

[54] BOTTLE CUTTER

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[51] Int. Cl. B26d 3/08, B26f 3/00

[58] Field of Search 225/2, 93, 96, 103; 82/92, 84; 30/164.95, 165.9

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Primary Examiner—Frank T. Yost

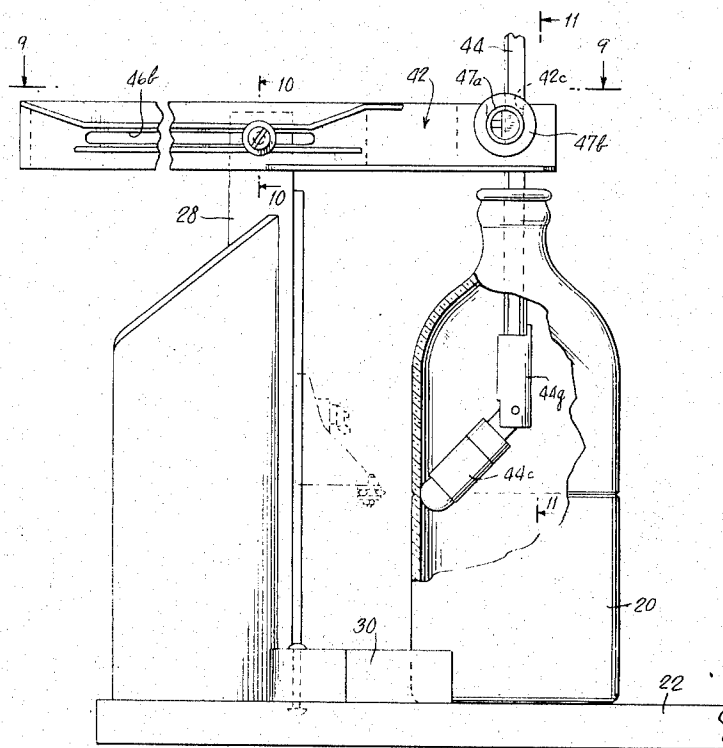
Attorney—Robert S. Dunham, Ivan S. Kavrukovich et al.

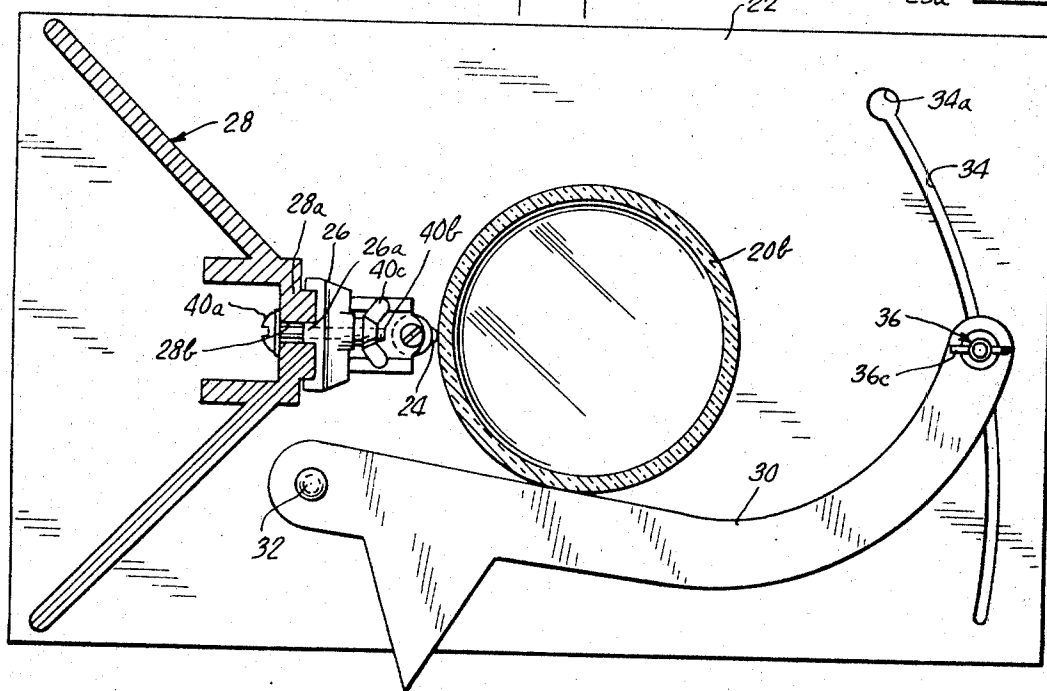
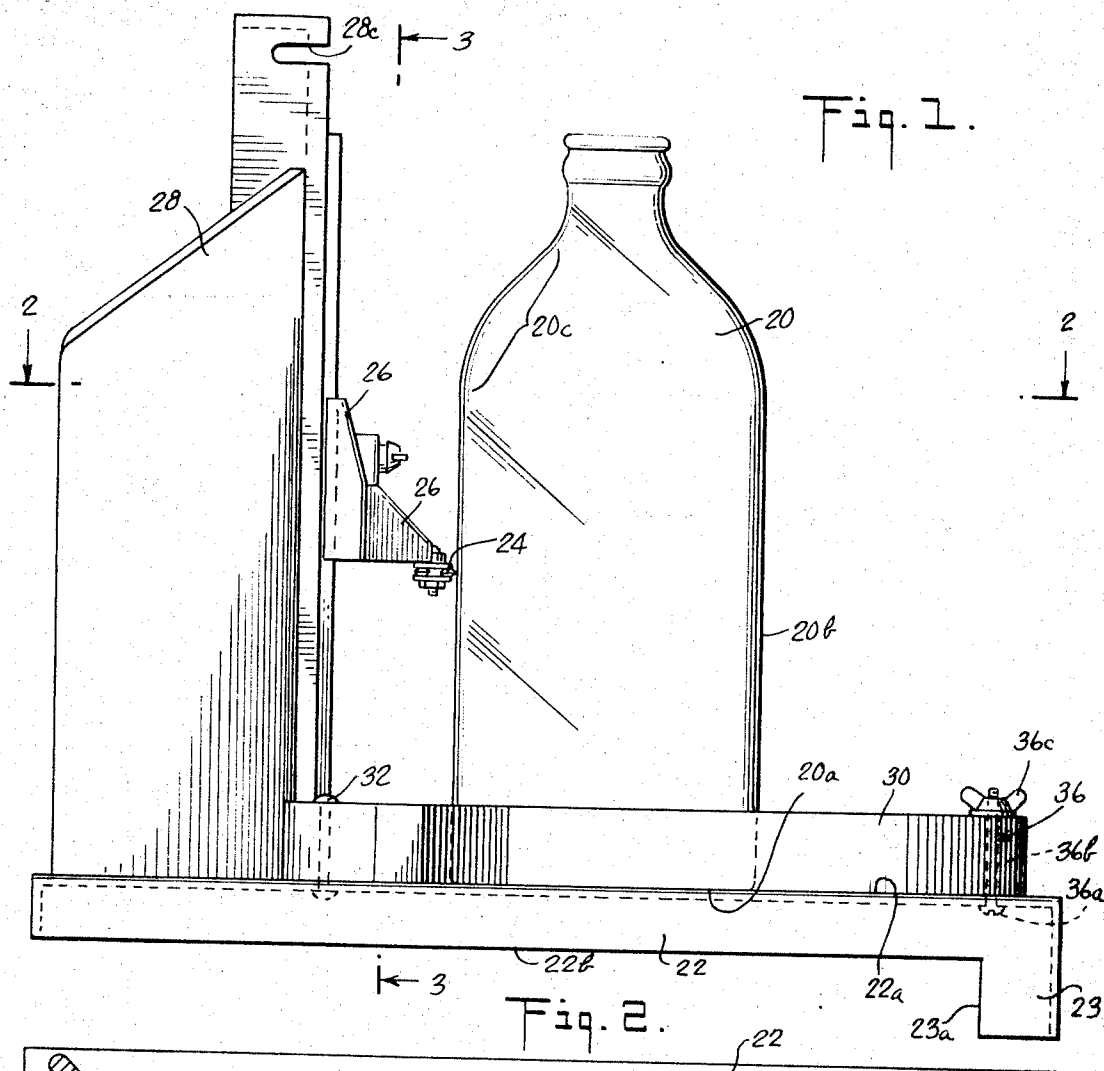
[57] ABSTRACT

Apparatus for cutting brittle articles such as glass bottles, jugs and tubes by scribing a cut line on the outside of the article and tapping the article from the inside, opposite the cut line, to break the article along the cut

line, or otherwise severing the article along the cut line. The apparatus comprises a flat base plate, a post extending upwardly from the base plate and a cutting wheel frame slidably mounted on the post. The base of an article such as a bottle is placed on the base plate and the position of the cutting wheel frame is adjusted to the level of the desired cut line on the article. The cutting wheel frame is then suitably tilted, if necessary, such that the cutting wheel is perpendicular to the article at the desired cut line. The lateral position of the article is defined by means of an arm pivoted on the base plate, and the article is then manually rotated against the cutting wheel and against the arm while its bottom remains on the base plate. When a cut line is scribed around the circumference of the article, a tapper is introduced into the article to tap the inside wall opposite the scribed cut line. The tapper may be suspended from a boom extending from the top of the post or from the cutting wheel frame, or it may be an independent tapper. The article may be severed along the cut line by other means, such as thermal shock. A particular advantage of the invented apparatus is that it can be conveniently used to cut articles of irregular cross-section, such as rectangular or odd-shaped bottles, as well as articles which have wide mouths, such as jars or vases, and larger articles such as large jugs.

18 Claims, 25 Drawing Figures





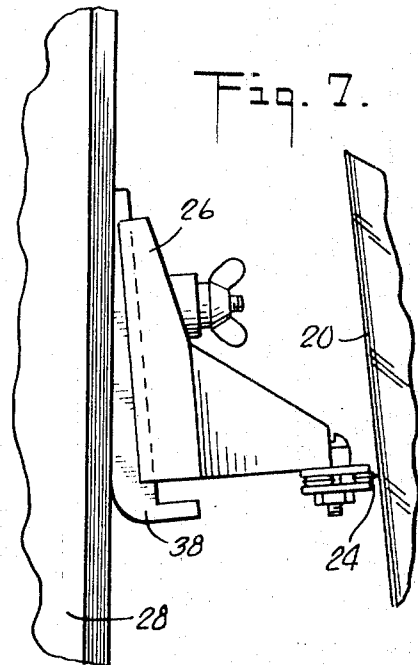
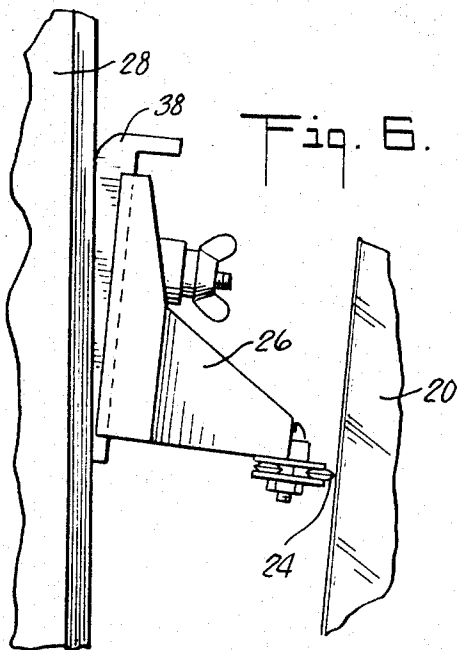
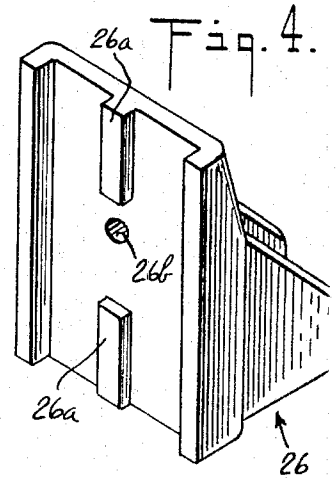
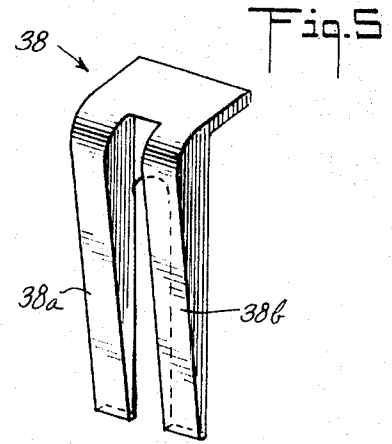
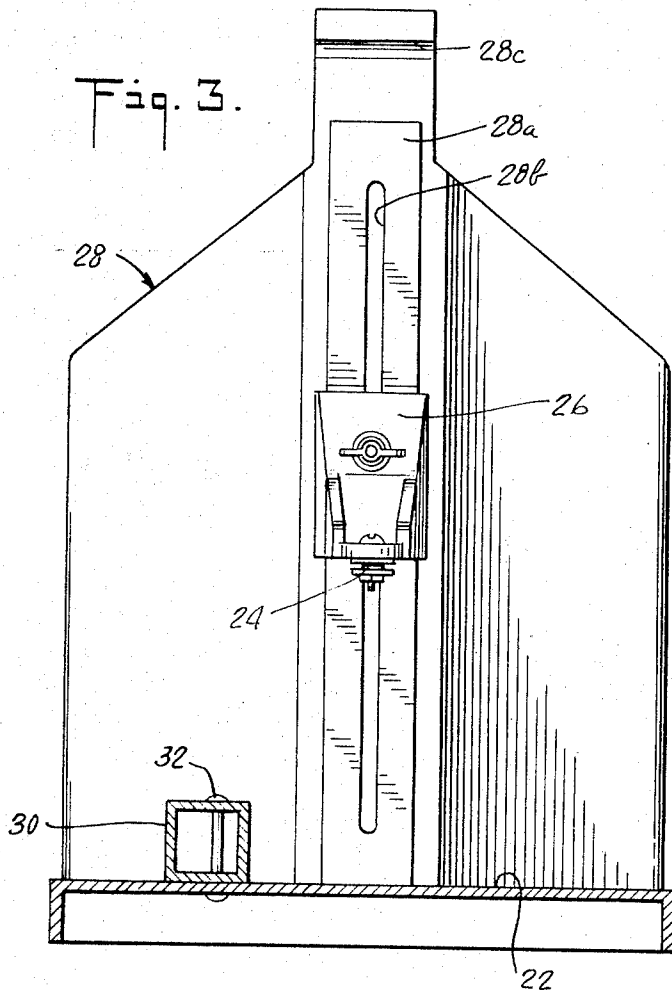


Fig. 10.

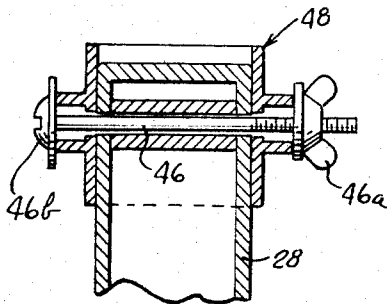


Fig. 14.

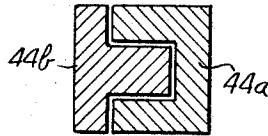


Fig. 15.

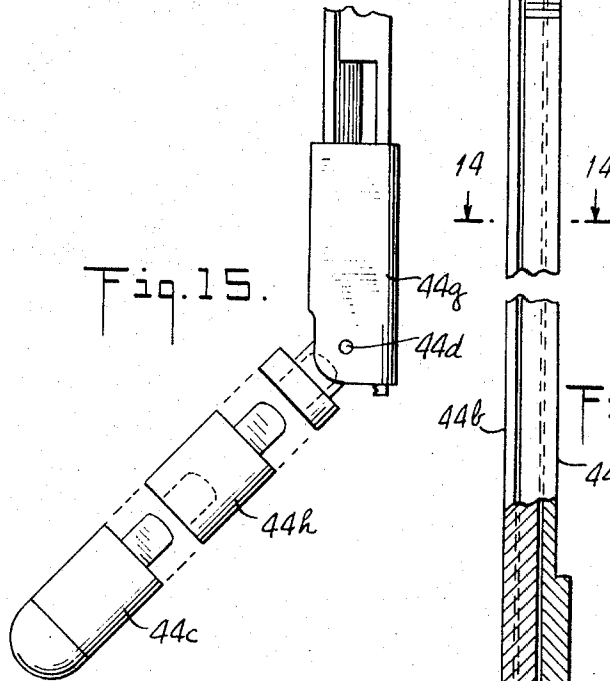


Fig. 13

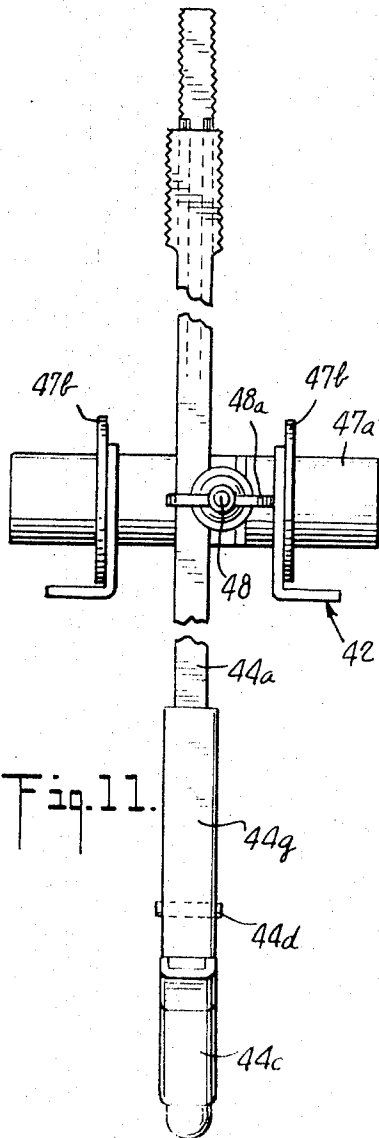
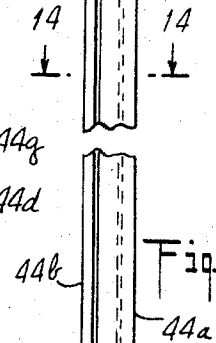
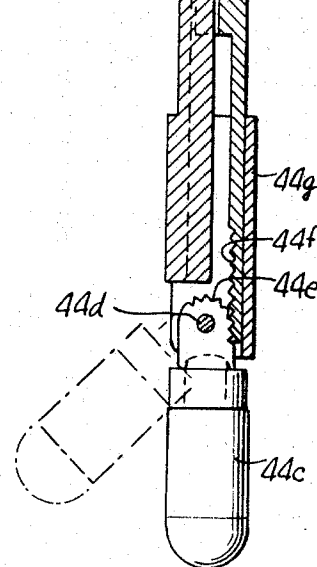
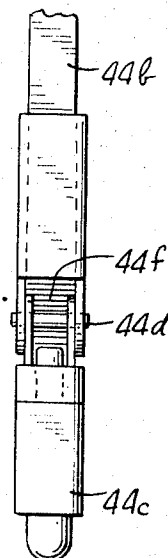
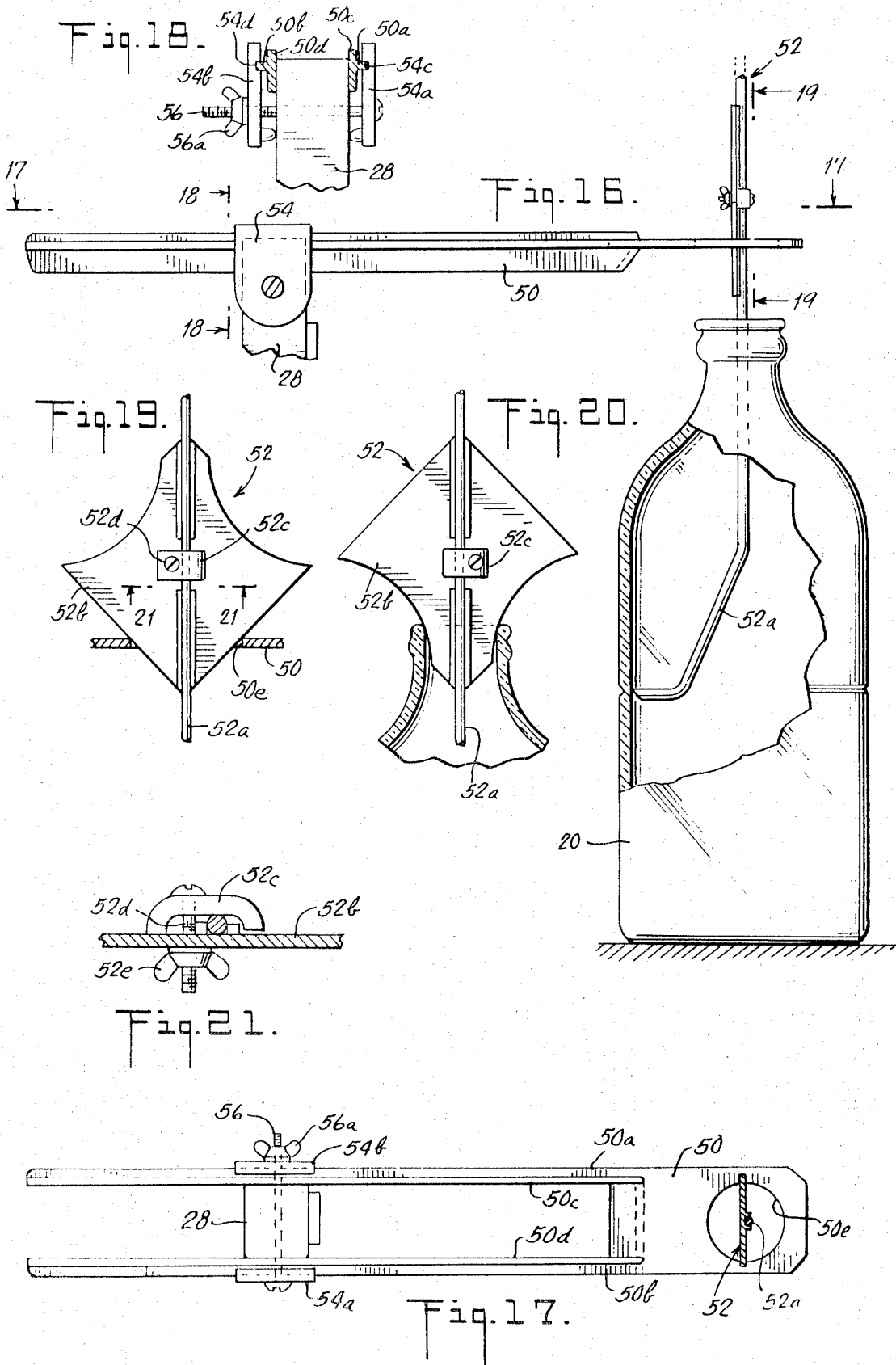


Fig. 12.





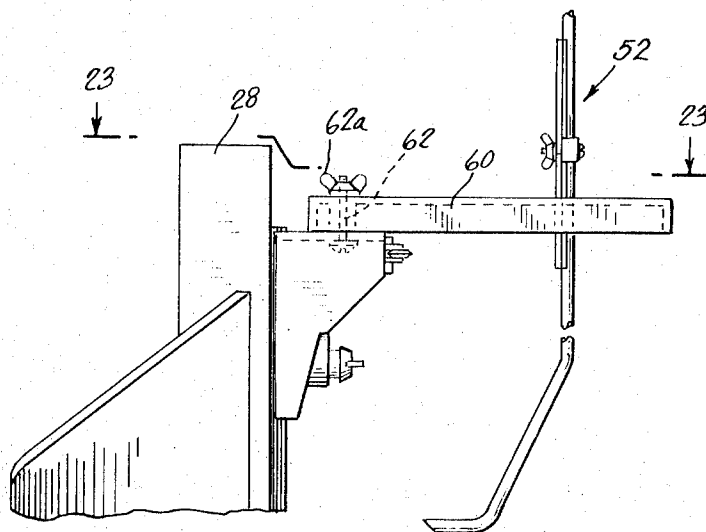


Fig. 22.

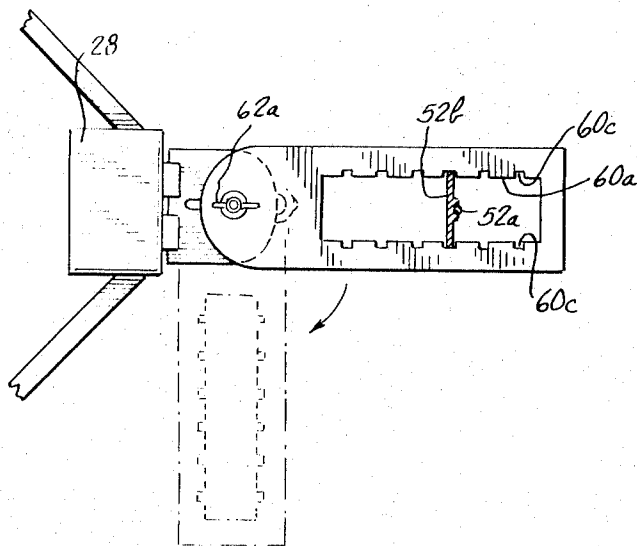


Fig. 23.

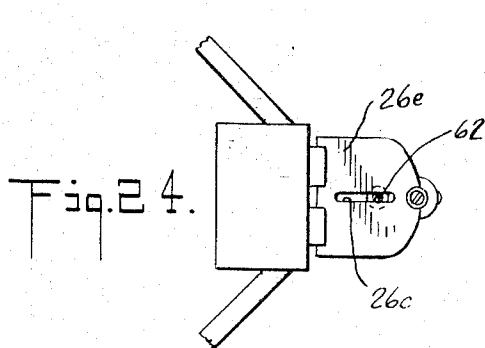


Fig. 24.

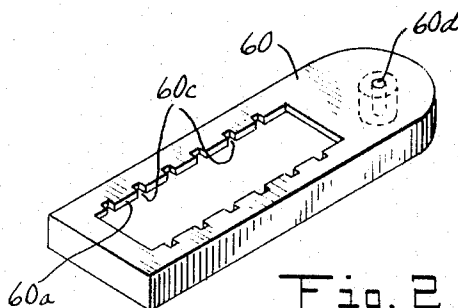


Fig. 25.

BOTTLE CUTTER**BACKGROUND OF THE INVENTION**

The invention is in the field of cutting brittle articles such as glass bottles, jugs, tubes or similar articles which have a base and an upwardly extending wall and which are made of brittle material.

One standard method of cutting articles such as glass bottles or tubes involves using a glass cutter wheel to scribe a cut line on the outside wall of the article, and then using a tapper to tap along the inside wall of the article opposite the scribed cut line for the purpose of severing the article along the cut line. A general requirement for successful cutting is that the cutting wheel be perpendicular to the surface on which it is scribing, and that the cutting wheel be in the plane of the scribed cut line. Another general requirement is that the scribed cut line be continuous and that it be of proper depth. Still another requirement is that the tapping be directly opposite the scribed cut line and that it be with proper force. Failure to satisfy either of these general requirements usually results in uneven severance of the glass or destruction of the article.

One prior art method and apparatus of cutting articles such as glass bottles is disclosed in Fleming, U.S. Pat. No. 3,572,564 where a jig pivoted at the bottle mouth is used to hold a glass cutter wheel at proper location and proper angle with respect to the outside wall of the bottle, and a hammer inserted through the bottle mouth is used to tap from the inside, opposite the line scribed on the outside of the bottle. This is generally satisfactory with round bottles of relatively small size, but is not satisfactory for cutting articles of other than round shape, such as square or odd-shaped bottles, and for cutting larger articles, such as larger bottles. Additionally, the disclosed apparatus and method may not be used for cutting articles such as jars or vases which do not have sufficiently narrow mouths. In general this prior art method requires considerable skill.

Another prior art device for cutting bottles and other similar articles is a bottle cutter kit sold under the trademark EPHREM'S OLDE TIME by STYLE-CRAFT of Baltimore, which comprises a horizontal base supporting a rectangularly disposed cradle of three rollers and one glass cutting wheel. A bottle or a similar article is placed on its side over the cradle and the longitudinal position of its bottom is defined by an upwardly extending backstop slidably mounted on the horizontal base. The bottle is then pressed down and turned to scribe a cut line. The cut line is then heated and cooled to separate the article into two pieces along the cut line by thermal shock. This device is also satisfactory for relatively small, round bottles, but not for articles which have other than round shape, such as rectangular bottles, or for larger articles. Additionally, the attack angle of the glass cutter wheel can not be adjusted to allow cutting articles at a location where the wall is not perpendicular to the article base.

In view of the prior art discussed above, the object of the subject invention is to provide a glass cutter which is simple and reliable and which satisfactorily cuts articles of different sizes and shapes and particularly articles of other than round cross-section and larger articles.

SUMMARY OF THE INVENTION

The invention is in the field of cutting brittle articles

such as glass bottles, jugs, tubes and the like, and any other articles which have bottom surfaces and upwardly extending walls and which are made of brittle material. A specific embodiment of the invention comprises a base plate which has a flat upwardly facing support surface for supporting the bottom of an article positioned for cutting, a post spaced from the support surface and extending upwardly therefrom, and cutting means slidably mounted on the post and having a cutting edge facing in the direction of the support surface for scribing a cut line on the wall of an article placed on the support surface.

When an article such as a glass bottle is positioned for cutting, the bottle bottom is placed on the support surface of the base plate, and a positioning arm which is pivoted on the base plate is used to define the lateral position of the bottle with respect to the post. Then the side wall of the article is brought next to the cutting means, and the cutting means is adjusted up or down the post such that a cutting wheel carried thereby is aligned with the desired location of a cut line. If at that point the cutting wheel is not perpendicular to the wall of the article at the location of the desired cut line, the cutting means is suitably adjusted with respect to the post so that the cutting wheel is perpendicular to the article wall. Then a cut line is scribed by manually rotating the bottle against the cutting wheel while keeping the article wall in contact with the positioning arm, and while keeping the article bottom firmly on the base plate.

After a cut line has been scribed around the entire circumference of the article, a tapper is introduced into the article for tapping the inside wall thereof opposite the cut line in order to break the article into two pieces along the cut line. The tapper may be supported from a boom extending from the top of the post or from the cutting means and serving to support the tapper in pendulum-like fashion to ensure that its tapping end is exactly opposite the scribed cut line. Alternately, a tapper independent of the boom may be used. When a boom suspended tapper is used, the lateral position of the article with respect to the boom is defined by means of a special tapping position of the positioning arm. Still alternately, the article may be severed along the scribed cut line by thermal shock.

An important aspect of the invented apparatus is that it can be used with equal facilities on articles such as conventional round bottles, and on odd-shaped articles such as square and rectangular bottles, vases and the like.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of the invented glass cutter with a bottle positioned for cutting.

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1.

FIG. 3 is a sectional view taken along line 3—3 of FIG. 1.

FIG. 4 is a perspective view of a cutting wheel frame forming a part of the glass cutter shown in FIG. 1.

FIG. 5 is a perspective view of a wedge used to adjust the angle of the cutting wheel frame with respect to the bottle.

FIG. 6 is a partial elevational view of the cutting frame and the wedge cooperating therewith to adjust the angle of the cutting wheel with respect to an article positioned for cutting.

FIG. 7 is a view similar to that of FIG. 6 and showing a different use of the wedge.

FIG. 8 is a partial elevational view similar to FIG. 1, but showing the glass cutter with a boom suspending a taper.

FIG. 9 is a sectional view taken along line 9—9 of FIG. 8.

FIG. 10 is a partial sectional view taken along line 10—10 of FIG. 8.

FIG. 11 is a partial sectional view taken along line 11—11 of FIG. 8.

FIG. 12 is a detailed elevational showing of the tapping end of the taper shown in FIGS. 8 and 11.

FIG. 13 is a partly elevational and partly sectional view of the taper.

FIG. 14 is a sectional view taken along line 14—14 of FIG. 13.

FIG. 15 is a partly exploded partial side elevational view of the tapping end of a taper.

FIG. 16 is a partial side elevational view of a modified boom supporting a modified taper and a partly elevational and partly sectional view of a bottle positioned for tapping.

FIG. 17 is a sectional view along line 17—17 in FIG. 16.

FIG. 18 is a sectional view along line 18—18 in FIG. 16.

FIG. 19 is a sectional view along line 19—19 in FIG. 16.

FIG. 20 is a view similar to that in FIG. 19, but shows the modified taper inserted directly into a bottle.

FIG. 21 is a sectional view along line 21—21 in FIG. 19.

FIG. 22 is a partial side elevational view showing a modified boom extending from the cutting wheel frame.

FIG. 23 is a sectional view taken along line 23—23 of FIG. 22.

FIG. 24 is a partial top view similar to FIG. 23 but with the modified boom removed.

FIG. 25 is a perspective view of the modified boom shown in FIGS. 22 and 23.

DETAILED DESCRIPTION

Referring to FIGS. 1 and 2, one embodiment of the invented apparatus is a device for cutting articles such as a bottle 20 which has a base 20a and a side wall 20b perpendicular to the base 20a. The bottle 20 is placed in cutting position over the top surface 22a of a base plate 22, with the bottle bottom 20a resting on the top surface 22a of the base plate 22.

The base plate 22 has a flat lower surface 22b and a retaining leg 23 which extends downwardly from the right-hand edge of the base plate 22. The base plate 22 may be placed over a flat surface such as a table top with the bottom surface 22b of the base plate 22 resting on the table top, and with the inwardly facing surface 23a of the retaining leg 23 against the edge of the table top. When the base plate 22 is so placed over a flat surface such as a table top, it will not slide along the table top when pressure is applied towards the left side of the base plate 22 (as seen in FIGS. 1 and 2).

When the bottle 20 is in the cutting position over the top surface 22a of the base plate 22, the bottle side wall 20b is brought in contact with the cutting edge of a cutting wheel 24 supported by a frame 26 which is slidably mounted on a post 28 extending vertically from the

left-hand side of the base plate 22. The frame 26 is then moved up or down the post 28 (by means described in detail below) until the cutting edge of the wheel 24 is aligned with the desired location of a cut line on the bottle 20, and the frame 26 is fixed at that position.

The lateral position of the bottle 20 on the base plate 22 is further defined by a positioning arm 30 whose near end is pivotally mounted on the base plate 22 by means of a fastener 32. The far end of the positioning arm 30 is releasably secured to the base plate 22 such that the arm 30 pivots about the fastener 32 like a phonograph arm and can be fixed at a particular position of its far end with respect to the base plate 22. In particular, the base plate 22 is provided with an arcuate slot 34 whose arc center is at the fastener 32, and with a bolt 36 which has a head 36a disposed below the arcuate slot 34, a shank 36b passing through the arcuate slot 34 and through a suitable aperture in the far end of the positioning arm 30 and a wing nut 36c threaded onto the top portion of the shank 36b. The head 36a is wider than the slot 34, such that the wing nut 36 can be tightened to fix the far end of the positioning arm 30 at a particular location along the arcuate slot 34, or it can be loosened such that the arm 30 can be moved like a phonograph arm to a different position along the arcuate slot 34.

When a bottle 20 has been suitably positioned on the base plate 22, as shown in FIGS. 1 and 2, a cut line may be scribed on the outside of its wall 20b by maintaining the bottle bottom 20a firmly on the top surface 22a of the base plate 22, pressing the bottle against the cutting edge of the cutting wheel 24 and against the positioning arm 30, and rotating the bottle 20 until the cutting wheel 24 scribes a continuous cut line around the circumference of the bottle 20. The bottle 20 may then be tapped from the inside opposite the line scribed by the cutting wheel 24 to separate the bottom into two pieces along the cut line. Alternately, other methods such as the use of thermal shock may be used to sever the bottle 20 along the scribed cut line.

It is important that the cutting wheel 24 be nearly exactly perpendicular to the wall 20b of the bottle 20 at the place where the cut line is scribed. Since other articles may be shaped differently from the bottle 20 shown in FIG. 1 (i.e., other articles may have slanted side walls), or it may be desired to cut the bottle 20 at the curved portion 20c of the side wall, means are provided for changing the angle between the plane of the cutting wheel 24 and the article positioned for cutting.

In particular, referring to FIGS. 1—7, the post 28 has a wall 28a provided with a vertically extending guide slot 28b, and the frame 26 is provided with a key projection 26a which fits within the guide slot 28b. When the key projection 26a of the frame 26 is keyed into the guide slot 28b, the axis of rotation of the cutting wheel 24 remains in the same vertical plane in any position of the cutting frame 26 along the post 28.

The means for changing the angle between the plane of the cutting wheel 24 and an article positioned for cutting, for the purpose of making sure that the cutting wheel 24 is perpendicular to the article wall at the place of the desired cut line, includes a wedge 38 which may be inserted between the frame 26 and the post 28 as shown in FIGS. 6 and 7.

The wedge 38 is shown in perspective view in FIG. 5 and is generally U-shaped, with legs 38a and 38b which are thicker at the base, where they join each other, and

are thinner at their free ends. The frame 26 is releasably secured to the post 28 by means of a bolt 40 having a head 40a disposed behind (on the left side of) the wall 28a of the post 28, a shank 40b passing through the guide slot 28b and through a suitable aperture 26b in the frame 26, and having a right-hand end portion onto which a wing nut 40c is threaded. When the wing nut 40c is loosened, the free ends of the legs 38a and 38b of the wedge 38 may be inserted between the post 28 and the frame 26, with the two legs of the wedge 38 flanking the key projection 26a. The wedge 38 may be inserted between the post 28 and the frame 26 either from the top, as shown in FIG. 6, or from the bottom, as shown in FIG. 7. When a portion of the wedge 38 sufficient to tilt the frame 26 to the desired angle with respect to the post 28 is inserted between the post 28 and the frame 26, the wing nut 40c is tightened to secure the frame 26 to the post 28 at the selected position. With the use of the wedge 38, it is possible to cut properly articles with nonvertical side walls, such as the articles shown in part in FIGS. 6 and 7.

If it is desired to cut an article at a location which is above the reach of the cutting wheel 24 when the frame 26 is mounted on the post 28 as shown in FIG. 1, the frame 26 may be changed to an upside-down position. That is, the wing nut 40c may be loosened until the frame 26 can be pulled to the right (in FIG. 1) far enough to allow the key projection 26a to clear the guide slot 28b. Then, the frame 26 may be rotated 180° about the bolt 40, and the key projection 26a may be reinserted into the guide slot 28b. In that upside-down position of the frame 26, the cutting wheel 24 is above the bolt 40.

In summary, a bottle is prepared for cutting by placing the bottle bottom on the supporting surface 22a of the base plate 22 and by rotating the positioning arm 30 about the pivot fastener 32 until the bottle is so disposed on the base plate 22 that the bolt 40 which fastens the frame 26 to the post 28 points to approximately the center of the bottle and the arm 30 is touching the side wall of the bottle. The arm 30 is then secured to the base 22 in that position by tightening the wing nut 36c.

The next operation is to position the cutting wheel 24 at the place where a line is to be scribed on the bottle 20. For that, the wing nut 40c is loosened and the frame 26 is slid up or down the post 28 until the cutting wheel 24 is suitably aligned with the desired cut line location. If the side wall of the bottle at that location is vertical, the wing nut 40c is tightened to secure the frame 26 to the post 28 at that position. If the side wall of the bottle is not vertical at the location of the desired cut line, the wing nut 40c is loosened and the wedge 38 is inserted between the post 28 and the frame 26 far enough to make the cutting wheel 24 as perpendicular as possible to the side wall of the bottle at the location of the desired cut line. A stack of two or more wedges may be used, if necessary. A cut line is then scribed by manually rotating the bottle against the cutting wheel 24 while keeping the bottle bottom on the base plate 22 and while keeping the side wall of the bottle in contact with the arm 30.

Brittle articles having a base and a side wall, but different in shape from the bottle 20 shown in the figures, are cut in a similar fashion. The base of the article is placed on the base plate 22, the side wall of the article is brought against the cutting wheel 24 and the frame

26 is adjusted so that the cutting wheel 24 is at the location of the desired cut line and is perpendicular to the side wall of the article at that location, the lateral position of the article on the base 22 is fixed by means of choosing a suitable position for the arm 30, and a cut line is scribed by manually rotating the article against the cutting wheel 24 while maintaining the base of the article on the base plate 22 and while maintaining the side wall of the article in contact with the positioning arm 30.

If the article has two bases, or two base-like surfaces, either of them may be placed on the base plate 22. For example, the bottle 20 shown in FIG. 1 may be placed on the base plate 22 as is shown in FIG. 1, or it may be turned upside-down and the bottle mouth may be placed on the base plate 22.

After a continuous and complete cut line has been scribed on the outside surface of the side wall of an article as described above, the article may be severed along the scribed cut line by any of a number of different methods.

One example of a severing method is tapping the inside of the article exactly opposite the cut line scribed on the outside surface of the article side wall. To sever an article by tapping, it is essential that the tapping be exactly opposite the scribed cut line and that the tapping be with proper force. If an article is tapped at a location which is not opposite the cut line, it may be difficult or impossible to sever the article. For example, the article may be severed at an irregular line which may follow the cut line only partly, or it may be destroyed.

For the purpose of insuring that an article may be tapped exactly opposite a cut line scribed on the outside surface of its side wall, the invented apparatus is provided with a tapper and means for suspending the tapper such that the hammer end of the tapper is at a precisely defined elevation with respect to the base plate 22. Referring to FIGS. 8, 9 and 10, a boom 42 is suitably attached to the top end of the post 28 and a tapper 44 is suspended from the right-hand portion of the boom 42 such that the hammer end of the tapper 44 can move in pendulum-like fashion to strike the inside of the article. The boom 42 has a substantially rectangular cross-section and has a longitudinally extending opening 42a which is centrally located and which is wide enough to receive loosely the top portion of the post 28. The side walls of the boom 42 which flank the opening 42a are provided with parallel longitudinal slots 42b, and a bolt 46 extends through the slots 42b and through the top portion of the post 28. The head 46b of the bolt 46 is on one side of the boom 42, while the threaded free end portion of the bolt 46 extends through the opposite side of the boom 42, and a wing nut 46a is threaded thereon. When the wing nut 46a is loosened, the boom 42 may be moved to the right or to the left of its position shown in FIGS. 8 and 9, or it may also be pivoted about the bolt 46.

The right-hand portion of the boom 42 forks into two parallel vertical walls each of which is provided with an upwardly facing cradle-like cutout 42c which receives loosely a spool-like attachment 47 which is releasably secured to the tapper 44. In particular, the attachment 47 comprises a horizontal cylindrical portion 47a which loosely fits within the cutouts 42c in the boom 42 and two annular retainers 47b affixed to the cylindrical portion 47a and flanking the two parallel vertical walls at the right-hand end of the boom 42. The cylindrical

portion 47a has a cutout 47c receiving the shank of the taper 44, and a bolt 48 is used to secure the attachment 47 at a particular position along the shaft of the taper 44. In particular, the bolt 48 has a wing nut 48a which may be tightened to secure the attachment 47 to the taper 44, or can be loosened such that the attachment 47 may slide up and down the shank of the taper 44.

The taper 44 comprises an elongated shank portion of light material, and a heavier hammer portion at the lower end thereof. In particular, referring to FIGS. 11 through 15, the shank portion of the taper 44 comprises a C-section 44a and a T-section 44b mating with the channel section 44a such that the sections 44a and 44b can move longitudinally with respect to each other. A hammer portion 44c is secured to the lower end of the T-section 44b by means of a pivot pin 44d. At the location of the pivot pin 44d, the hammer end 44c of the taper 44 is provided with pinion teeth 44e engaging rack teeth 44f provided at the lower portion of the C-section 44a. With this rack and pinion engagement, it is possible to change the angle between the hammer portion 44c and the shank of the taper 44 by moving the C-section 44a and the T-section of 44b relative to each other in the longitudinal direction. Thus, when the C-section 44a is pulled up with respect to the T-section 44b as far as possible, the hammer end 44c of the taper 44 is in line with the shank section of the taper 44; but when the C-section 44a is pushed down with respect to the T-section 44b, the hammer end 44c is angled with respect to the shank portion of the taper 44 and can be brought, for example, to the position shown in broken line in FIG. 13. A sleeve 44g encloses the lower ends of the C-section 44a and the T-section 44b to keep them together and to facilitate the operation of the rack and pinion arrangement for changing the angle between the shank section and the hammer section of the taper 44. If it is desired to make the hammer end 44c longer, one or more inserts 44h may be used as shown in FIG. 15.

When a cut line has been scribed around the outside of the side wall of an article such as the bottle 20 as described earlier, the article may be severed into two parts by placing it on the base plate 22 as shown in FIGS. 8 and 9, and tapping the inside of the article side wall exactly opposite the cut line scribed on the outside thereof.

In particular, after an article such as the bottle 20 has been cut and is ready for severing by tapping, the article is temporarily removed from the base plate 22, and the arm 30 is moved to its tapping position shown in FIG. 9. To do this, the wing nut 36c of the bolt 36 which secures the far end of the arm 30 to the base plate 22 is loosened, and the positioning arm 30 is rotated counterclockwise to the end of the arcuate slot 34 (FIG. 2). The end of the arcuate slot 34 has an opening 34a which is wider than the head 36a of the bolt 36; therefore, the head 36a can be lifted through the opening 34a to clear the top surface of the base plate 22, and to allow the arm 30 to be rotated further counterclockwise until it is in the position shown in FIG. 9. In that tapping position shown in FIG. 9, the positioning arm 30 is prevented from further counterclockwise rotation because its side wall 30a bears against the post 28. The opposite side wall of the arm 30, namely, the side wall 30b, and the side wall 30c of a projection 30d extending from the positioning arm 30 together define

a centering receptacle for an article such as the bottle 20.

The side walls 30b and 30c of the positioning arm 30 place the center of a round article directly under the boom 42 and help maintain the article in that position for tapping. Then, the taper 44, with the hammer end 44c as shown in solid lines in FIG. 13 may be introduced into the bottle through the bottle mouth, and the boom 42 may be adjusted with respect to the post 28 (by loosening the wing nut 46a of the bolt 46 which secures the boom 42 to the post 28) such that the boom 42 supports the taper 44 as shown in FIGS. 8 and 9, with the shank of the taper 44 being at approximately the center of the bottle 20. Then, the C-section 44a and the T-section 44b of the taper 44 may be moved with respect to each other to suitably angle the hammer portion 44c with respect to the shank portion of the taper 44. The friction between the sections 44a and 44b holds them in the selected position with respect to each other. Then, the wing nut 48a of the bolt which secures the attachment 47 to the shank portion of the taper 44 is loosened, and the shank portion of the taper 44 is moved with respect to the attachment 47 until the hammer end 44c of the taper 44 is exactly opposite the scribed cutline, as shown in FIG. 8. The wing nut 48a is then tightened to secure the attachment 46 to the shank portion of the taper 44 in the selected position, and the wing nut 46a of the bolt 46 securing the boom 42 to the post 28 is also tightened to retain the selected position of the boom 42.

The bottle 20 may then be tapped by manually swinging the upper portion of the taper 44 to the left and to the right as in FIG. 8. After one or more taps, a crack develops at the location of the cutline which is tapped, and the bottle 20 is manually turned such that it can be again tapped at a location adjacent the crack which has developed. When a new crack continuous with the first crack develops, the bottle is again turned a little and tapping continues until the crack is around the entire circumference of the bottle 20 and the bottle can be severed into two pieces along the cut line.

An alternate means for severing an article along a scribed cutline is shown in FIGS. 16 through 20. The alternate means comprises a boom 50 which is attached to the post 28 in a manner similar to the manner in which the boom 42 is attached to the post 28, and a taper 52 which can be used in a manner similar to the manner in which the taper 44 is used, but which can also be used without a boom, i.e., directly in conjunction with an article such as a bottle.

The modified boom 50 is attached to the top end of the post 20a by means of a C-shaped clamp 54 having facing side walls 54a and 54b which straddle the top end of the post 28. The side walls 54a and 54b of the clamp 54 are provided with facing grooves 54c and 54d which are parallel to each other and which receive the lateral edges 50a and 50b respectively of the boom 50. The boom 50 has an elongated rectangular opening defined by facing side walls 50c and 50d which flank the upper end of the post 28. A bolt 56 passes through suitable openings in the two side walls of the clamp 54 and the post 28 and is provided with a wing nut 56a which can be loosened to allow the C-shaped clamp 54 to pivot about the bolt 56, thereby pivoting the boom 50 about the top end of the post 28, and to also allow the boom 50 to be moved to the left and to the right (in FIG. 16). The wing nut 56a can be tightened to secure

the boom 50 in a selected position with respect to the post 28. The right-hand portion of the boom 50 is provided with a circular opening 50e which is used to suspend a modified tapper 52.

The modified tapper 52 comprises a heavy metal wire 52a which is suitably bent as shown in FIG. 16 and has a sharp, angle-cut tapping end, and a suspending attachment which comprises an arrowhead shaped plate 52b and means for releasably securing the plate 52b at a selected position along the wire 52a. The means for releasably securing the plate 52b to the wire 52a include a C-shaped clamp 52c straddling the wire 52a and releasably secured to the plate 52b by means of a bolt 52d provided with a wing nut 52e. When the wing nut 52e is loosened, the suspending attachment of which the plate 52b is a part can be moved up and down along the length of the wire 52a and can be secured at a selected position by tightening the wing nut 52e. Also, when the wing nut 52e is sufficiently loosened, the plate 52b can be rotated 180° with respect to the length of the wire 52a, such that the plate 52b can be either in the position shown in FIG. 19 or in the position shown in FIG. 20.

For severing an article by tapping with the modified tapping means shown in FIGS. 16 through 21, the article is positioned on the base plate 22 as shown in FIGS. 8 and 9. Then the position of the boom 50 with respect to the post 28 is adjusted such that the opening 50e is directly above the center of the article. The tapping end of the wire 52a is then introduced through the opening 50e, as shown in FIGS. 16 and 17, and the plate 52b is adjusted along the length of the wire 52a such that the sharp tapping end of the wire 52a is exactly opposite the scribed cut line when the plate 52b is resting on the opening 50e in the boom 50. Then, the article can be severed along the cut line by tapping as described earlier. It is noted that when the boom 50 is used, the plate 52b is suspended thereon as shown in FIG. 19, with the blunter end of the plate 52b resting on the boom 50.

The modified tapper 52 may be used without the boom 50, i.e., directly on an article which has a scribed cut line. To this end, if the article has a narrow mouth, i.e., if the article is a fairly narrow-mouth bottle, the plate 52b may be secured to the wire 52a as shown in FIG. 20, and the sharper end of the plate 52b may be partly introduced into the bottle mouth as shown in FIG. 20. The position of the plate 52b with respect to the wire 52a may then be adjusted such that the sharp tapping end of the wire 52a is exactly opposite the cut line when the plate 52b is positioned with respect to the bottle mouth shown in FIG. 20.

A modified and preferred boom 60 for supporting a modified tapper 52 is shown in FIGS. 22 through 25. The modified boom 60 differs from the boom 50 shown in FIGS. 16 through 18 primarily in the fact that it attaches to the cutting wheel frame 26 and not to the vertical post 28. The modified boom 60 is generally rectangular in horizontal cross-section and has a centrally located notched rectangular opening 60a. The boom 60 attaches to the cutting wheel frame 26 by means of a bolt 62 which passes through an elongated slot 26c in the top wall 26e of the cutting wheel frame 26 (when the cutting wheel 26 is mounted as shown in FIG. 22) and through a suitable opening 60b in the boom 60. The head of the bolt 62 is below the wall 26e of the cutting wheel frame 26 and is wider than the width of the

slot 26c, while the top end of the shank of the bolt 62 protrudes above the boom 60 and is provided with a wing nut 62a. When the wing nut 62a is loosened, the boom 60 can be pivoted about the bolt 62, for example, between the two positions shown in FIG. 23, or it can be moved to the left and to the right (as in FIGS. 22, 23 and 24) by moving the bolt 62 along the slot 26c. The wing nut 62a can be tightened to secure the boom 60 at a selected position with respect to the vertical post 28. The rectangular opening 60a in the boom 60 is provided with transversely arranged notches 60c for supporting the modified tapper 52 at a selected position with respect to the vertical post 28.

The modified boom and tapper shown in FIGS. 22 through 25 are used in the following manner: An article is positioned for tapping as described earlier, the cutting wheel frame 26 is secured to the vertical post 28 in the position shown in FIG. 22, the modified boom 60 is attached to the cutting wheel frame 26 as described in the preceding paragraph, and the boom 60 is oriented as shown in FIG. 23. The article is then placed in the tapping position described earlier, and the lower tapping end of the modified tapper 52 is inserted through the rectangular opening 60a and into the article. The plate 52b of the modified tapper 52 is placed between two selected facing notches 60c such that the wire 52a is approximately at the center of the article which is prepared for tapping. If need be, the wing nut 62a is loosened and the boom 60 is moved to the left or to the right for fine adjustment of the position of the tapper 52 with respect to the article. The wing nut 62a is then tightened, and the article is tapped from the inside as described earlier. After the article has been severed by tapping, the modified boom 60 may be moved out of the way by loosening the wing nut 62a and rotating the boom 60 to the position shown in broken lines in FIG. 23. The boom 60 may be secured in that broken line's position by tightening the wing nut 62a. When the boom 60 is in that side position, it does not interfere with cutting, and it may remain in that side position while a new article is cut as described earlier.

Articles on which a cut line has been scribed as described above may be severed into two pieces by methods other than tapping. For example, an article with a cut line scribed thereon may be severed by thermal shock produced by filling the article with hot liquids such as water and directing a relatively thin stream of cold liquids such as cold tap water to the outside of the article along the scribed cut line. Other methods of severing by thermal shock are also possible. Such other methods may include heating the article at the cut line by means of a hot wire or lighting a combustible liquid soaked string wound around the article over the cut line.

Claimed:

1. Apparatus for cutting brittle articles each having a bottom surface and a wall extending upwardly from the bottom surface, said apparatus comprising:
 - base plate means having a flat upwardly facing support surface;
 - a post spaced from the support surface and extending upwardly from the base plate means;
 - cutting means having a cutting edge and slidably mounted on the post for motion toward and away from the support surface of the base plate means along the post, said cutting edge facing in the direction of the support surface, and

means for selectively fixing the cutting means on the post at a selected position with respect to the support surface of the base plate means;

whereby the wall of an article may be cut by placing the bottom surface of the article on the support surface of the base plate means and rotating the article about an axis perpendicular to its bottom surface while maintaining the wall pressed against the cutting edge and while maintaining the bottom surface pressed against the support surface of the base plate means.

2. Apparatus as in claim 1 including adjusting means for selectively fixing the cutting means at a defined orientation of the cutting edge with respect to the post, whereby the cutting edge may be oriented perpendicularly to the wall of an article positioned for cutting.

3. Apparatus as in claim 2 wherein the adjusting means includes a wedge-shaped insert insertable between the cutting means and the post.

4. Apparatus as in claim 3 wherein the post includes a wall facing the support surface of the base plate means and having a vertically extending guide slot, the cutting means includes a frame having a key projection slidably fitting within the guide slot and a fastening means for releasably fixing the frame at a selected position along the guide slot, whereby the cutting means may be tilted at a selected angle with respect to the post wall by inserting the wedge-shaped insert to a selected degree between the cutting means and the post.

5. Apparatus as in claim 4 wherein the insert is U-shaped having legs thick at the base but decreasing in thickness near their free ends, the spacing between the legs corresponding to the width of the key projection of the cutting means frame, whereby the insert may be inserted either from the top or from the bottom between the post and the guide means frame, with the insert legs flanking the key projection to pivot the frame about an axis perpendicular to the guide slot.

6. Apparatus as in claim 1 including positioning means for fixing in at least one direction the lateral position of an article placed on the base plate means for cutting.

7. Apparatus as in claim 6 wherein the positioning means comprises an arm pivotted for motion in a plane substantially parallel to the support surface of the base plate means.

8. Apparatus as in claim 6 wherein the positioning means comprises an arm having a near end and a far end, means for pivotally connecting the near end of the arm with the base plate means to allow pivoting the arm in a plane substantially parallel to the support surface of the base plate means, and means for selectively and releasably affixing the far end of the arm to the base plate means at selected positions with respect to the post.

9. Apparatus as in claim 8 wherein the means for selectively and releasably affixing the far end of the positioning arm to the base plate means comprises means defining an arcuate slot in the base plate means having an arc center at the point where the near end of the arm is pivoted, and fastening means for selectively and releasably fastening the far end of the arm at selected positions along said arcuate slot.

10. Apparatus as in claim 6 wherein said positioning means comprises an arm pivotally mounted for motion in a plane substantially parallel to the support surface of the base plate means and having a tapping position

for restraining in a fixed position with respect to the post an article placed on the support surface of the base plate means and a range of cutting positions for restraining the lateral motion in one direction of an article placed on the support surface of the base plate means for cutting.

11. Apparatus as in claim 1 including a tapper having a hammer-like tapping end insertable into a cut article placed on the support surface of the base plate to tap the wall surface opposite the cut line thereon, and including a tapper support means for supporting the tapping end of the tapper at a selected height above the support surface of the base plate means.

12. Apparatus as in claim 11 wherein the tapper support means comprises a boom, means for pivotally and slidably fastening the boom to the post above the cutting means to allow pivoting the boom about an axis perpendicular to the guide slot of the post and to allow lateral adjustment of the boom toward and away from the support surface of the base plate means, said boom having means for pivotally supporting the tapper, whereby the tapper may be positioned with its tapping end opposite a cut line in the article wall and the article wall may be tapped by pivoting the tapper about the boom support.

13. Apparatus as in claim 1 wherein the base plate means has a substantially flat bottom surface and includes a retaining leg extending downwardly along one peripheral edge of the base plate means, whereby the bottom surface of the base plate means may be placed over a flat surface such as a table top and the retaining leg may be brought in contact with the edge of the flat surface to assist in keeping the base plate from sliding over the flat surface.

14. Apparatus as in claim 13 wherein the retaining leg is across the support surface of the base plate from the cutting means, whereby pressing an article against the cutting means while cutting the article tends to hold the base plate at a fixed position with respect to the flat surface.

15. Apparatus as in claim 1 for cutting articles which have a top surface parallel to the article bottom surface, said apparatus including a tapper having a stem terminating in a hammer-like tapping end, retaining means slidably mounted on the tapper stem for engaging the top surface of the article to limit the distance between the tapping end and the article top, and means for selectively fastening the retaining means to the tapper stem at a selected position of the retaining means on the tapper stem.

16. Apparatus as in claim 1 including a tapper having a tapping end insertable into a cut article placed on the support surface of the base plate to tap the wall surface opposite the cut line thereon and including a tapper support means for supporting the tapping end of the tapper at a selected height above the support surface of the base plate means, and means for releasably securing the tapper support means to the cutting means.

17. Apparatus as in claim 16 wherein said tapper support means is movable between a tapping position in which it extends from the cutting means toward the support surface of the base plate and a side position in which it clears the support surface of the base plate and the space thereabove.

18. Apparatus as in claim 1 including a tapper comprising two elongated shank portions movable relative to each other, a hammer-like tapping portion pivotally secured to one of the shank portions and means for changing the angle between the hammer end and the shank of the tapper by moving the elongated shank portions relative to each other.

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