July 22, 1969 R. I. GINGRICH 3,456,398

GRINDING FIXTURE FOR TELEVISION FUNNELS

Filed July 13, 1966 2 Sheets-Sheet 1

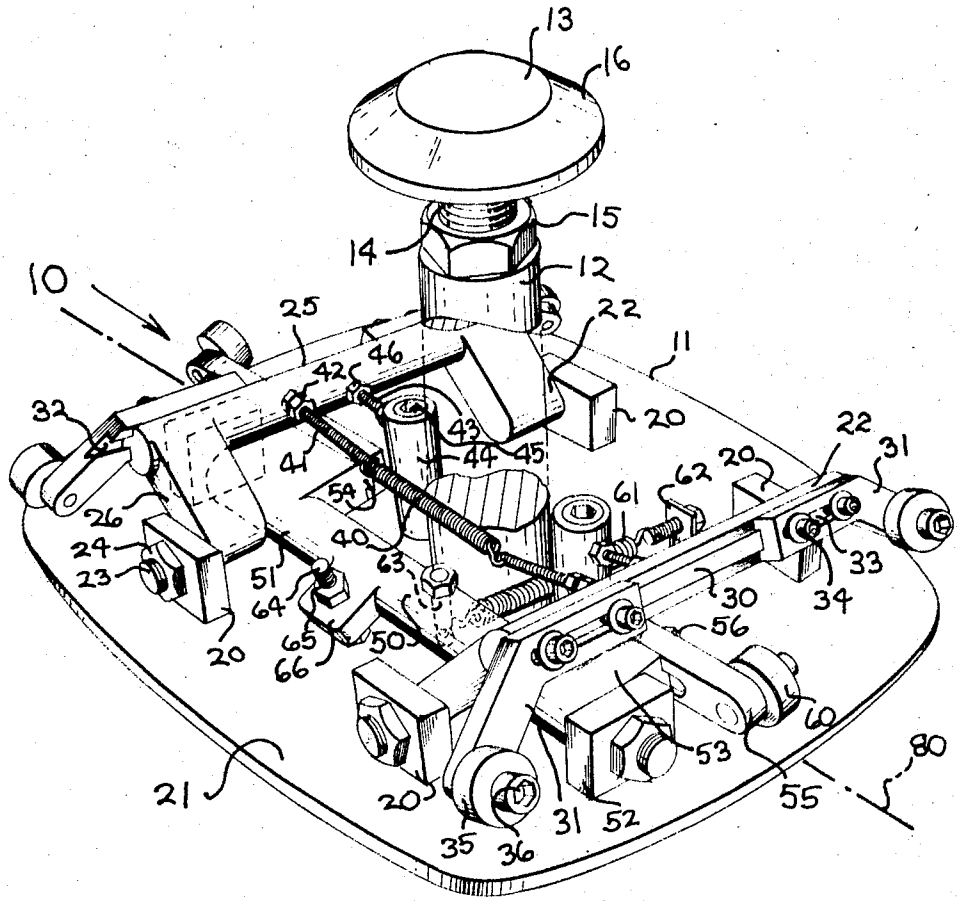


FIG. 1

INVENTOR.
RICHARD I. GINGRICH
BY O. R. Birchall
& W. A. Schaich
ATTORNEYS

July 22, 1969 R. I. GINGRICH 3,456,398

GRINDING FIXTURE FOR TELEVISION FUNNELS

Filed July 13, 1966 2 Sheets-Sheet 2

FIG. 2

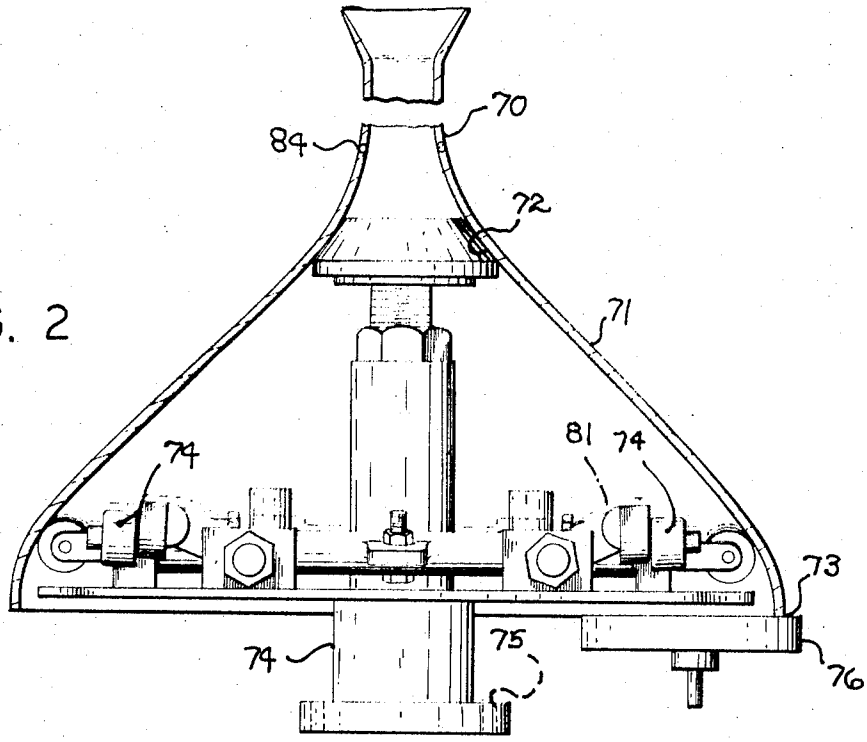
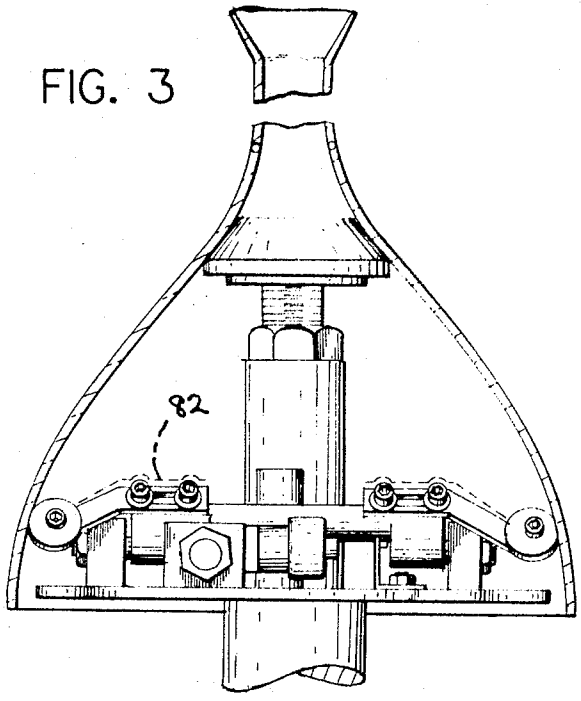


FIG. 3



INVENTOR.
RICHARD I. GINGRICH
BY O. R. Birkhall
& W. A. Schaich
ATTORNEYS

United States Patent Office 3,456,398 Patented July 22, 1969

3,456,398

GRINDING FIXTURE FOR TELEVISION FUNNELS

Richard I. Gingrich, Columbus, Ohio, assignor to Owens-Illinois, Inc., a corporation of Ohio

Filed July 13, 1966, Ser. No. 564,955
Int. Cl. B24b 19/22; B23q 3/06
U.S. Cl. 51—227 14 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus for centering and aligning a frusto-pyramidal hollow glass article such as the funnel portion of a cathode-ray television bulb. The apparatus includes a plurality of yoke assemblies the extremities of which bias against the interior peripheral edge of the glass funnel in order to precisely align the funnel with respect to its longitudinal axis. A centrally positioned support post is utilized to hold the apex portion of the glass funnel in its proper position.

This invention relates to a fixture for supporting a hollow article from its interior surface. More particularly, the present invention relates to a checking and grinding fixture useful in supporting the funnel or other portions of a cathode-ray tube by contacting the inside surface thereof.

During the production of cathode-ray tubes, such as those employed in the television industry, it has been common practice to form the tubes in various pieces which are assembled into a unitary product known in the industry as a bulb. The viewing portion or face plate is formed as a rather shallow dish with rather modest sidewalls. The free edge of the face plate is often ground or prepared for coupling with the other parts of the bulb. The grinding is performed as nearly perpendicular as practical to the longitudinal axis of the bulb. The longitudinal axis is considered for purposes herein to be the axis from the front to the back of the bulb. The rear frusto-conical portion of the bulb is conventionally manufactured by placing a gob of molten glass into a press and forcing the glass into the desired shape of configuration, or by placing a gob of molten glass into a mold and rotating the mold about its longitudinal axis, thus forcing the outside of the glass to assume the configuration of the mold. The frusto-conical portion of the bulb is commonly known as the funnel. The interior configuration of the funnel will vary for a number of of reasons, among which are physical differences, from mold to mold, temperature differences from mold to mold, thermal variations applied to the funnel subsequent to forming, distortions resulting from handling and supporting the hot funnel, and variation in weight of the funnel. Therefore, it is highly desirable to orient the funnel from a position that is independent of the above pointed out variations.

Since practically the entire internal electrical assembly is supported from the interior surface of the bulb or from support points established therein, it is important that the internal geometry be kept as symmetrically oriented about the longitudinal axis of the bulb and particularly the funnel as possible. Longitudinal alignment of the funnel is a requisite since under the present day method of construting a cathode-ray tube the funnel body is first formed and the thickened cylindrical section at the small end of the tube is removed by various methods including the application of thermal stresses coupled with a mechanically induced scratch or notch. The funnel is then united with a cylindrical tubular section commonly known as the neck. The neck must be in alignment with the longitudinal axis of the bulb and must be accurately positioned so that the electron gun components housed therein will produce an even sweep across the completed cathode-ray tube.

After the neck has been attached, the funnel is then supported from its interior surface and the peripheral edge around the large end of the funnel is ground so that the edge thereof lies in a plane normal to the longitudinal axis of the bulb.

In brief, the present invention relates to a support fixture for supporting a cathode-ray tube funnel or other similar article from its interior surface. The funnel is supported in the neck region and at a plurality of points near the wide end of the funnel. The support points are coupled in pairs on pivotable supports that can move generally along the longitudinal axis of the funnel, however, their freedom of movement perpendicular to the longitudinal axis of the bulb is restricted.

The primary object of this invention is to provide a support fixture that will hold frusto-conical parts in proper alignment regardless of variations in their weight and geometry.

An additional object of this invention is to support a glass article such as a cathode-ray tube funnel section in proper alignment so that work can be performed thereon.

Another object of the instant invention is to support a glass funnel section by its internal surface so that material may be removed from the ends of the funnel prior to coupling of parts therewith.

A further object of the present invention is to provide a glass funnel support fixture that contacts only the interior of the funnel at a plurality of points and aligns the funnel along its longitudinal axis.

An object of this invention is to provide a television tube funnel support fixture that will accurately position a funnel regardless of variations in its weight, thickness or geometrical shape.

Further objects and advantages of the present invention will become apparent from the following description with particular reference to the accompanying drawings, and the features of novelty which are characteristic of this invention will be pointed out with particularity in the claims attached to and forming a part of this specification.

In the drawings:

FIG. 1 is a perspective view looking in a downward direction on the fixture;

FIG. 2 is a side elevational view partly in section which shows a funnel positioned on the fixture; and

FIG. 3 is an end elevational view partly in section that is similar to FIG. 2.

Referring to the drawings wherein like reference characters designate corresponding parts throughout the several views, there is shown in FIG. 1 a fixture assembly generally at **10**. The fixture has a base plate **11** that conforms in external contour to the shape of a cathode-ray tube funnel or other similar article that is to be manufactured. Base plate **11** is in this instance of rectangular configuration and could equally well be round if it were to be used for a round funnel or face plate. Centrally located and attached in a perpendicular manner to base plate **11** is spindle **12**. The top end of spindle **12** is preferably tapped with an internal thread (not shown). A support cone **13** is attached to an externally threaded adjustment screw **14** which in turn is threadly engaged with the internal threads at the top of spindle **12**. A locknut **15** is positioned on adjustment screw **14** so that support cone **13** can be immobilized at any desired distance from the top of base plate **11**. The locking is easily accomplished by tightening locknut **15** down against the top end of spindle **12**. Support cone **13** may have a frusto-conical support surface **16** such as shown in FIG. 1 or else the support surface can be of near rectangular configuration or other desired geometry to accommodate the interior of a funnel or face plate near the small or upper end thereof. Support

cone 13 can be made of any material that will not mar or scratch the inside surface of the funnel.

Attached to base plate 11 and located between spindle 12 and the edge of the base plate are mounting blocks 20. Mounting blocks 20 are attached to the top surface 21 of base plate 20 by conventional means. Mounting blocks 20 are spaced apart in pairs and contain a bore therethrough parallel to surface 21 of base plate 11. A yoke assembly 22 is pivotally mounted in the aligned bores of mounting blocks 20. The yoke assembly 22 and its manner of attachment to mounting blocks 20 can best be seen on the upper or left-hand side of FIG. 1. Shafts 23 of yoke assembly 22 are supported through the bores of mounting blocks 20 and are secured in position by retaining nuts 24. It will be obvious that other fastening means could be employed, however to describe and set forth the invention a threaded shaft and nut combination has been utilized. Thus it can be seen in FIG. 1 that yoke assembly 22 pivots about the shafts located on either end thereof. Yoke assembly 22 has an offset central section 25 that is interconnected to shafts 23 by arms 26. As yoke assembly 22 pivots in mounting blocks 20, the distance of the offset central section 25 will vary from the top planar surface 21 of base plate 11, however section 25 will always remain parallel to surface 21.

Offset central section 25 contains a slide bar 30 that can best be seen on the lower or right-hand yoke assembly 22 of FIG. 1. Slide bar 30 is an integral part of central section 25 and for purposes herein is of rectangular configuration. Slide bar 30 extends over the length of central section 25 and is also parallel to the top surface 21 of base plate 11.

Referring once more to the right-hand yoke assembly 22 of FIG. 1, extension bars 31 are slidably mounted on slide bar 30. One side of extension bar 31 contains a groove 32 that fits on slide bar 30 thus permitting a lateral adjustment which will be pointed out in more detail infra. Extension bars 31 contain elongated slots 33 through which clamping bolts 34 are inserted. Thus it is evident from FIG. 1 that extension bars can be positioned closer to each other or farther apart from each other as the particular application may dictate. Extension bar 31 contains contact roll 35 attached to its outwardly extending end by bolt 36. Rolls 35 may be either fixed in clamped position by bolts 36 or else they may be free to rotate if desired. Rolls 35 are preferably made from a material, similar to support cone 13, in that it will not scratch or otherwise adversely affect the interior surface of the funnel or other part. Rolls 35 may be slightly tapered in external configuration to better match the inside curvature of the funnel. Thus it can be seen from FIG. 1 that there are two yoke assemblies 22 mounted on either end of base plate 11.

In order to keep the yoke assemblies in an upright and flexible position, a tension spring 40 is attached to the left and right-hand yoke assemblies at the offset central section thereof. An adjustment screw 41 is attached to offset central section 25 and a locknut 42 is threaded thereover so that screw 41 may be immobilized against section 25 at any desired position. In this manner, tension spring 40 can be adjusted to maintain contact rolls 35 at the desired elevation above base plate 11. An additional adjustment bolt 43 to counteract the tension force of spring 40 is also positioned on the offset central section 25. Adjustment bolt 43 is positioned against post 44 thus stopping yoke assembly 22 at the desired height above base plate 11. Post 44 is secured in a rigid manner to base plate 11 by a fastener such as 45. A locknut 46 may also be used with adjustment bolt 43 as shown in FIG. 1.

An additional yoke assembly that will be called longitudinal yoke assembly 50 is also anchored to base plate 11. Assembly 50 is pivoted about the ends of cylindrical portion 51 which are rotatably mounted in blocks 52. Assembly 50 is arranged at right angles to yoke assemblies 22 and is mounted between the base plate 11 and assemblies 22 so that it does not interfere with their movement. Extending substantially at right angles from cylindrical portion 51 of longitudinal yoke assembly 50 are arms 53 that contain slide bars 54 on the ends that are substantially parallel to cylindrical portion 51. Extension bars 55 are grooved, in a manner similar to extension bars 31, so that they will mate and slide along with slide bars 54. Hold down bolts 56 are used to immobilize extension bars 55 after their initial setting has been determined.

Rolls 60 are positioned on the ends of extension bars 55 similar to those on extension bars 31. The rolls 60 are biased in an upward direction under the influence of spring 61. Spring 61 is adjustably anchored to angle 62 which is in turn fastened to the top of base plate 11. The other end of spring 61 is attached to stud 63 which is cantilevered in a downward direction from cylindrical portion 51 of longitudinal yoke assembly 50. The ensuing moment derived from the spring force acting on the end of stud 63 supplies the torque necessary to rotate assembly 50 in blocks 52. To counteract the spring induced moment, a stop bolt 64 and accompanying locknut 65 have been provided on tab 66 which protrudes outwardly from cylindrical portion 51. By proper adjustment between the stop bolt 64 and its contact with the top surface of base plate 11, the desired height of rolls 60 above base plate 11 can be maintained.

FIG. 2 is a side elevational view that shows a cathode-ray funnel in seated position on the fixture. Neck portion 70 has been welded or adhered to funnel section 71. Support cone 13 abuts against the interior surface of funnel 71 at contact point 72. The support surface 16 of cone 13 can be made to conform to the geometry at the contact point 72. By adjustment of screw 14 the entire funnel can be raised and lowered. This adjustment need only be made at the initial fitting of the funnel to the fixture.

The funnel 71 extends down over and around the yoke assemblies and base plate 11 so that its lower edge 73 is free around its entire periphery. The lower inside edge of 73 does not come in contact with the edge of base plate 11 since it is firmly held in all lateral directions by contact with rolls 35 and 60. A contact point is depicted at 74.

The entire fixture assembly 10 may be mounted on a pedestal 74 with tie-down attachment point such as holes 75 for convenient mounting on a grinding machine (not shown). An edge grinder 76 is shown in engagement with lower edge 73 of funnel 71. Relative movement between edge grinder 76 and pedestal 74 permits lower edge 73 to be ground very precisely so that the resulting ground surface is normal to the longitudinal axis of the funnel.

Since it is important to establish the longitudinal axis of the cathode-ray tube from the interior surface of the funnel, it can be seen that when funnel 71 approaches a seated condition at contact point 72 the lower edge 73 can gyrate in any lateral direction until the inside surface touches one of the contact points 74. At that time the funnel movement is restricted in one direction, hence can only travel downward while pushing that particular yoke assembly downward also. Further downward motion by the funnel will force the interior surface of the funnel against all of the contact points. The funnel automatically comes to rest in a centered position since the distance horizontally from the contact point on one roll to the corresponding roll on the other side of that particular yoke assembly is fixed. During the initial set-up of the fixture the contact points are adjusted by means of, for example, clamping bolts 34, so that the contact points are equidistant from a horizontal axis such as axis 80 of FIG. 1. In FIG. 2, the vertical travel of longitudinal yoke assembly 50 is shown by dotted line 81. Rolls 60 can either slide or rotate against the interior surface of the funnel as it moves into final position.

FIG. 3 is an end elevational view that shows primarily

the action of yoke assembly **22**. The vertical movement is shown by dotted line **82**.

During production of cathode-ray funnels the fixture as set forth in this specification can be advantageously used since funnels wherein the internal geometry varies slightly from part to part can be readily placed upon the fixture without the necessity of time consuming adjustments. If the funnel has a large frusto-conical interior, the net result will be that it will move further down over the fixture before it centers itself under the influence of the yoke assemblies. A completely acceptable funnel will result by grinding off the excess material at the lower edge thereof. The importance of the instant invention can be additionally realized when the production of wide angle cathode tubes is consihdered. In a wide angle tube, the electron gun is positioned within the neck portion of the tube. As the electron beam traverses the area generated by the viewing surface, the beam is sometimes blocked as it attempts to reach the remote corner sections of, for example, a rectangular tube. In order to permit the electron beam full unrestricted coverage of the viewing surface, the round contour at the small end of the funnel is modified with cut-out portions to permit the electrons unimpeded access to the remote sections of the tube. Support cone **13** can be tailored to the required geometry and when a funnel is positioned thereupon, it will move downward until the desired cross section comes to rest on the support cone. This exact selection of the proper cross section as dictated by the electron gun can be selected automatically even though there may be a variance from one funnel to the next because of different plunger wear or configuration.

The present invention also lends itself well to the final inspection of the already ground lower edge **73** of the funnel. Instead of mounting pedestal **74** on a grinding assembly as heretofore described, the pedestal can be placed upon a plane table and a height gage can be used to check the peripheral accuracy of the funnel.

Another valuable use of the fixture of the instant invention can be realized by attaching pedestal **74** to a lath employed in uniting glass parts such as a cathode-ray funnel and its corresponding neck portion such as **70** of FIG. 2. The funnel may be positioned so that its longitudinal axis is horizontal. The funnel can be firmly held against contact point **72** of support cone **13** and rolls **35** and **60** by external clamping means (not shown). Neck section **70** is likewise chucked near funnel **71** with its longitudinal axis coinciding with the longitudinal axis of the funnel. The funnel and neck are then rotated about the longitudinal axis as weld **84** is completed.

As has been pointed out previously, the present invention has been set forth in terms of a rectangular cathode-ray tube, however it will work equally well for a tube wherein the frontal or viewing surface is round. In a round funnel application, the yoke assemblies can be repositioned so that the contact points are all equidistant from a vertical axis that passes upward through the spindle.

Thus it can be ascertained that the present invention heretofore described sets forth a unique apparatus that forces a frusto-conical articles to assume a symmetrical position, regardless of variance from one part to the next. By having the entire periphery arranged in a symmetrical fashion, the frusto-conical article can be ground, inspected, or coupled to additional parts in a manner well within allowable tolerances. The self-centering ability of the present invention is achieved by permitting the pairs of contact rolls to move up and down in unison while the relative distance between each pair of contact rolls is fixed and while all other movement except the arcuate up and down motion of the contact rolls is restricted.

While certain representative embodiments and details have been shown for the purpose of illustrating the invention, it will be apparent to those skilled in this art that various changes and modifications may be made therein without departing from the spirit or scope of the invention.

What is claimed is:

1. In a fixture for supporting an article with internally tapered sidewalls including base support means with a single upright spindle cantilevered centrally therefrom, support means adjustably attached to the end of said spindle remote from the base support means, mounting means attached to said base support means to position a plurality of pivotable one-piece yoke assemblies in spaced relationship about said spindle, biasing means connected to said one-piece yoke assemblies to control the rotational movement thereof, means adjustably secured to the opposite extremities of each of said one-piece yoke assemblies to contact and direct the position of an article positioned on said fixture.

2. A support fixture as claimed in claim **1** wherein the base support means is essentially planar in configuration.

3. A support fixture as claimed in claim **1** wherein the support means attached to the end of the spindle remote from the base support means has a beveled exterior support pad attached to a threaded shaft for complementary engagement with an internally threaded aperture within said spindle.

4. A support fixture as claimed in claim **1** wherein the mounting means are in the form of apertured support blocks arranged in pairs to pivotally support a plurality of yoke assemblies.

5. A support fixture as claimed in claim **1** wherein a plurality of extension bars are slidably attached to each yoke assembly.

6. A support fixture as claimed in claim **5** wherein each extension bar has a contact roll attached to the end thereof for guiding and positioning a frusto-conical article.

7. A support fixture as claimed in claim **1** wherein part of each yoke assembly is urged in a direction away from the surface of the base support means by spring means attached thereto.

8. A support fixture as claimed in claim **1** wherein the movement of a pair of said yoke assemblies is controlled by a common spring means.

9. A support fixture as claimed in claim **1** wherein adjustable stop means are attached to each yoke assembly to restrict the amount of rotational movement thereof.

10. In a fixture for supporting a frusto-conical article with internally tapered sidewalls including an essentially planar base plate with the peripheral edge thereof tailored to conform generally to the interior surface at the large end of said frusto-conical article, an upright spindle attached to and cantilevered upwardly from the center of said base plate so that the longitudinal axis thereof is essentially normal to the surface of said base plate, a support cone with an exterior contour complementary to the interior of the small end of an article to be supported thereon attached to a threaded shaft for threaded engagement with an internally threaded aperture within said spindle, a locking means positioned between the end of said spindle and said support cone to selectively immobilize the distance between said support cone and said base plate according to the internal height of said frusto-conical article, a plurality of spaced pairs of yoke assembly mounting blocks attached to the top surface of said base plate, a yoke assembly pivotably supported between each pair of spaced apart mounting blocks, a spring attached to each yoke assembly to urge a part of the yoke assembly in a direction away from the top surface of the base plate, an extension bar slidably coupled to each end of each yoke assembly so as to permit a lateral adjustment parallel to the top of said base plate, clamp means to immobilize the movement between the yoke assembly and the extension bars contained thereon, a contact roll attached to the end of each extension bar so that said rolls will contact the interior surface of a frusto-conical article when it is supported by said support cone.

11. A support fixture for supporting an article with internally tapered sidewalls including an upright spindle cantilevered therefrom to support the small end of said article remote from a planar surface that is associated with the base of said fixture, a pair of rigid one-piece yoke assemblies pivotally mounted and spaced equidistant from the base of said spindle, said rigid yoke assemblies being parallel to one another, a third rigid one-piece yoke assembly pivotally mounted and arranged perpendicularly with respect to said pair of rigid yoke assemblies, the terminals of said third rigid yoke assembly lying a line coincident with the base of said spindle, means on the opposite ends of each of said yoke assemblies for resiliently supporting an article contacting the terminals thereof whereby said article is urged into a symmetrical position on said fixture.

12. A support fixture as claimed in claim 11 wherein the terminals of said yokes move in an arcuate path perpendicular to said planar surface.

13. A support fiixture as claimed in claim 11 wherein the distance between the respective terminals of said pair

of yokes is less than the distance between the terminals of said third yoke assembly.

14. A support fixture as claimed in claim 11 wherein the distance between the terminals of all yoke assemblies is substantially equidistant from the longitudinal axis of said spindle.

References Cited

UNITED STATES PATENTS

3,381,347	5/1968	Reinwall.	
1,245,361	11/1917	Lutz	269—52 X
1,688,424	10/1928	Kiefer	251—227 X
1,791,781	2/1931	Wilson	269—52 X
3,021,643	2/1962	Blanding.	
3,279,783	10/1966	Blankenship.	
3,364,628	1/1968	Bennett.	

HAROLD D. WHITEHEAD, Primary Examiner

U.S. Cl. X.R.

269—321