United States Patent

Maytag

[15] **3,687,098**

[45] **Aug. 29, 1972**

[54] **CONTAINER NECKING MECHANISM AND METHOD**

[72] Inventor: **John Hardy Maytag,** Denver, Colo.

[73] Assignee: **Coors Porcelain Company,** Golden, Colo.

[22] Filed: **March 19, 1971**

[21] Appl. No.: **126,138**

[52] **U.S. Cl.**.....**113/120 R,** 113/1 G, 72/354, 72/370

[51] **Int. Cl.**....**B21d 51/00,** B21b 17/02, B21d 22/00

[58] **Field of Search** .....113/1 G, 120 H, 120 M, 113/120 AA, 120 R; 72/94, 343, 354, 358, 370; 29/1-3

[56] **References Cited**

UNITED STATES PATENTS

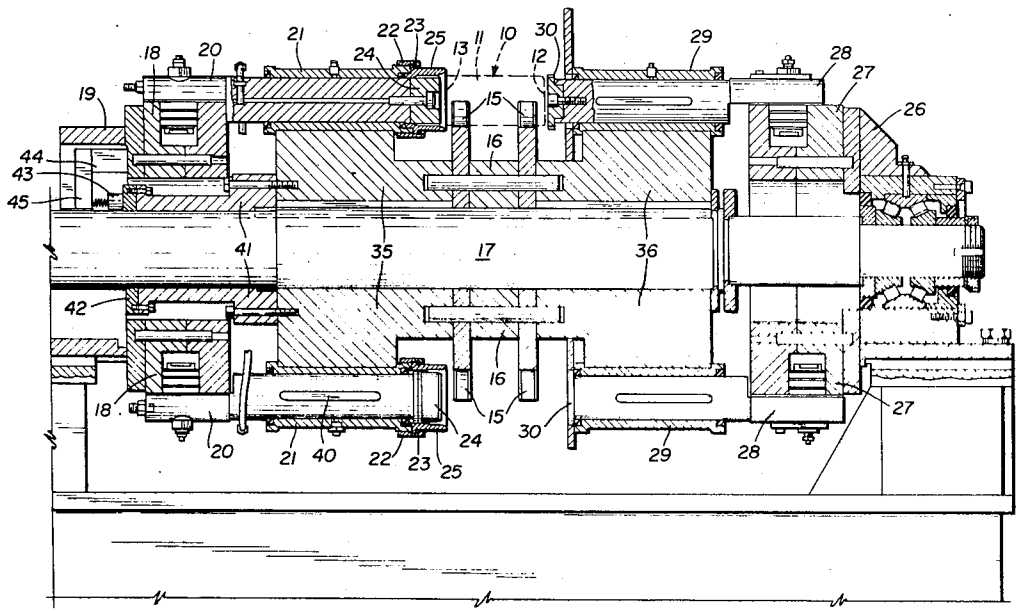
3,600,927	8/1971	Wahler	113/120 AA
3,468,153	9/1969	Patarini	113/120 AA
2,013,654	9/1935	Hothersall	113/1 G
865,257	9/1907	Kohl	113/120 H
1,698,999	1/1929	Hothersall	72/370
388,288	8/1888	Knapp	72/354
3,581,542	6/1971	Wahler	72/94

Primary Examiner—Charles W. Lanham
Assistant Examiner—Michael J. Keenan
Attorney—Bertha L. Macgregor

[57] **ABSTRACT**

Container necking mechanism comprising a stationary necking die and reciprocatory punch and push plate members, each of said punch and push plate members being controlled by a rotated cam, said cams causing the punch or push plate member to exert pressure in the direction against the container at predetermined times during the cam rotations to move the container toward and from an annular space between the stationary die and punch member, and said cams having complemental working faces on parts of their peripheries which cooperate during part of the necking operation to move a container into necking position in the die by simultaneous movements of both punch and push plate members in the same direction whereby frictional resistance between the punch and the container is eliminated during movement of the container with the punch.

4 Claims, 3 Drawing Figures



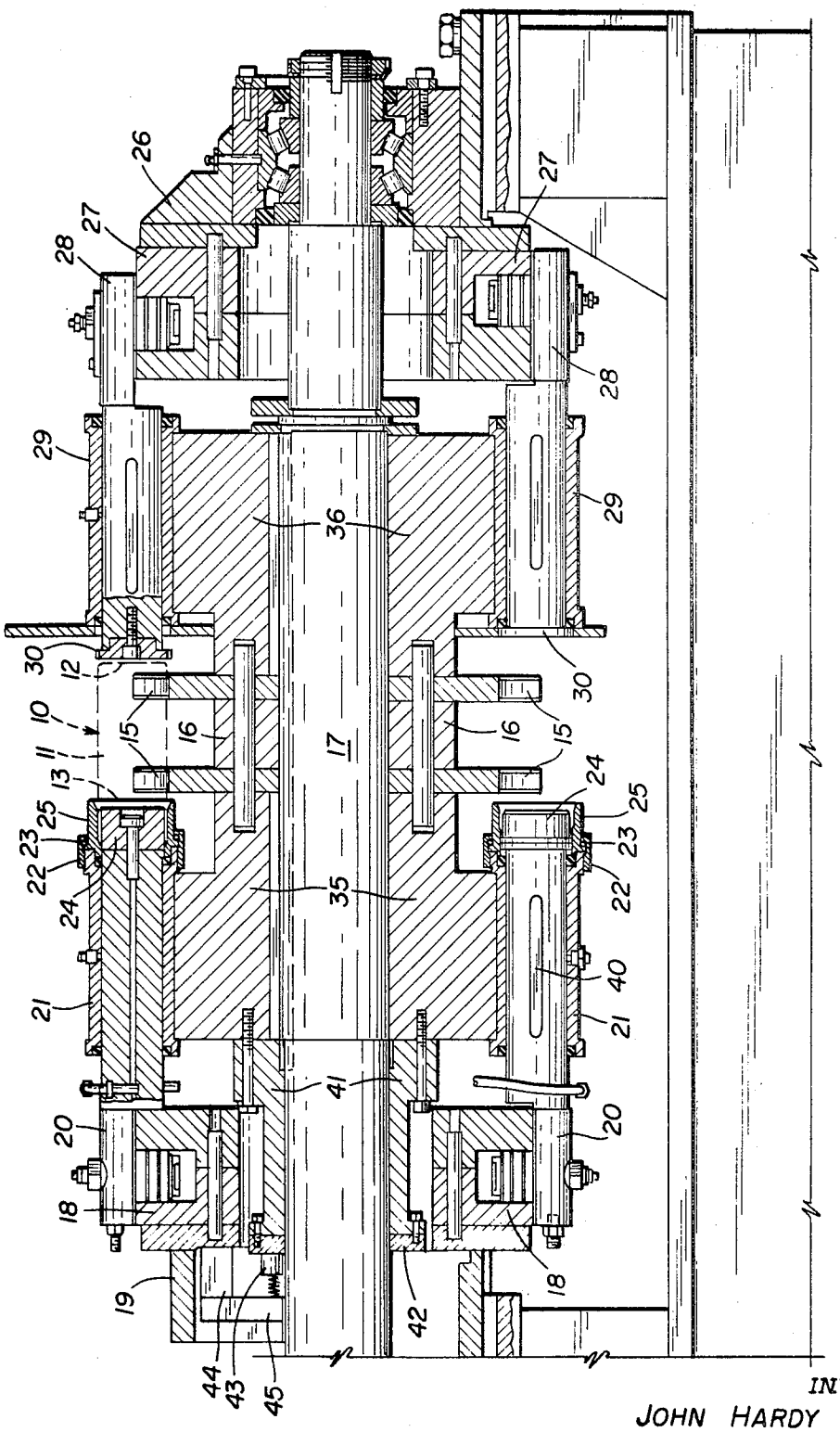


FIG. 1

INVENTOR.
JOHN HARDY MAYTAG
BY
Bertha L. MacGregor
ATTORNEY

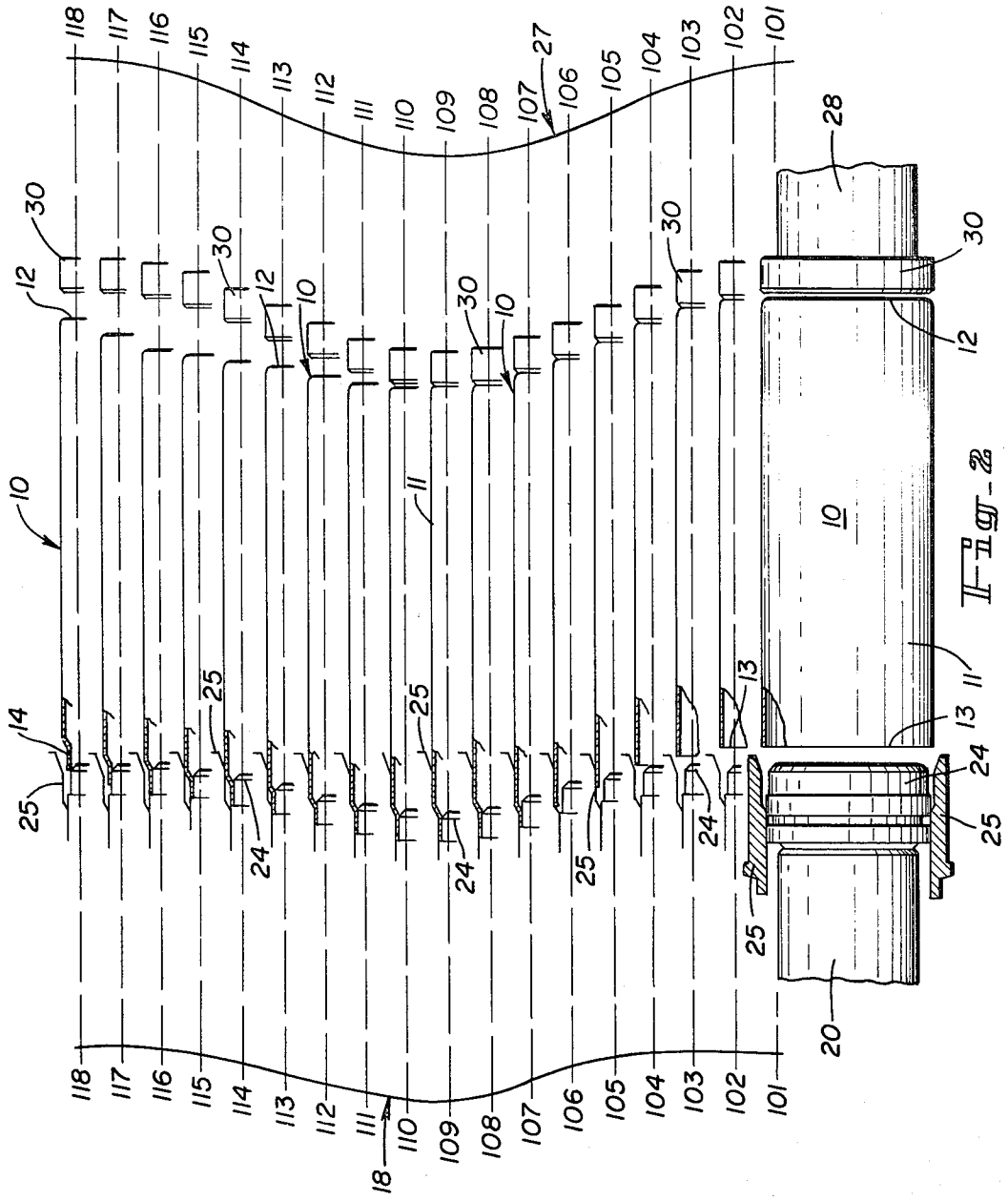


Fig. 2

INVENTOR.
JOHN HARDY MAYTAG
BY
Bertha L. MacGregor
ATTORNEY

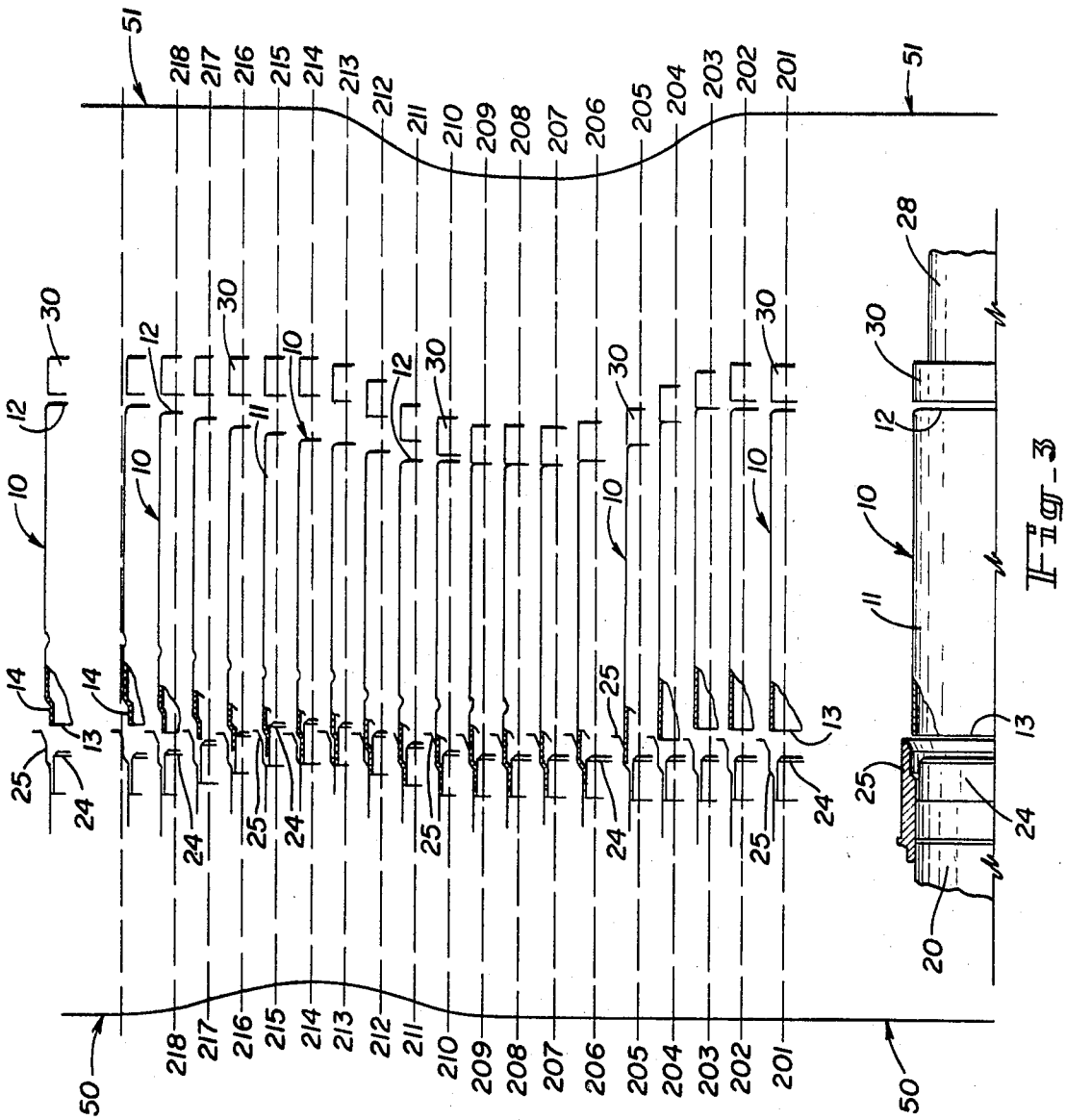


Fig. 3

INVENTOR.
JOHN HARDY MAYTAG
BY
Bertha L. MacGregor
ATTORNEY

CONTAINER NECKING MECHANISM AND METHOD

This invention relates to container necking mechanism and method of necking containers such as cylindrical cans. Necking is a procedure which reduces the diameter of a can adjacent its open end, preparatory to flanging the circumferential edge and applying a cover thereon to close the can. In a 12 fluid ounces can, approximately 5¼ inches tall, the necked portion extends inwardly five sixteenths of an inch from the circumferential edge of the container. The reduction in the diameter of the can adjacent its top, produced by the necking procedure, is quite small, approximately ⅛ inch, but sufficient to provide space within the outer diameter of the body of the can for the rim or chime formed on the outer side of the top edge when the cover is applied to the container. When necking is omitted, the chime protrudes radially outwardly beyond the container body and interferes with the efficient packaging of the containers wherein it is desirable to have the container bodies in close contact with each other without the spacing caused by the protruding rims.

When prior art necking mechanisms and methods have been employed for necking thin walled cans, such as aluminum containers, the cylindrical bodies have become wrinkled or buckled in the operation due to pressure applied simultaneously in opposite directions to the top and bottom ends of the cans. It has been customary to move a container end to be necked into an annular space between a reciprocatory punch and a stationary die, where the necking takes place, by applying pressure to the container bottom by means of a push plate, the punch having previously been fully retracted and being maintained stationary relatively to the die meanwhile. The frictional resistance encountered by the can end due to frictional resistance simultaneously with the stationary die and punch while being forced into the space between them exceeds the column strength of the can, causing wrinkling and buckling of the can body.

The main object of this invention is to perform the necking of thin walled containers without injury to the containers, and in an efficient and dependable manner. This object is achieved by eliminating resistance heretofore imposed by the knock out punch on the container adjacent its open end as the container meets the necking mechanism, by providing means for moving both the punch and the bottom push plate members, and consequently the container, in the same direction during the necking contact between container and punch member while within the annular space in the stationary die.

IN THE DRAWINGS:

FIG. 1 is a longitudinal vertical sectional view, partly in elevation, of a container necking machine embodying my invention, the drive mechanism for the main shaft being omitted.

FIG. 2 is a diagrammatic view illustrating the operation of the mechanism of FIG. 1, showing a container to be necked by the stationary necking die and cam actuated knock out punch at the lower left of the drawing cooperating with the cam actuated necking ram and push plate at the lower right of the drawing, and showing also the progressive movements of the parts at designated time intervals.

FIG. 3 is a view similar to FIG. 2 illustrating the operation of corresponding parts in prior art necking machines.

In the embodiment of the invention shown in FIG. 1, the container to be necked is a conventional seamless cylindrical thin walled can **10** having side walls **11**, bottom **12** and an open top edge **13**. In FIGS. **2** and **3**, the can **10** is shown at the bottom of the drawings as it appears before having been necked, and at the top of the drawings as it appears after having been necked at **14**.

Referring to FIG. **1**, containers **10** are deposited from a delivery chute (not shown) into the pockets of a pair of star wheels **15** which include a spacer **16**. The wheels **15** are mounted on a rotatable shaft **17** in such position that the cans **10** carried by the rotated star wheel are in axial alignment with a knock out punch which is part of the necking mechanism comprising a knock out cam **18**, cam support **19**, knock out ram **20**, bushing **21**, retaining nut **22**, lock gasket **23**, knock out punch **24** and stationary necking die **25**, all located at the left of the container **10** in FIG. **1**. The containers **10** are also aligned with a push plate for contacting the bottom of the can **10**, part of the necking mechanism including the necking cam support **26**, necking cam **27**, necking ram **28**, bushing **29** and push plate **30**, all located at the right of the container **10** in FIG. **1**.

A plurality of the necking dies **25** and knock out mechanisms **20–24** is mounted in the knock out rams block **35**, and a registering number of the necking push plates **30** and mechanisms **26–29** is mounted in the necking rams block **36**. Other designated parts of the mechanism are a key **40**, air collar **41**, wear plate **42**, air manifold **43**, air manifold standoff **44** and air manifold reaction plate **45**. The operation of the cams **18** and **27** and the parts actuated thereby will be understood by reference to FIG. **2**.

In FIG. **2**, the un-necked container **10** is shown at the bottom of the view in axial alignment with the stationary necking die **25** and knock out punch **24**, at the left, and with the necking push plate **30** at the right, the plate **30** being adjacent the can bottom **12** at the beginning of the necking cycle indicated at **101** on the cams **18** and **27**. The knock out cam **18** and the necking cam **27** are rotated in unison. Their contours or working faces differ from each other in certain areas which impart movements to the containers **10**. Time intervals in the rotation of the cams **18** and **27** are designated **101–118** inclusive.

As the cams **18** and **27** rotate during the interval **101–104**, the ram **28** and push plate **30** are gradually moved toward the punch **24** and stationary die **25** due to the contour of the cam **27** contacting the ram **28**, consequently moving the can **10** toward the annular space between the punch **24** and die **25**. As indicated in the interval **105–109**, the knock out cam **18** has a contour which corresponds approximately with that of cam **27**, causing the container **10** to be moved to the left by the push plate **30** into contact with the inner surface of the stationary die **25** and at the same time the knock out ram **20** and punch **24** are relieved of pressure from punch cam **18** and are free to move in the same direction as the container at approximately the same speed. The simultaneous movement of the push plate **30** and punch **24** in the same direction during the interval **105–109**, while the can edge **13** is moving into the annular space within the die **25**, eliminates frictional

resistance which would be encountered at this stage of the necking operation if the punch **24** were held stationary by the cam **18** or were forced toward the right in this interval.

The completion of the necking which reduces the diameter of the wall **11** adjacent the edge **13**, as indicated at **14**, is performed between the stationary die **25** and punch **24** while the latter is moving in the same direction as the container and push plate **30** in the interval indicated at **108–109** on the cams when the push plate **30** in exerting pressure on the bottom of the container. During this interval, the cam **18** permits the punch **24** to move with the container and thus relieves the container of bearing pressure opposed to that exerted by the plate **30**.

During the interval **110–118**, the push plate **30** is being moved away from the bottom of the container, leaving the necked container free to move in response to pressure exerted by the knock out punch **24** which travels in the path defined by the cam **18**.

FIG. **3** illustrates necking operations heretofore performed by prior art mechanism and methods. The container **10**, stationary die **25** and punch **24**, as well as the push plate **30** and ram **28** are similar to parts so designated in FIG. **2**, but a knock out cam **50** and necking cam **51** differ from the cams **18** and **27** which have replaced them. The contours of the cams **50** and **51** differ from each other and also from the cams **18** and **27**, respectively. Time intervals corresponding to the rotations of the cams **50** and **51** are designated **201–218**. During the time indicated approximately by **205–209**, the cams **50** and **51** exert pressures in opposite directions toward each other on the punch **24** and push plate **30**, respectively, and thus on opposite ends of the container **10** between them, causing injury to thin walled bodies due to the resistance imposed by the punch member **24** bearing against the container area adjacent the edge **13** while that part of the container is within the annular space between die **25** and punch **24** and plate **30** is bearing on the bottom of the can. In the prior art procedure illustrated in FIG. **3**, the pressure on the can which is generated by pressure from the push plate opposed by friction with the stationary punch is additive to that caused by the pressure of the push plate opposed by friction with the necking die.

The advantages obtained by the use of the cams **18** and **27** for actuating the knock out punch **24** and push plate **30** are apparent from FIG. **2**, where a can is pushed by the plate **30** to the left while the can is spaced from the punch **24**; the necked can is moved by the punch **24** toward the right while the can is spaced from the push plate **30** in movement out of necking position; and intermediate these two movements of the can, in the time interval indicated approximately at **105–109**, the cams **18** and **27** rotate in unison to present a pressure exerting face against the push plate member and a cooperating substantially complemental non-pressure exerting face toward the punch **24**, producing movement simultaneously in the same direction of the container, punch and push plate members, thereby preventing injury to the container because frictional resistance has been eliminated between the punch and container as they move together in the same direction.

I claim:

1. Container necking mechanism comprising
   a. a stationary necking die,
   b. a reciprocable punch movable in the die and separated from the die by an annular necking space,
   c. a reciprocable push plate spaced in axial direction from the punch,
   d. rotated supporting means supporting a container having an open end to be necked in axial alignment with the necking die, punch and push plate,
   e. a rotated push plate cam operatively connected to the push plate, said cam including means to actuate the push plate to contact the container and move the container gradually toward the punch into necking contact with the punch and stationary die in the annular space between them and including means to withdraw the push plate from the container, and
   f. a rotated punch cam operatively connected to the punch, said cam including means to actuate the punch to space the punch from the open end of the container while the push plate moves the container gradually toward the punch, including means to actuate the punch to engage the container and to move in the same direction with the container while the push plate is pushing the container into said annular space, and including means for moving the punch and container out of the said space by actuating the punch to bear on the container necked end while the push plate is out of contact with the container.

2. The mechanism defined by claim **1**, in which the cams are contoured to have substantially complemental working faces on corresponding parts of their peripheral surfaces which actuate the push plate to push the container and simultaneously actuate the punch to engage the container and to move the container and punch in the same direction.

3. The method of necking an open end container which comprises the steps of moving the container toward a stationary necking die and reciprocable punch by exerting pressure against the container end while the opposite end is free of pressure, moving the punch and container simultaneously in the same direction to position the container end between the punch and die in necking engagement therewith, and exerting pressure on the necked end to free the container from the punch and die while the bottom of the container is free of pressure, whereby pressure caused by friction between can and punch and consequent injury to the container are eliminated.

4. The method of necking a container having a closed end and an open end, which comprises the steps of moving the container toward necking mechanism by imposing pressure against the closed end of the container in axial direction while the open end is free from pressure, moving the container by pressure against the closed end into necking position and simultaneously engaging the open end by necking mechanism moving in the same direction as that imposed on the container closed end, and moving the necked container away from the necking mechanism by imposing pressure against the open end while the closed end of the container is free from pressure, whereby pressure caused by friction between can and punch and consequent injury to the container are eliminated.

* * * * *