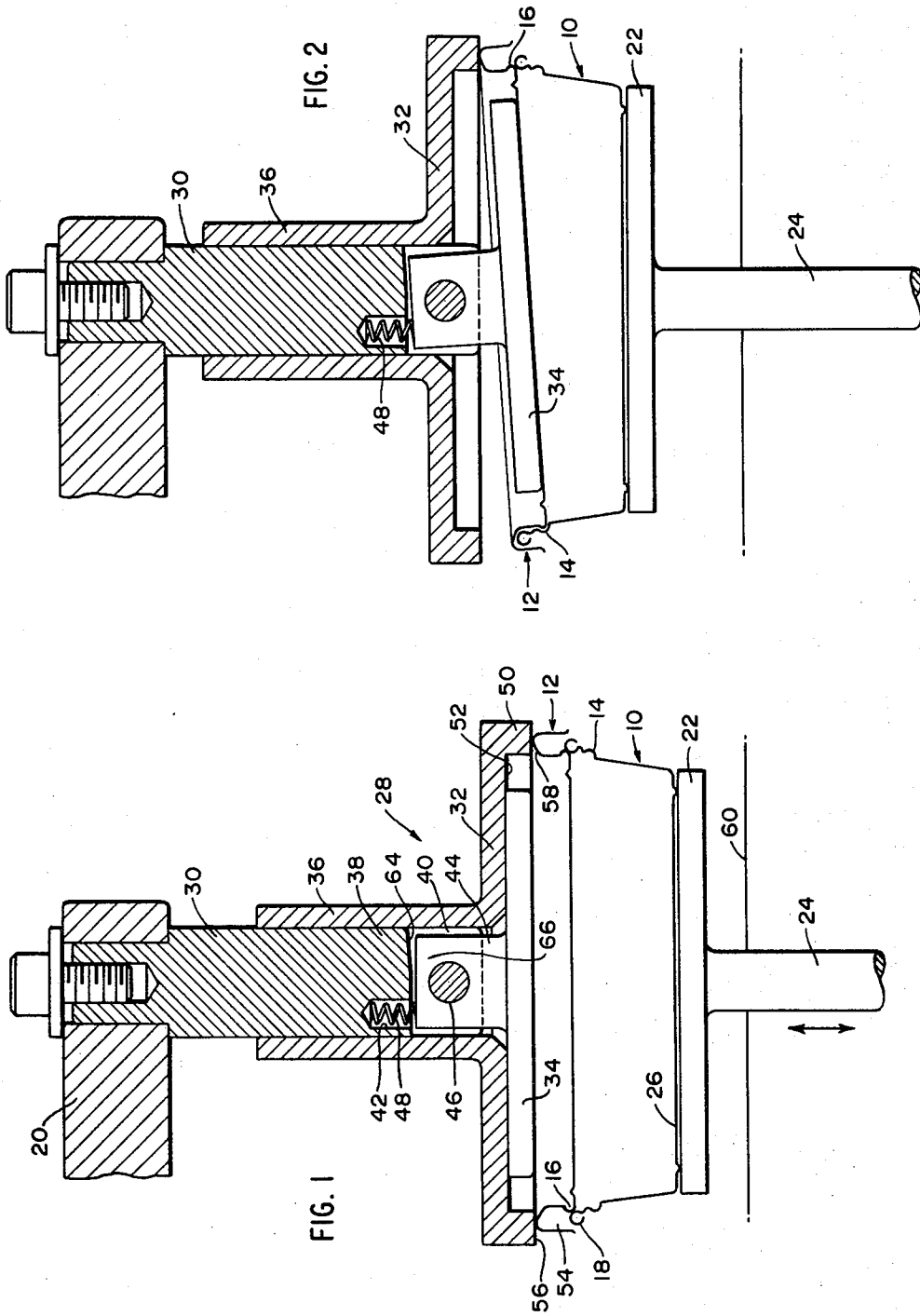


FIG. 2

FIG. 1

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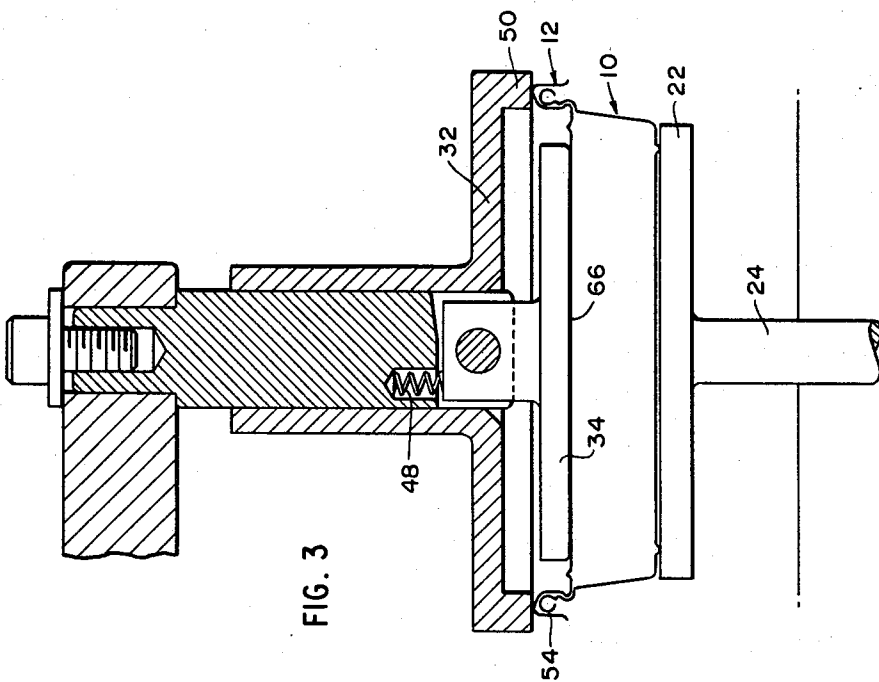
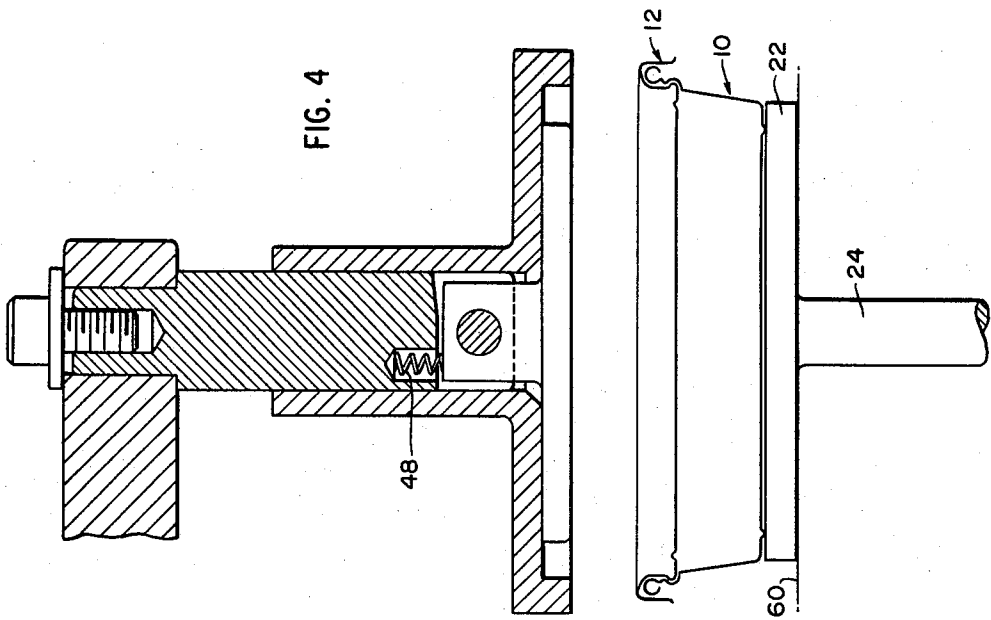


FIG. 4

FIG. 3

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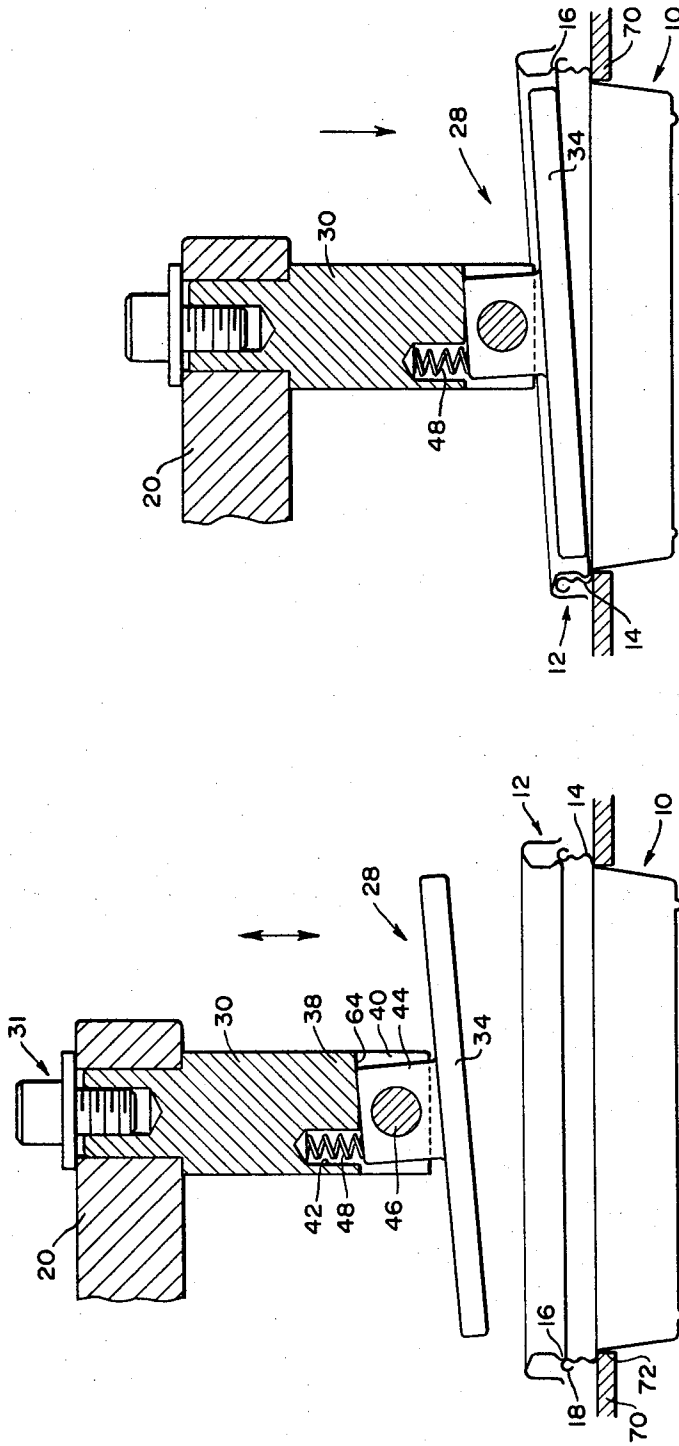


FIG. 6

FIG. 5

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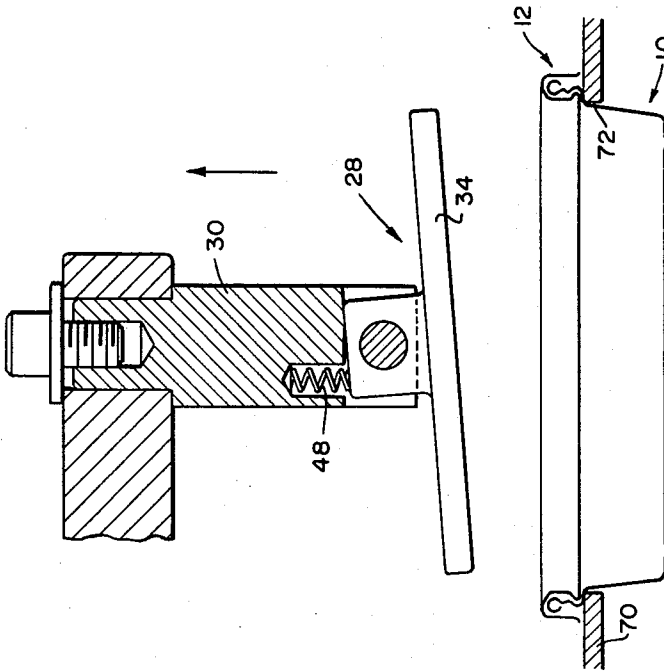


FIG. 8

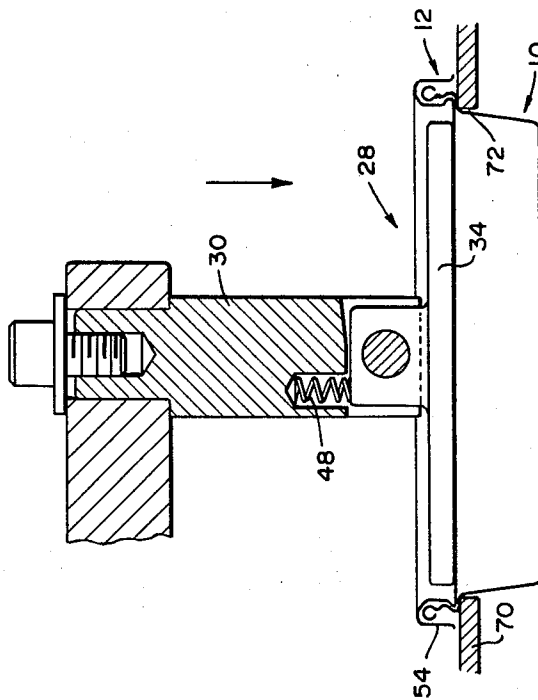


FIG. 7

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**CAPPING DEVICE FOR CONTAINERS**

This invention relates to means for automatically seating lids on containers.

At the present time there are a number of mechanisms available for automatically seating lids on containers. These mechanisms apply an axially directed force on the lid to force it to seat on the container mouth. As the force is applied axially, simultaneously and uniformly about the entire lid periphery, the lid or the container mouth must necessarily distort appreciably in order to allow the lid to snap into place. Because the entire lid periphery snaps in place simultaneously, substantial air entrapment takes place which causes a substantial internal pressure in the sealed container. That pressure within the container may force the lid to pop off the lid seat and make the package unsaleable. Further, that pressure serves to resist the capping or seating of the lid during the capping operation and adds to lid and/or container distortion.

A principal object of this invention is to provide means for automatically seating lids on containers, which reduces lid and container distortion and reduces the amount of air trapped in the container during capping.

To accomplish that and other objects, this invention in accordance with one embodiment includes among its features a container support which moves relative to a capping head disposed above it. A moveable plate forming part of the capping head lies above a disc which is positioned to engage the central portion of a lid resting on the container rim. The disc is pivotally supported on the capping head and tilts the lid on the rim so that it seats first on one side and then on the other as the support raises the container with the lid upon it against the head. In another embodiment, the plate is omitted.

In the drawings:

FIGS. 1-4 are side views of one embodiment of capping mechanism of this invention and showing the sequence of steps performed by the mechanism to seat a lid on the container mouth.

FIGS. 5-8 are side views of another capping mechanism of this invention and showing the sequence of capping steps performed by it.

**DETAILED DESCRIPTION**

In this description and throughout the drawings like reference numerals are used to designate like parts.

In FIGS. 1-4 a container 10 and lid 12 are shown in line form and are intended to be typical of the containers which may be capped by the machine of this invention. The container 10 is shown to have a lid seat 14 which is adapted to receive the bead 16 of coverall lid 12. The lid seat 14 is conventionally provided with an undercut, and the diameter of the bead 16 in the lid exceeds the diameter of the mouth of the container about the seat 14. Consequently, some deformation, albeit temporary, is required to push the bead down through the mouth of the container to the seat 14.

The machine of this invention is designed to force the lid to a seated position wherein the bead 16 is disposed in the seat 14 while minimizing the distortion of the lid and container and reducing the amount of air trapped in the container when the lid is seated.

The matter of air entrapment may best be understood with reference to the container and lid as

shown in the position of FIG. 1. In that figure, the lid 12 rests on the rim 18 of container 10, and the two effectively form an air seal for the container interior. When the lid is forced to a position wherein the bead rests in the seat, the volume of the container is reduced, and unless part of the air in the container is allowed to bleed out, the volume is compressed and a substantial pressure is created in the container.

The mechanism of this invention is of the type which may be used on a filling machine typically shown in U.S. Pat. No. 3,503,182 dated Mar. 31, 1970 entitled Liquid Filling Machine. The mechanism forms one of several different sub-assemblies on the machine. Arm 20 typically forms part of the frame of that machine, and a support 22 disposed below the arm and carried by rod 24 is also mounted on the frame. The rod 24 may typically be connected to or form part of a pneumatic cylinder designed to raise and lower the support 22 toward and away from the arm 20. The support 22 in the form shown is disc shaped and has a supporting surface 26 upon which the container 10 rests. Some special feeding mechanism (not shown) may be employed to deposit the containers one at a time on the supporting surface.

The arm 20 bears a capping head 28 which comprises a fixed vertical post 30, a plate member 32 and a disc 34. The post 30 is secured directly to the outer end of arm 20 and in turn slidably supports sleeve 36 that forms part of the plate member. The plate member 32 by means of the sleeve 36 hangs on the post 30 and is prevented from sliding off the bottom of the post by the disc 34.

The lower end 38 of post 30 has a transverse slot 40 open at the bottom, and a small recess 42 extends upwardly from the top of the slot. A flange 44 is secured to the disc 34 and extends into slot 40 on the post. Pin 46 extends through an opening in the flange 44 and engages the sides of slot 40 to pivotally support the disc in place. The recess 42 houses a spring 48 that biases the disc 34 to an inclined position with respect to the plate member 32 as shown in FIG. 2.

Plate member 32 includes a peripheral flange 50 that extend downwardly from the plane of the lower surface 52 of plate 32 and is of a diameter substantially equal to that of the peripheral portion 54 of lid 12. Particularly, the lower surface 56 of flange 50 is the same diameter as the upper surface 58 of lid 12 so that when the container and lid are elevated to the position of FIG. 1, the upper surface 58 of the peripheral portion 54 of the lid engages lower surface 56 of flange 50 of the plate member.

In the rest or inoperative position, the support 22 is in the lower position shown in FIG. 4 at the level of surface 60, and the plate member 32 is in its lowermost position as is also shown in FIG. 4 (and FIG. 1). The lid rests on the container rim as in FIG. 1, and is spaced from the plate and disc. The lower surface 52 of the plate member engages disc 34, and the weight of the plate member overcomes the bias of spring 48 to hold the disc in a plane parallel to the plate member, closure wall 62 of the lid, and the surface 26 of support 22. When the mechanism is in that position, a container 10 may be deposited on the platform 26, and a lid 12 may be deposited on the rim of the container by some form of shuttle mechanism. That is, the container and lid are

then disposed in the relationship shown in FIG. 1, although the support 22 is in its lowermost position as in FIG. 4.

It will be appreciated that when the plate 32 is elevated on the post 30, the bias of the spring 48 will tilt the disc to the position shown in FIG. 2. This pivotal action of the disc 34 is facilitated by the bevel 64 cut in the top of the slot 40 so as to avoid interference between the top of the slot and corner 66 of flange 44.

After the container with the lid are deposited on the surface 26, the rod 24 rises to elevate the support 22, and the assembly reaches the condition of FIG. 1 wherein upper surface 58 of peripheral portion 54 of the lid engages lower face 56 of flange 50 of the plate. Rod 24 continues to raise the container 10 and lid 12 after engagement of the lid periphery with the plate member 32, and the container and lid elevate plate member 32 as shown in FIG. 2. Because the post 30 is fixed, the sleeve 36 of the plate member slides upwardly on the post and unseats the plate member from disc 34, and the disc is then left to the action of spring 48. Consequently the disc moves to its biased position shown in FIG. 2, and the continued upward travel of support 22 causes the tilted disc to force one side of lid 12 onto lid seat 14. Because only one side of the lid is seated at a time, the container and/or lid are caused to distort only in one direction, namely in a direction perpendicular to the plane of the drawing as illustrated in FIG. 2. It is not necessary for the container to simultaneously deform in the other direction because the lid is not being forced to seat across that diameter.

It will also be appreciated that when the lid is positioned as in FIG. 2, air is allowed to bleed from the interior of the container about bead 16 as the container and lid are forced somewhat out of round and substantial air passages are formed between the mouth of the container and bead 16.

Continued upward travel of the support 22 to the position shown in FIG. 3 causes the elevated lid to compress spring 48, and the disc assumes the horizontal position when supported from beneath by the central portion 66 of the lid 12 upon which it rests. As the lid is first partially seated and the air is allowed to bleed from the inside of the container out of the container about the lid bead, the force required to seat the lid fully as shown in FIG. 3 is substantially less than that which would be required if the entire lid were seated simultaneously. The continued elevation of the container and lid against disc 34 causes the lid to fully seat about the rest of its periphery. It will also be noted in FIG. 3 that the plate member 32 is still supported about its flange 50 by the peripheral portion 54 of the lid. And in FIG. 3, the container 10 is fully sealed by the lid and the capping operation is substantially completed.

The rod 24 which carries the support 22 may then be lowered as shown in FIG. 4 so as to free the fully capped container. When the rod 24 lowers to the position shown in FIG. 4, the plate member 32 once again seats on disc 34 so as to hold the disc in the horizontal plane against the bias of spring 48, and the container with its seated lid are free to be removed as they are completely accessible. Some form of shuttle mechanism may be employed to transfer the container and lid from the support 22 to a conveyor or other mechanism for moving the sealed container to a

packaging station. And the next container and lid may be placed on the support for capping by the mechanism.

Referring now to FIGS. 5-8, there is shown another embodiment of the invention for automatically seating lids on containers. In this form of the invention a feeding mechanism (not shown) may be employed to position container 10 within the aperture 72 provided in supporting plate 70. The container 10 and lid 12 may be placed together in the position shown in FIG. 5. Aperture 72 in supporting plate 70 is dimensioned to receive the bottom portion of container 10, and to accurately position container 10 below the capping head 28. Lid seat 14 rests upon the surface of supporting plate 70 adjacent at the periphery of aperture 72.

Lid seat 14 of container 10 is designed to receive the bead 16 of lid 12. The diameter of bead 16 of the lid exceeds the diameter of the mouth of the container above the seat 14. Consequently some temporary deformation is required to push the bead down through the mouth of the container to the seat 14 and provide a tight fit between container 10 and lid 12. The embodiment shown in FIGS. 5-8 as that shown in FIGS. 1-4 is designed to force the lid to a seated position wherein the bead 16 is disposed in the seat 14 while minimizing the distortion of the lid and container and reducing the amount of air trapped in the container as the lid is seated.

FIG. 5 shows the capping head 28 positioned above the container 10 and lid 12. Arm 20 typically forms part of the frame of a machine such as the one shown in U.S. Pat. No. 3,503,182, supra. Supporting plate 70 disposed below arm 20 may also be mounted to the frame of the machine. Arm 20 may be coupled to or form part of a pneumatic cylinder (not shown) designed to raise and lower arm 20 with respect to supporting plate 70.

Capping head 28 comprises a fixed vertical post 30 and a pivotal disc 34. The post 30 is secured directly to the outer end of arm 20 by a conventional bolt arrangement 31. As in the first embodiment, the lower end 38 of post 50 has a transverse slot 40 open at the bottom, and a small recess 42 extends upwardly from the top of slot 40. Flange 44 secured to the disc 34 extends into slot 40 of post 30. Pin 46 extends through an opening in the flange 44 and engages the sides of slot 40 to pivotally support the disc in place. The recess 42 houses spring 48 that biases the disc to an inclined position with respect to the supporting plate 70 as shown in FIG. 5.

In the rest or inoperative position, the capping head 28 is in its upper position as indicated in FIG. 5, and lid 12 rests on the container rim and is spaced from disc 34. The disc 34 is in its inclined position under the bias of spring 48. Bevel 64 limits its inclination.

As the arm 20 and post 30 descend vertically, the bias of the spring 48 is sufficient to retain the disc 34 in its inclined position until the position shown in FIG. 6 is reached. As the capping head 28 descends the bias of spring 48 is sufficient to force the left hand side of disc 34 against one side of lid 12 to thereby seat a portion of lid 12 onto lid seat 14 of container 10. Because only one side of the lid is seated at a time, the container and/or lid are caused to distort only in one direction, namely in a direction perpendicular to the plane of the

drawing as viewed in FIG. 6. It is not necessary for the container to simultaneously deform in the other direction because the lid is not being forced to seat across that diameter.

It will be appreciated that when the lid is positioned as shown in FIG. 6, air is allowed to bleed from the interior of the container about bead 16 as the container and lid are forced somewhat out of round and a substantial air passage is formed between the mouth of the container and bead 16.

The continued downward travel of post 30 toward the position shown in FIG. 7 causes disc 34 to pivot to a substantially horizontal position against the bias of spring 48. As the lid is first partially seated and the air is allowed to bleed from the inside out, the force required to seat the lid fully as shown in FIG. 7 is substantially less than that which would be required if the entire lid periphery seated simultaneously and a substantial volume of air trapped inside. The continued descent of post 30 and disc 34 against the top surface of lid 12 causes the lid to fully seat about the rest of its periphery. In FIG. 7 the capping operation is substantially completed.

The arm 20 and post 30 may then be raised to the position shown in FIG. 8 in order to free the fully capped container. As the capping head 28 is raised the disc 34 is caused to pivot to its inclined position under the bias of spring 48. Some form of lift and shuttle mechanism (not shown) may be employed to lift the container from its aperture 72 and transversely move the container to another position. Another container and lid may then be placed on the plate 70 for capping by the capping head 28.

From the foregoing, it will be recognized that the spring 48 must be of sufficient strength to overcome the resistance encountered in seating one side of the lid on the seat of the container, but it must be sufficiently weak so that it will move to the horizontal after one side is seated so as to seat the opposite side of the lid without tearing the lid. Obviously if the spring 48 were too strong, continued upward travel of the support from the position of FIG. 2 to FIG. 3 for example would tear the lid rather than seat the right side as viewed in those figures.

Having described the invention in detail, it will be appreciated that the objects and advantages described above are derived from the mechanism. The containers are capped more readily with less distortion and force, and high pressure is not created inside the container because the air is allowed to spill out of the container as the lid is inserted in the mouth.

What is claimed is:

1. A lid capping mechanism comprising
  - a support for holding a container to be capped,
  - a post above the support and aligned therewith,
  - a plate slidable on the post and disposed parallel to the support, said plate maintaining its parallel relation to the support as the plate moves on the post and adapted to engage the periphery of a lid on a container on the support,
  - a disc pivotally connected to and carried by the post and disposed beneath the plate, the pivotal axis of the disc being horizontal, said disc being adapted to engage the central portion of a lid on the mouth of a container on the support,

and means for raising said support for causing a lid on the container to lift the plate on the post and cause the disc to seat the lid on the container.

2. A mechanism for seating a lid resting on the mouth of a container comprising

- a container support having a horizontal platform for carrying a container to be capped in a position in which a lid may rest on the container mouth,
- a post mounted above the support and generally perpendicular to the platform and spaced therefrom,
- a plate slidable up and down on the post and oriented in a plane parallel to the platform, said plate having a peripheral portion for engaging the periphery of a lid resting on the mouth of a container carried on the platform,
- a disc carried on the bottom of the post and beneath the plate and smaller than the plate for engaging the central portion of the lid,
- means engaging the disc maintaining the disc parallel to the plate when the plate is in a lowermost position on the post,
- and means connected to the disc and causing said disc to tilt with respect to the plate when the plate is moved from its lowermost position and causing the lid to seat on one side of the container mouth before it seats on the opposite side.

3. A mechanism as defined in claim 2 further characterized by

- said means maintaining that disc parallel to the plate being the lower surface of the plate engaging the disc when the plate is in its lowermost position.

4. A mechanism as defined in claim 2 further characterized by

- said means connected to the disc being a pivotal support for the disc on the post,
- and a spring engaging the disc and urging it to assume a position at an angle to the platform.

5. A mechanism as defined in claim 4 further characterized by

- said means maintaining the disc parallel to the plate being the lower surface of the plate engaging the disc when the plate is in its lowermost position.

6. A mechanism as defined in claim 2 further characterized by

- a sleeve connected to the plate and slidable up and down on the post, said plate resting on the disc when the sleeve is in its lowermost position on the post,

- and means including a pivotal connection between the bottom of the post and the disc causing the disc to tip with respect to the platform when the plate is raised on the post off the disc.

7. A mechanism as described in claim 6 further characterized by

- said pivotal connection including a downwardly open slot in the bottom of the post,
- a stem secured to the center of the disc and lying within the slot,

- and a horizontal pin extending through the stem and into the margins of the slot allowing the disc to pivot on the pin,

- and a spring engaging the post and stem biasing the disc to that tipped position with respect to the platform.

8. A mechanism for seating lids on a container comprising,

a support for carrying a container to be capped,  
 a head mounted above the support and including a  
 disc aligned with it and pivotable about an axis  
 parallel with the support,  
 means for moving at least one of either the support  
 or disc relative to the other with the disc aligned  
 with the support so as to engage the lid when the  
 support and disc are brought toward one another,  
 biasing means carried by the head and engaging the  
 disc yieldably holding the disc at an angle to the  
 support and of sufficient strength to cause the lid  
 to seat at an angle to the container upon initial  
 contact of the disc with the lid so that the lid seats  
 first on one side,

said biasing means thereafter responsive to the con-  
 tinued movement of the support and disc toward  
 one another thereby causing the disc to assume a  
 position parallel to the support and seat the op-  
 posite side of the container,

said head including a fixed post above the support,  
 said disc being pivotally mounted on said post,  
 and said biasing means being a spring disposed  
 between the post and disc,

a plate forming part of said head and slidable up and  
 down on said post,

said plate engaging said disc when in the down posi-  
 tion and holding the disc parallel to said support  
 and overcoming the bias of said spring.

9. A mechanism for seating lids on a container com-  
 prising,

a support for carrying a container to be capped,  
 a head mounted above the support and including a  
 disc aligned with it and pivotable about an axis  
 parallel with the support,  
 means for moving at least one of either the support  
 or disc relative to the other with the disc aligned  
 with the support so as to engage the lid when the  
 support and disc are brought toward one another,  
 biasing means carried by the head and engaging the  
 disc yieldably holding the disc at an angle to the  
 support and of sufficient strength to cause the lid  
 to seat at an angle to the container upon initial  
 contact of the disc with the lid so that the lid seats  
 first on one side,

said biasing means thereafter responsive to the con-  
 tinued movement of the support and disc toward  
 one another thereby causing the disc to assume a  
 position parallel to the support and seat the op-  
 posite side of the container, and  
 additional means forming part of and movable on  
 said head and engaging said disc and releasably  
 holding said disc parallel to said support and over-  
 coming the bias of said spring.

10. A mechanism as defined in claim 9 further  
 characterized by  
 said additional means being positioned to be engaged  
 by a lid resting on a container on said support and  
 to be moved thereby as said lid is moved toward  
 said head to free the disc to the influence of the  
 biasing means.

11. A mechanism as defined in claim 8 further  
 characterized by  
 said plate having a flange extending in the direction  
 of the support and engageable by a lid resting on a  
 container on said support and being slidable  
 thereby to rise on the post and free the disc to the  
 influence of the spring.

12. A lid capping mechanism comprising  
 a support member for holding a container to be  
 capped,  
 a post above the support member and aligned  
 therewith,  
 a disc member connected to and carried by and  
 disposed beneath the post, said disc being adapted  
 to engage the lid on the mouth of a container on  
 the support member,  
 means connected to at least one of the support  
 member and post for moving the members toward  
 and away from one another,  
 means connected to one of the members for enabling  
 one of said members to tilt with respect to the  
 other when the two are moved toward each other  
 to seat the lid first on one side of the container be-  
 fore it is fully seated,  
 and additional means forming part of said one of the  
 members releasably holding said members in  
 parallel relation until the lid is engaged by said disc  
 member.

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