July 5, 1955 R. S. BRESCKA ET AL 2,712,306

CRYSTAL CUTTING MACHINE

Filed Feb. 19, 1954 2 Sheets-Sheet 1

FIG 1

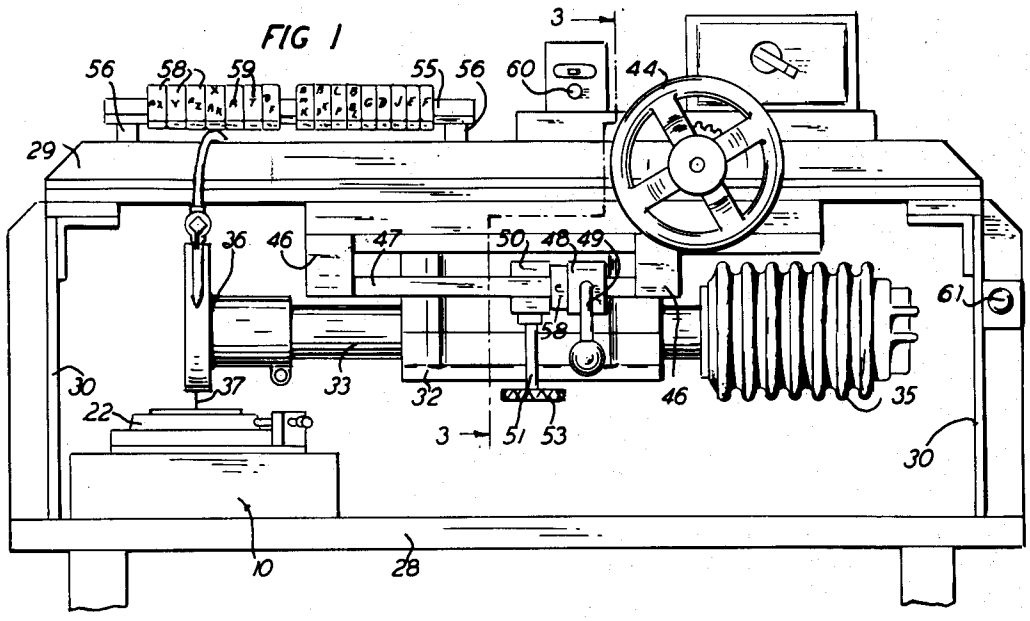


FIG 2

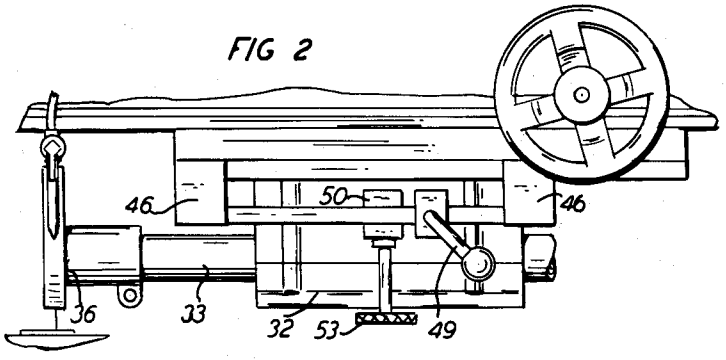


FIG 6

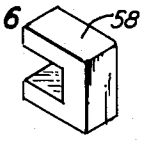


FIG 5

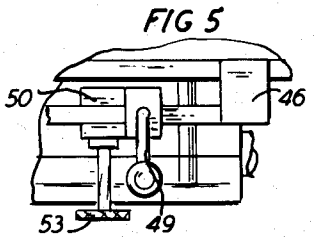
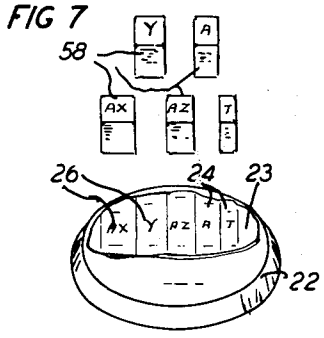


FIG 7



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July 5, 1955 R. S. BRESCKA ET AL 2,712,306

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Filed Feb. 19, 1954 2 Sheets-Sheet 2

FIG 3

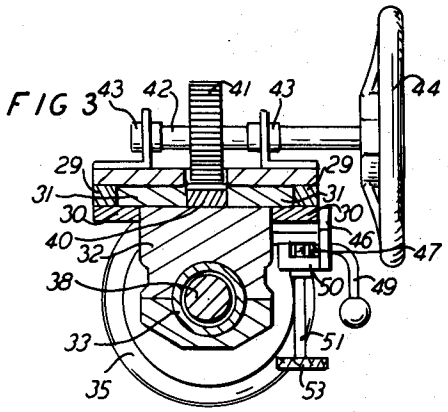
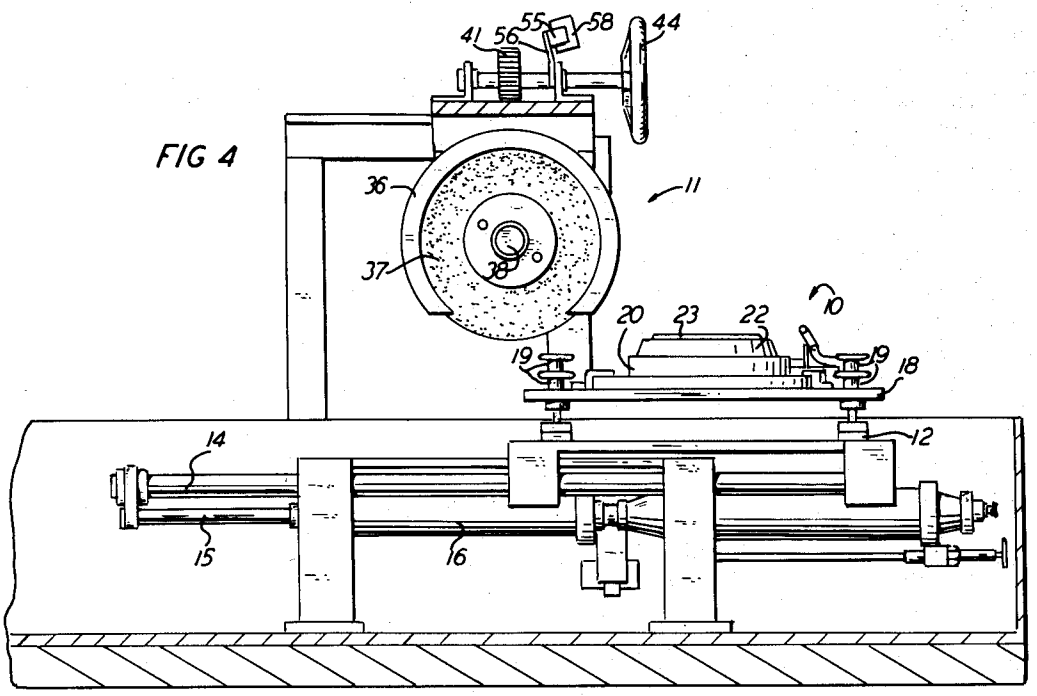


FIG 4



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CRYSTAL CUTTING MACHINE

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Application February 19, 1954, Serial No. 411,512

5 Claims. (Cl. 125—13)

This invention relates to article cutting apparatus and more particularly to apparatus for positioning a cutter with respect to the work.

In the process of producing quartz crystal plates from the original stone, many steps are followed including the cutting of wafers or slices of predetermined thicknesses from the original stone and then cutting the wafers into blanks of various lengths and widths which will require a minimum of grinding to produce accurately dimensioned finished plates. Most of the available crystalline quartz is in the form of very irregular stones or fragments of various sizes and due to the presence of twining and other defects only certains parts of most stones are suitable for use in the communication arts. In order to make most efficient use of the good quartz, it is common practice to lay out cutting lines on each wafer separately to minimize waste with the result that blanks of as many as six different sizes are sometimes cut from a single wafer. It is, therefore, necessary to adjust the saw accurately with respect to work prior to each cut. Conventional gear or screw type adjusting devices are not well adapted to this purpose due to their inherent backlash and the high degree of care required in their manipulation.

The object of the invention is an article cutting apparatus capable of accurate adjustment of the cutter known distances relative to the work after each cutting operation.

With this and other objects in view, the invention comprises an article support reciprocable in a given path and at right angles to the path of a carriage for a rotatable cutter and means associated with spacers of varied widths corresponding to the variable widths of the blanks or parts to be cut from the wafer or article to locate the cutter at predetermined cutting positions relative to the article for each cutting operation.

The carriage for the rotatable cutter may be moved readily by a hand wheel which rotates a pinion relative to a rack on the carriage. However, a member, fixed to the carriage, is adapted for sliding movement on a fixed position bar and adapted to lock the carriage to the bar. A locating element slidable on the bar is adapted to be clamped thereto and cooperates with the locking member of the carriage to receive U-shaped spacers of varied widths or thicknesses therebetween to accurately adjust the rotatable cutter for each cutting operation.

Other objects and advantages will be apparent from the following detailed description when considered in conjunction with the accompanying drawings, wherein:

Fig. 1 is a front elevational view of the apparatus;

Fig. 2 is a fragmentary front elevational view of the apparatus;

Fig. 3 is an enlarged vertical sectional view taken substantially along the line 3—3 of Fig. 1;

Fig. 4 is an end elevational view of the apparatus having certain portions removed to illustrate the reciprocating means of the article support;

Fig. 5 is a fragmentary detailed view of the adjusting means;

Fig. 6 is an isometric view of one of the spacers, and

Fig. 7 is an isometric view of the article to be cut illustrating the markings thereon and the spacers to be selected for the successive cutting operations.

The apparatus includes two main units, article feeding unit indicated generally at **10** and a cutter feeding unit indicated generally at **11**. The article feeding unit **10** includes a carriage **12** supported on parallel bars **14** for reciprocation between given lengths through the actuation of a piston rod **15** of an air cylinder **16**. The carriage **12** includes a table **18** which may be adjusted vertically relative to the carriage and fixed thereto by the aid of securing means **19**. A mounting plate **20** removably secured to the table **18** has the conventional ceramic member **22** removably secured thereto.

Fig. 7 illustrates a crystal plate **23** removably cemented to the ceramic member **22** and marked at **24** for parts to be cut from the plate so as to produce crystal wafers of predetermined sizes therefrom. The requirement for crystal wafers of various sizes makes it possible for parts of various sizes to be cut from the plates **23** to utilize as much as possible of the material in each crystal plate. These plates are marked by placing templets of sizes corresponding to the various types of crystal wafers on the cemented plate prior to reaching the apparatus and, at the same time, indicia or identifying markings **26** are placed within the areas of these marked portions.

By viewing Fig. 1, it will be noted that the article feeding unit **10** is mounted on a main support **28** beneath a frame **29** which extends between vertical members **30** mounted on the support. The frame **29** has a cross-sectional contour (as shown in Fig. 3) providing supporting guide tracks **30** for flanges **31** of a carriage **32**. The carriage **32** firmly supports a tubular housing **33** which has a power unit **35**, such as an electric motor, mounted on one end thereof and a guard **36** for a rotatable cutter **37** mounted on the other end thereof. A shaft **38** for the motor **35** (Fig. 3) extends through the housing **33** and the guard **36** to a position where the cutter **37** is removably secured thereto.

The carriage **32** has a rack **40**, mounted thereon parallel with the housing **33**, interengaging a pinion **41** which is mounted on a shaft **42**. The shaft **42** is journalled in suitable bearings **43** which are fixedly mounted in the frame **29**, the shaft being rotatable by a hand wheel **44** mounted on the forward end thereof.

The frame **29** has downwardly projecting members **46** supporting a stationary bar **47**. A unit **48**, mounted on the carriage **32** and movable therewith, extends substantially around the bar **47** and is provided with an internally threaded aperture or other suitable means to receive a locking element **49** actuable to cause gripping engagement with the bar **47** to releasably lock the carriage in any desired position. A locating member **50**, bifurcated to straddle the bar **47** and movable thereon, has an internally threaded aperture in the lower portion thereof to receive a locking element screw **51** having a knurled head **53**.

A rack **55** in the form of a rectangular bar mounted at **56** on the frame **29** is adapted to receive a plurality of spacers **58** of like general contours and varying widths corresponding to the widths of the various types of crystal wafers which are to be produced from the parts cut from the plates **23**. The spacers **58** are identified by letters or indicia **59** which are identical with the indicia **26** placed on the portions of the plates **23** (as illustrated in Fig. 7). It will be noted, by viewing Fig. 6, that the spacers **58** are U-shaped in general contour to be placed readily on the bar **47** and rack **55**.

Considering now the operation of the apparatus, let it be assumed that the plate **23** (shown in Fig. 7) is to receive six cuts therein to divide it into parts of known varying sizes. The first cut is to be made along the farthest line to the left after the cutter **37** is adjusted by sight. This adjustment is accomplished by the operator loosening the locking elements **53** and **49** and rotating the hand wheel **44** in a direction to cause the carriage to move the cutting unit until the cutter **37** is aligned with the first line of the part. During this adjustment, the feeding unit **10** is in the position shown in Fig. 4. When the cutter **37** is in the position for the first cut, the locking element **49** is moved, from the position shown in Fig. 2 to the position shown in Fig. 1, to lock the carriage to the bar **47** against motion. A switch **60** is actuated to cause opening of a valve in an air line to the air cylinder to cause the feeding unit **10** to move at a predetermined slow speed relative to the cutter. When the first cut has been completed, a rapid return switch **61** may be actuated which will operate another valve to cause the feeding unit to return to the position (shown in Fig. 4) rapidly.

Prior to starting the feeding unit **10** for the first cut, the operator observed the marking "AX" on the first part, so that during this cutting operation, the operator moved the locating member **50** into engagement with the adjacent surface of the clamping unit **48** and selected the spacer **58** identified with the letters "AX." As soon as the feeding unit **10** is returned to its starting position, the clamping unit **48** is released, the hand wheel **44** actuated to move the carriage to the right a distance sufficient for placing the selected spacer (AX) **58** on the rod **47** at the right of the member **50**, after which the wheel **44** is rotated in a reverse direction to move the unit **48** against the spacer to locate the carriage in a position where the cutter **37** will be known to be adjusted accurately for the next cut. After the element **49** of the unit **48** is locked on the bar **47** and the operator notices the indicia for the next part is "Y," the feeding unit **10** is operated by the switch **16** to bring about the second cut in the plate **23**. During this time the locating element **50** is loosened on the rod **47**, moved to the left to free the spacer marked "AX" for removal, and moved into close engagement with the locking unit **48** to mark the position for the next spacer. When the second cut has been completed and the feeding unit **10** returned to the starting position, the spacer **58**, identified by the letter "Y," has been selected by the operator and the same procedure is followed for loosening the clamping unit **48**, moving the carriage sufficiently so that the selected spacer may be inserted on the rod at the right of the locating element **50** and the carriage again returned to the left until the clamping unit **48** engages the selected spacer. This series of steps may appear to require considerable time but fortunately certain steps may be taken during each cutting operation so that there is little time required for the actual adjustment of the carriage or cutter relative to the work. Furthermore, each adjustment is positive and corresponds accurately to the width of the respective identified part.

It is to be understood that the above described arrangements are simply illustrative of the application of the principles of the invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. An apparatus for cutting an article into parts of various widths comprising a support for an article reciprocable in a path between given limits, a rotatable cutter parallel with said path and supported for adjustment at right angles thereto, a unit actuable to lock the cutter in any adjusted position, spacers substantially identical in width to the widths of the parts to be cut from the article, and a locating element cooperating with certain of the spacers selected singly to space the unit and the cutter a distance controlled by each selected spacer.

2. An apparatus for cutting an article into parts of various widths comprising a support for an article reciprocable in a path between given limits, a rotatable cutter parallel with said path and supported for adjustment at right angles thereto, a stationary bar disposed at right angles to the cutter, a unit movable axially with the cutter relative to the bar and actuable to lock the cutter in any adjusted position to the bar, spacers substantially identical in width to the widths of the parts to be cut from the articles and adapted to be disposed on the bar, and a locating element movably disposed on the bar and adapted to be locked in any position thereon to locate the position of the unit and the cutter for one cut and to cooperate with selected ones of the spacers to position the unit and cutter for a successive cut.

3. An apparatus for cutting parts of predetermined variable widths from an article comprising means reciprocable in a given path to support the article, a rotatable cutter, a carriage to rotatably support the cutter in a plane parallel with said path, means to support the carriage for movement in a path at an angle to the path of the support, a bar disposed at a fixed position adjacent the carriage and parallel with the path of movement thereof, a unit fixed to the carriage, movable on the bar and adapted to lock the carriage to the bar, a locating element slidably mounted on the bar and adapted to be releasably locked thereon, and spacers of varied widths, corresponding to the variable widths of the parts to be cut, disposed on the bar singly between the unit and the locating element to locate the cutter accurately relative to the article for successive cutting operations.

4. An apparatus for cutting parts of predetermined variable widths from an article comprising means reciprocable in a given path to support the article, a rotatable cutter, a carriage to rotatably support the cutter in a plane parallel with said path, means to support the carriage for movement in a path at an angle to the path of the support, means actuable to move the carriage in either direction when the unit is unlocked, a bar disposed at a fixed position adjacent the carriage and parallel with the path of movement thereof, a unit fixed to the carriage, movable on the bar and adapted to lock the carriage to the bar, a locating element slidably mounted on the bar and adapted to be releasably locked thereon, and spacers of varied widths, corresponding to the variable widths of the parts to be cut, disposed on the bar singly between the unit and the locating element to locate the cutter accurately relative to the article for successive cutting operations.

5. An apparatus for cutting an article into parts of various widths having indicia marked thereon identifying their widths, the apparatus comprising, a support for the articles singly reciprocable in a path between given limits, a rotatable cutter parallel with said path and supported for adjustment at right angles thereto, a stationary bar parallel with the path of adjustment of the cutter, spacers substantially identical in width to the widths of the parts to be cut and have indicia thereon identical to the indicia on their respective parts, and a locating element movable on the bar and adapted to be locked in any position thereon to locate successive cutting positions and to cooperate with the spacers singly to space the unit and cutter for subsequent cuts.

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