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Dunham et al.

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[54] **CONTAINER STABILIZING APPARATUS**

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[52] **U.S. Cl.** ..... **198/19;** 198/22 B; 250/223 B

[51] **Int. Cl.**[2] **B23Q 5/22**

[58] **Field of Search** ..... 209/73, 74, 72, 111.7, 209/111.6, 82, 80; 198/22 B, 22 R, 19; 250/223 B; 356/240

[56] **References Cited**

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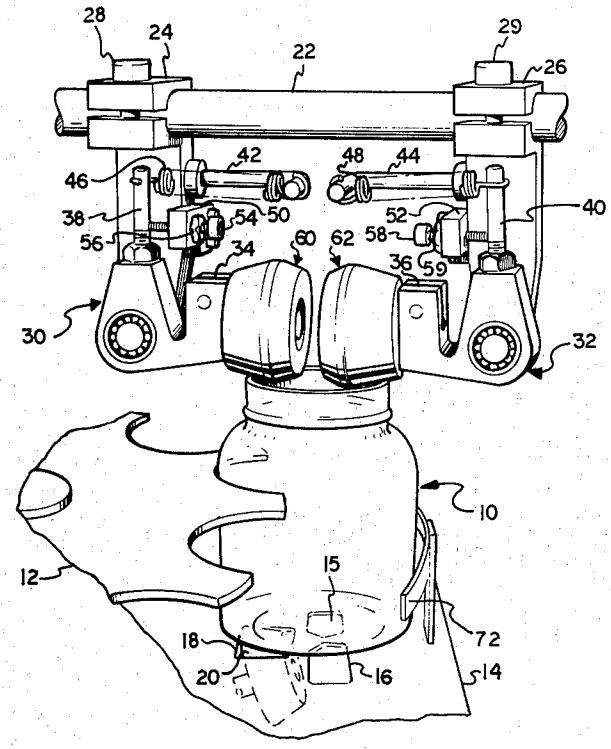
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[57] **ABSTRACT**

A glass container undergoing inspection is stabilized with two tapered rolls which engage a rim portion thereof. The container is rotated by a drive wheel which engages one edge of the container heel. One tapered roll holds the container in contact with the drive wheel. The other, diametrically opposed tapered roll holds the opposite side of the container heel at a generally fixed elevation above a slide plate by providing a balancing reaction force to the forces exerted by the first tapered roll and the drive wheel. Both tapered rolls are spring loaded and pivotally mounted to allow forcing a glass container into engagement with them as the container enters the inspection position.

11 Claims, 2 Drawing Figures



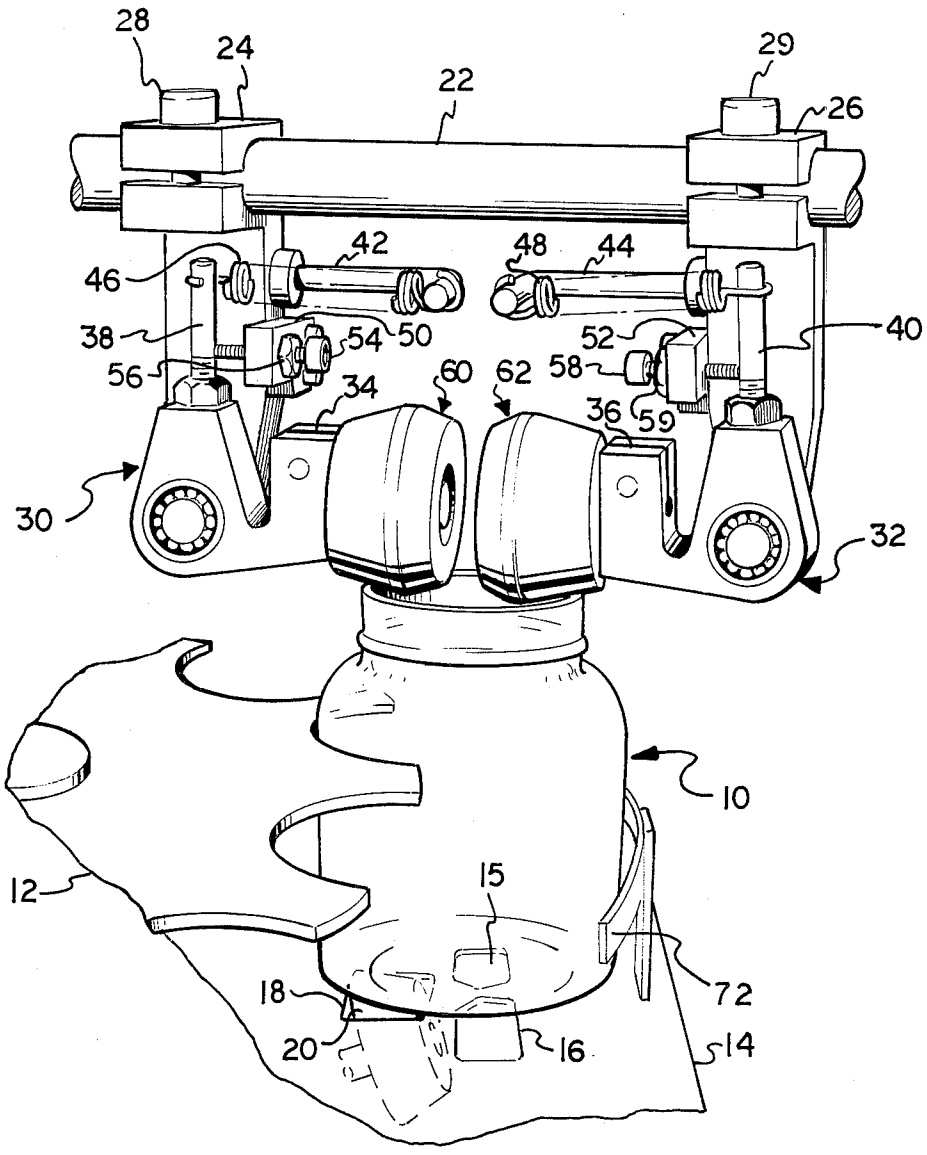

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FIG. 1

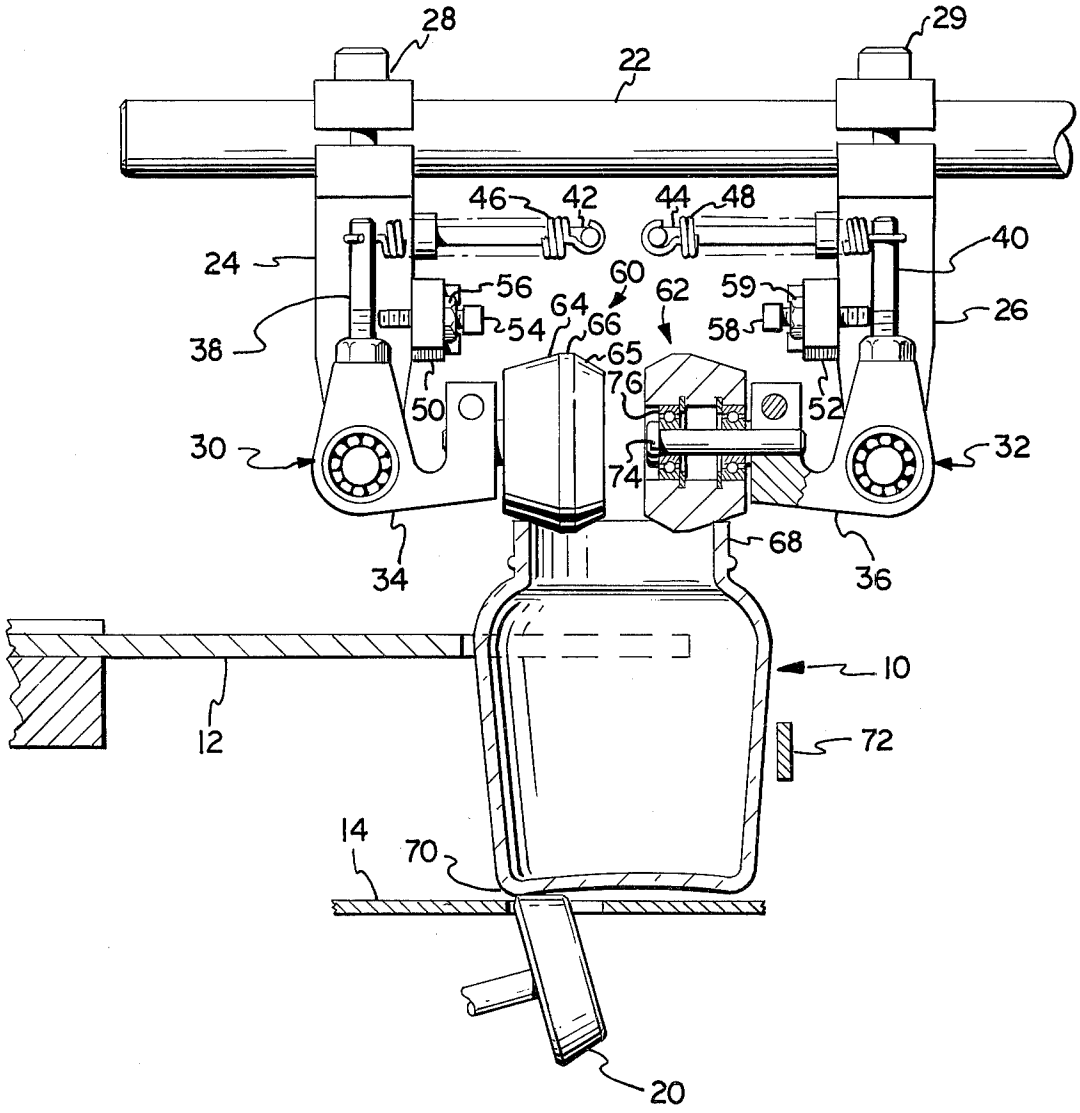

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FIG. 2

CONTAINER STABILIZING APPARATUS

BACKGROUND OF THE INVENTION

This invention generally relates to the inspection of glass containers. More particularly, this invention relates to the stabilization of glass containers during the inspection process. Specifically, this invention relates to the use of a pair of tapered rollers to stabilize a glass container being driven by a drive wheel under one edge of the heel of the container.

The use of rotary, indexing type inspection machines to inspect glass containers is well known in the art, as typified by U.S. Pat. Nos. 3,313,409 and 3,327,849. These machines are quite efficient in detecting defective containers using optical inspection techniques. However, increasing speeds have made the raising of the container on a rotating pad at each inpsection station undesirable. A heel drive system has been utilized which rotates the container in station with raising the container. That is, the container is simply "forced" into contact with a rotating drive wheel as it enters the inspection station. However, this proved to be an unstable configuration and the dual tapered rolls of the present invention were devised to solve this problem. The tapered rolls stabilized the container during inspection and were easily displaced by the container during entry to and exit from the inspection station.

SUMMARY OF THE INVENTION

Our invention is an improvement in apparatus for inspecting glass containers. In this apparatus, containers are moved in series to and through an inspection station. In the station, a portion of the container heel is exposed to viewing by inspection equipment positioned below through an opening formed in a container bottom supporting slide plate. The containers are rotated about their vertical axis during inspection by engagement of the heel of the container with a rotating drive wheel at the inspection station. The improvement is in a means for holding the container in contact with the drive wheel while maintaining the container axis substantially vertical. A first tapered roller is rotatably mounted about a generally horizontal axis. The first roller is positioned above the drive wheel and engages the inner surface of a rim portion of the container with its tapered surface to hold the container against the drive wheel. A second, substantially identical tapered roller is positioned in substantially diametrically opposed relationship to the first roller. The second roller is also mounted for rotation about a substantially horizontal axis. The tapered surface of the second roller likewise contacts the inner surface of the container rim and steadies the container during rotation, while preventing movement of the upper end of the container out of a generally central position with respect to the inspection station.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the apparatus of the present invention; and

FIG. 2 is an elevational view of the apparatus of the present invention, partially in cross-section.

DETAILED DESCRIPTION OF THE DRAWINGS

The apparatus of the present invention is a part of an inspection machine for the inspection and gauging of glass containers. The machine with which the present

invention is utilized may be seen in U.S. Pat. Nos. 3,313,409 or 3,327,849, the teachings of which are hereby incorporated by reference. The particular inspection station with which the apparatus of the present invention is used, is one in which the heel or lower portion of a glass container is inspected for checks or small flaws with optical inspection equipment. This basic type of equipment and form of inspection are well known in the art and therefore need no further discussion.

As illustrated in FIG. **1**, glass containers **10** are indexed from inspection station to inspection station in engagement with a pocketed starwheel **12.** While only one starwheel **12** has been shown, typically a plurality of stacked pocketed starwheels are used to ensure proper stability of the glass containers **10.** The glass containers **10** are slid along a slide plate **14** which extends around the entire circumference of the inspection machine in question. At the particular inspection station illustrated in FIG. **1**, two openings **15** and **16** are cut through the slide plate **14.** When the glass container **10** has been indexed into this particular inspection station, optical inspection equipment has a line of sight through the inspection openings **15** and **16** which allows a view of a substantial portion of the bottom portion of the glass container **10.** This allows inspection of the bottom portion of the glass container **10** for small cracks or checks as they are known in the glass container art. A third opening **18** is also formed in the slide plate **14** at this inspection station to allow a rotating drive wheel **20** to extend above the elevation of the slide plate **14** (see FIG. **2**). The drive wheel **20** is driven from a conventional drive source, not shown, and engages the bottom of the glass container **10** to cause the glass container **10** to rotate and thus present all of the circumference of the bottom of the glass container **10** in front of the inspection openings **15** and **16** to thus allow an inspection of the complete circumference of the glass container **10.** This particular type of drive varies from that conventionally shown in the prior art, in that such inspection stations normally have a rotating pad or disc which raises the glass container **10** slightly in the station and then rotates the glass container **10** while it is held above the level of the slide plate **14.** The particular type of drive mechanism shown in FIG. **1** allows a less complex machine to be built thus somewhat reducing the cost of manufacture. In addition, it has been found that this particular type of drive mechanism results in inspection accuracy which is no less than that obtained by the prior art drive systems. However, this type of drive system presents a problem in that the tendency of the glass container **10** is to rub on the slide plate **14** while it is being rotated and likewise wobble somewhat thus failing to present a consistent target for the inspection apparatus. The apparatus of the present invention provides this necessary stabilizing function. A horizontal rod **22** extends across the bottom check inpsection station and may be supported by any form of a suitable vertical support column, not shown, which may be attached to the machine frame. The horizontal rod **22** is positioned at an appreciable distance above the glass container **10** and attached thereto and extending downwardly toward the glass container **10** is a first clamp bar **24** and a second clamp bar **26.** The clamp bars **24** and **26** are of a typical design which has a split formed therein that allows movement of the clamp bars **24** and **26** to any desired position relative to the length

of the horizontal rod **22.** Locking screws **28** and **29** may be tightened to hold the first and second clamp bars **24** and **26** in any desired position. Each of the clamp bars **24** and **26** have a rock arm, respectively **30** and **32,** journaled at the lower end thereof. The rock arms **30** and **32** are attached to the clamp bars **24** and **26** such that they are free to pivot back and forth. The rock arm **30** has a roller carrier portion **34** which extends inwardly toward the glass container **10.** Likewise, the rock arm **32** also has a roller carrier portion **36** which also extends inwardly toward the glass container **10.** The rock arm **30** also has a vertically extending stop rod portion **38** attached thereto. The general configuration of the rock arm **30** is thus that of a somewhat modified L-shape with the stop rod portion **38** and the roller carrier portion **34** formed in the shape of an L with the pivot point of the rock arm **30** being at the juncture of these two portions. Likewise, the second rock arm **32** also has a vertically extending stop rod portion **40.** Note that the stop rod portions **38** and **40** as shown in FIG. **1** are actually threaded rods which are screwed into their respective rock arms **30** and **32.** However, the stop rod portions could be made as an integral part of the rock arms if so desired. Attached to the first clamp bar **24** and extending inwardly toward the glass container **10** is a first spring attachment bar **42.** The first spring attachment bar **42** has its end bent to form a hooked portion for the attachment of the coil spring thereto. Likewise, a second spring attachment bar **44** is attached to the second clamp bar **26** and extends toward the first spring attachment bar **42.** The two spring attachment bars **42** and **44** are substantially identical to one another. A coil spring **46** is attached to the stop rod portion **38** of the rock arm **30** and the bent end portion of the first spring attachment bar **42.** A second coil spring **48** is attached to the stop rod portion **40** and the bent end portion of the second spring attachment bar **44.** The net effect of the springs and their attachments is to bias the rock arms **30** and **32** into a generally downwardly directed position. However, the force of the springs **46** and **48** is deliberately kept relatively low so that a glass container **10** may overcome this biasing force without great difficulty. A first stop plate **50** is attached to the first clamp bar **24** and extends generally to a position in alignment with the stop rod portion **38.** A second stop plate **52** is attached to the second clamp bar **26** and extends to a similar position with respect to the stop rod portion **40.** A threaded stop screw **54** is threadably engaged with the first stop plate **50** and extends therethrough to contact the stop rod portion **38** and thus prevent the rock arm **30** from assuming a position too far removed from the desired elevation of a glass container **10.** A lock nut **56** may be used to hold the stop screw **54** in any desired adjustable position. A second threaded stop screw **58** is engaged in the second stop plate **52** and cooperates to stop the movement of the stop rod portion **40** in a similar manner as that described with respect to the stop rod **38** and the first threaded stop screw **54.** A lock nut **59** may be used to hold the threaded stop screw **58** in any position in which it is set. Attached to the extreme outboard portion of the roller carrier portion **34** of the rock arm **30** is a rotatably mounted tapered roller or stabilizing roll **60.** A second tapered roller or stabilizing roll **62** is similarly mounted on the extreme outboard portion of the roller carrier portion **36** of the rock arm **32.** The two stabilizing rolls **60** and **62** are designed to perform the stabilization and guiding function of the glass container **10** previously described, while the glass container **10** is being guaged. The precise configuration of the stabilizing rolls **60** and **62** may be seen more clearly with respect to FIG. **2.**

With respect to FIG. **2,** it should first be realized that the stabilizing rolls **60** and **62** are essentially identical to one another. Therefore, the description of the precise configuration of one of these rolls will serve as a description of both. The stabilizing roll **60** has two distinct tapered portions **64** and **65** of a generally frustoconical shape which are separated by a relatively flat central portion **66.** The two tapered portions **64** and **65** both taper toward the longitudinal axis of the stabilizing roll **60.** The angle of inclination is preferably on the order of 10°, although a range of angles of from 5° to 30° is workable. It will be noted that the tapered portion **64** of the stabilizing roll **60** engages a rim portion **68** of the glass container **10.** The rim portion **68** defines an open mouth of the glass container **10** in which both the stabilizing rolls **60** and **62** are positioned. A corresponding tapered portion of the stabilizing roll **62** is also engaged with the rim portion **68** of the glass container **10** substantially diametrically opposed to the stabilizing roll **60.** The precise configuration of the stabilizing roll **60** thus described is partially a matter of convenience. That is, as may readily be seen in FIG. **2,** only the tapered portion **64** is actually necessary to provide the stabilizing function required. However, in order to allow smooth entry of the stabilizing rolls **60** and **62** into the open mouth of the glass container **10** when the glass container **10** is being moved into the inspection station, the second reverse tapered portion **65** is also provided. The central portion **66** is provided to avoid the formation of sharp corners which would rapidly be worn down in use and perhaps lead to inaccuracies in centering. Thus, the two tapered portions **64** and **65** allow a stabilizing roll of a fairly wide width which does not extend extremely far into the open mouth of the glass container **10** thus leading to entrance and exit problems. This allows the movement of the rock arms **30** and **32** when the glass container **10** is moved into station to be fairly small, thus ensuring smooth entrance and exit of the glass container **10.** It may be realized that as the glass container **10** is moved into the inspection station by the pocketed starwheel **12,** the stabilizing rolls **60** and **62** will force their way into the open mouth of the glass container **10** thus causing the rock arms **30** and **32** to pivot. Once the stabilizing rolls **60** amd **62** have completely entered the open mouth of the glass container **10,** the rock arms **30** and **32** will assume the positions shown in FIG. **2.** In this position note that the stop screw **54** is not touching the stop rod portion **38** of the rock arm **30.** Conversely, the stop screw **58** is contacting the stop rod portion **40** of the rock arm **32.** This relationship is quite important in ensuring proper container stabilization and may be explained as follows: the glass container **10** has one portion of its lower or heel area **70** resting on the drive wheel **20.** The drive wheel **20** is rotating and thus has a tendency to rotate the glass container **10** outwardly away from the pocket of the pocketed starwheel **12.** The stabilizing roll **60** exerts a downward force on the glass container **10** thus tending to hold it into contact with the drive wheel **20.** However, this would not be sufficient to prohibit movement of the glass container **10** away from the influence of the drive wheel **20,** at

least until such time as it might strike a fixed guard rail **72.** In such a configuration, however, the finish portion of the glass container **10** would be tipped from its vertical axis and the bottom or heel portion **70** would likewise be out of a horizontal plane, thus leading to possible inaccuracies in inspection for bottom checks or flaws. Thus, the second stabilizing roll **62** also engages the rim portion **68** of the glass container **10.** However, if unrestrained, this stabilizing rolls **62** could exert enough downward force on the glass container **10** to force the portion of the heel **70** of the glass container **10** opposite the drive wheel **20** into contact with the slide plate **14.** This is undesirable because once again the glass container **10** would be out of vertical alignment and additionally the contact of the heel portion **70** with the slide plate **14** is undesirable, since the slide plate **14** may be of a metallic material which could impart abrasions to the glass container **10** thus causing a weakening effect. In addition, repeated contact of a grinding nature of glass containers **10** with the slide plate **14** in such a location would lead to a rapid wearing of the slide plate **14** in this location. Thus, when the glass container **10** is in its proper position the two stabilizing rolls **60** and **62** hold the glass container into contact with the drive wheel **20** so that it is rotated and also will hold that portion of the heel **70** of the glass container **10** which is not in contact with the drive wheel in a fixed horizontal plane above the slide plate **14** for consistent and accurate rotation. As a final note with respect to FIG. **2,** it may be seen that the stabilizing roll **62** is mounted on a shaft **74** which is mounted in the roller carrier portion **36** of the rock arm **32.** The shaft **74** carries bearings **76** on which the stabilizing roll **62** is mounted for rotation. The stabilizing roll **60** is mounted to its roller carrier portion **34** in an identical fashion.

What we claim is:

1. In an apparatus for inspecting glass containers wherein the containers are moved in series to and through an inspection station where a portion of the container heel is exposed to viewing by inspection apparatus positioned below through an opening in a container bottom supporting plate and wherein the containers are rotated about their vertical axis by engagement of the container heel with a rotating drive wheel located at the inspection station, the improvement in holding the container in engagement with the drive wheel and maintaining the container axis substantially vertical during such engagement which comprises:

a first rotatably mounted tapered roller positioned in contact with an inner edge of a rim portion of said glass container at a location generally above said drive wheel; and

a second rotatably mounted tapered roller positioned in contact with the inner edge of said rim portion at a location substantially diametrically opposed to said first tapered roller.

2. The improvement of claim **1** further including means for biasing said first and second tapered rollers in a downward direction.

3. The improvement of claim **2** further including stop means for limiting the downward movement of said first and second tapered rollers to a pre-selected maximum downward location.

4. The improvement of claim **1** wherein each of said first and second tapered rollers is of a generally frustoconical shape and wherein the angle of taper of said first and second tapered rollers is between 5° and 30°.

5. The improvement of claim **1** wherein said first and second tapered rollers each further include a reverse tapered portion connected thereto, said reverse tapered portions tapering inwardly toward one another.

6. Apparatus for controlling the rotation about its vertical axis of a glass container, having an open mouth defining a rim, at an inspection station by engagement of the heel portion of the container with a rotating drive wheel, comprising, in combination:

a first tapered roller positioned in contact with the inner edge of said rim vertically adjacent the location of said drive wheel;

a second tapered roller positioned in contact with the inner edge of said rim at a location substantially diametrically opposed to that of said first tapered roller; and

means for rotatably supporting said first and second tapered rollers.

7. The apparatus of claim **6** further including means for biasing said first and second tapered rollers in a downward direction.

8. The apparatus of claim **7** further including stop means for limiting the downward movement of both said first and second tapered rollers to a pre-selected maximum downward location.

9. The apparatus of claim **6** wherein each of said first and second tapered rollers is of a generally frustoconical shape and wherein the angle of taper of said first and second tapered rollers is between 5° and 30°.

10. The apparatus of claim **6** wherein said means for rotatably supporting said first and second tapered rollers comprises:

a horizontal rod extending across the open mouth of said container at an elevation above said open mouth;

a first clamp bar, attached to said horizontal bar and extending downwardly therefrom, on one side of said open mouth;

a second clamp bar, attached to said horizontal bar and extending downwardly therefrom, located substantially diametrically opposed to said first clamp bar;

a first rock arm, pivotally mounted on said first clamp bar, extending toward said open mouth;

a second rock arm, pivotally mounted on said second clamp bar, extending toward said open mouth;

a first shaft, mounted on said first rock arm, carrying a bearing upon which said first tapered roller is mounted; and

a second shaft, mounted on said second rock arm, carrying a bearing upon which said second tapered roller is mounted.

11. The apparatus of claim **6** wherein said first and second tapered rollers each further include a reverse tapered portion connected thereto, said reverse tapered portions tapering inwardly toward the center of said open mouth.

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