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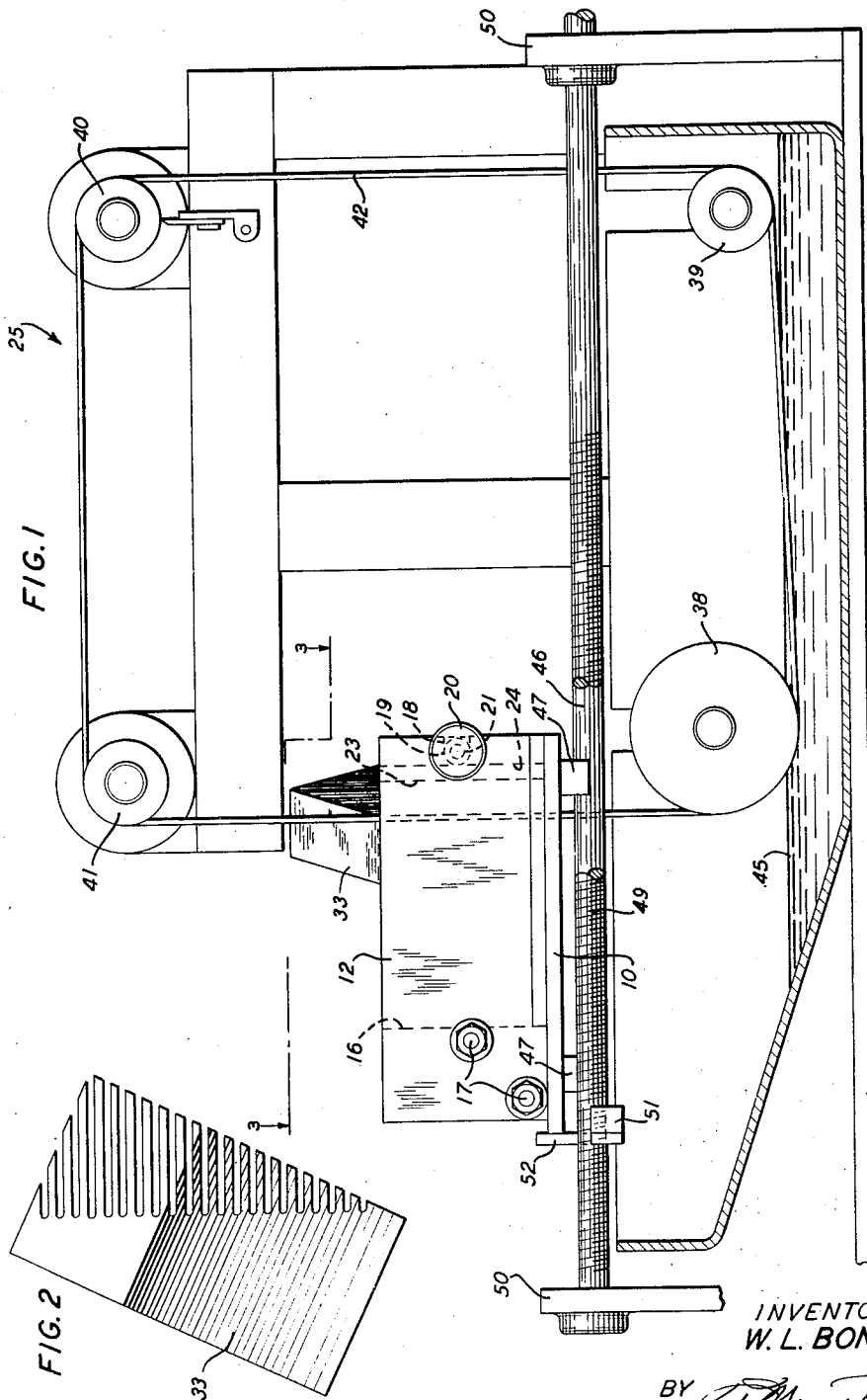
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2,515,331

HOLDING FIXTURE FOR CRYSTALS

Filed July 9, 1948

2 Sheets-Sheet 1



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FIG. 3

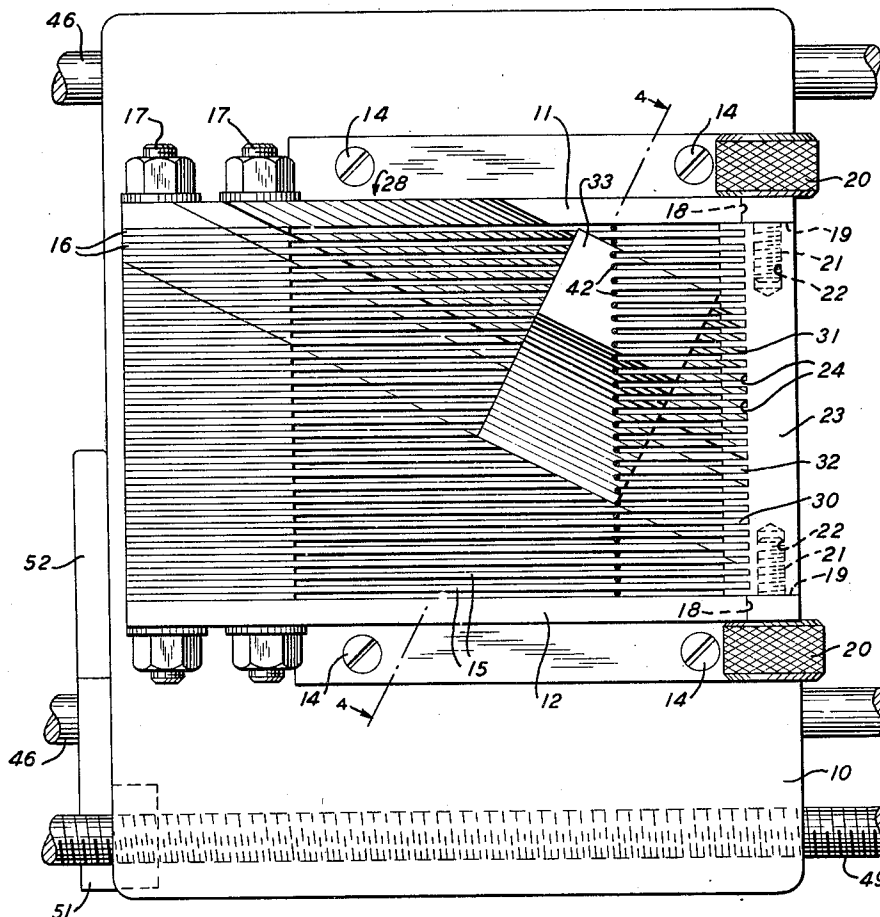


FIG. 4

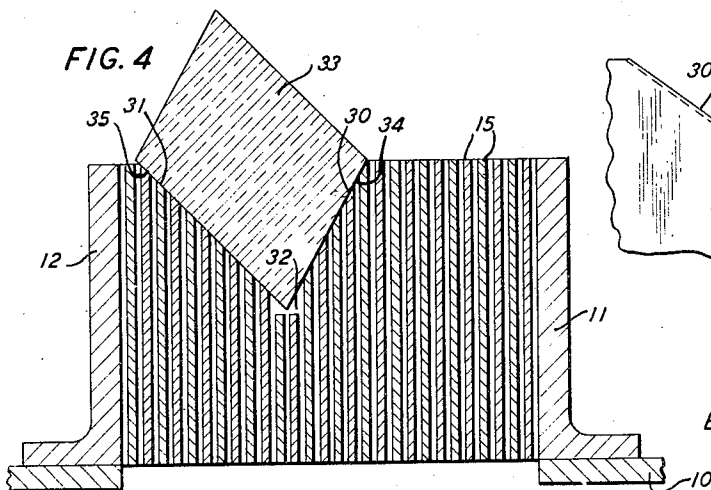
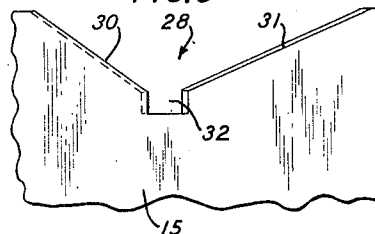


FIG. 5



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HOLDING FIXTURE FOR CRYSTALS

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This invention relates to holding fixtures for articles to be cut, and more particularly to fixtures movable relative to cutting members for holding articles at given angular positions while being cut.

In the manufacture of synthetic crystals produced, for example, from ethylene diamine tartrate solutions, an endless string commercially identified as a string saw traveling through a fluid such as water which is a solvent for the synthetic crystal cuts or dissolves a path through the crystal. In this manner, by the use of a plurality of endless strings the synthetic crystals may be divided into a plurality of wafer-like portions of equal thickness. The synthetic crystal similar to the quartz crystal, has certain inherent axes and the wafer-like portions which are to be embodied in electrical units of the communication arts must be cut or produced from the virgin crystal so that their faces will be at given angles with respect to certain of the axes in the crystal. Owing to the fact that the synthetic crystals are substantially identical in structure and that the said axes are in substantially the same positions in each crystal, movement of the article or synthetic crystal relative to cutting members such as the endless strands saturated with the solution which is a solvent for the crystal, will produce wafers from all crystals having like characteristics.

An object of the invention is to provide a holding fixture for an article, such as a crystal, to be cut into portions of given thicknesses, the portions extending at given angles with respect to the natural faces thereof. The natural faces are approximately aligned with the atomic planes of the crystal. These natural faces may hence be used to align the crystal for producing cuts having any desired angular relation to the atomic planes and crystal axes. The crystal axes are themselves characteristic of the particular crystalline material.

With this and other objects in view, the invention comprises a holding fixture for the article or the crystal to be cut by a cutting member, the fixture including parallel supporting elements having aligned grooves with groups of aligned surfaces cooperating to support the crystal at given angular positions with respect to the supporting elements, and means to support the elements at fixed spaced positions relative to each other whereby relative movement of the fixture and a cutting member will cause cutting of a path through the crystal by the cutting member at given angles relative to the atomic planes of

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the crystal as controlled by supporting it in the grooves of the supporting elements.

More specifically, the article in the present embodiment of the invention is a synthetic crystal of ethylene diamine tartrate to be cut into wafers of given thicknesses by the aid of a plurality of endless strands moving continually through a solution such as water, to dissolve parallel paths through the crystal. To cut the wafers at the desired angles with respect to the atomic planes of the crystal, and to provide guides for the strands, the fixture includes a plurality of parallel plate-like elements secured together at one end. The other ends of the elements may be held in their proper positions by a retaining member removably secured in place. The supporting elements have aligned substantially V-shaped grooves therein cooperating to form a supporting groove in the fixture extending diagonally at a given angle across the paths of the cutting members or endless strands and to tilt the article at another given angle with respect to the parallel planes of the supporting elements.

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 side elevational view of a crystal cutting unit embodying the holding fixture;

Fig. 2 is a top plan view of the crystal partially cut;

Fig. 3 is a top plan view of the crystal-holding fixture illustrating the position of the partially cut crystal therein, taken as indicated by line 3—3 of Fig. 1;

Fig. 4 is a vertical sectional view of a fixture taken along the line 4—4 of Fig. 3; and

Fig. 5 is a fragmentary side elevational view of one of the supporting elements illustrating the contour of the groove therein.

Referring now to the drawings, attention is first directed to Figs. 3 and 4 which illustrate the fixture as including a carriage or base portion 10 having vertical side members 11 and 12 mounted thereon as illustrated at 14. The side members 11 and 12 are spaced given distances apart depending upon the number of supporting elements 15 mounted therebetween. The supporting elements 15 are metal plates of like thicknesses separated from each other by spacing members 16 of like thicknesses and secured in their group arrangements between the uprights or side members 11 and 12 by the aid of bolts 17. The other ends of the side members have aligned notches 18 therein to receive reduced portions 19 of thumb

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screws 20. The thumb screws 20 have their threaded portions 21 positioned in threaded apertures 22 in the opposite ends of a retaining member 23, the inner surface of which has a plurality of equally spaced notches 24 therein to receive the adjacent ends of the supporting elements 15 to hold them in their proper positions. The retaining member may be readily removed from the supporting elements and the notches 18 of the side members 11 and 12 by loosening the thumb screws 20 and pulling the retaining member 23 outwardly, making it possible to remove the fixture from the cutting apparatus indicated generally at 25 in Fig. 1.

The supporting elements 15 have like grooves 28 formed therein, as illustrated in Fig. 5, cooperating to produce an article receiving groove in the top of the fixture which extends diagonally across the paths which will be cut through the article determined by the spaces between the supporting elements, and which will support the article at a given angle with respect to the parallel supporting elements. In Fig. 5 it will be noted that one side 30 of the groove is spaced from the other side 31 thereof by an inwardly cut portion 32 at the juncture of the surfaces to receive the lowermost edge of the article 33 whereby surfaces 34 and 35 of the article may rest upon their respective surfaces 30 and 31 of the grooves 28. Although the supporting elements are defined as having like grooves 28 formed thereon, only portions of these grooves are formed in certain of the supporting elements as shown in Fig. 3.

The article 33 in the present embodiment of the invention is a synthetic crystal formed from a solution of ethylene diamine tartrate. It will be noted that the cross-sectional contour of the crystal 33 is not truly rectangular and it has been found in the production or growing of these crystals that they assume this contour. Although some crystals may be larger than others, depending upon the interval of time allowed for growing the crystals from their initial seeds in the aforementioned solution, the angular relations of their sides with respect to their top and bottom surfaces remain the same. The contour of the groove 28 is such that regardless of variations in the width and thickness of successive articles or crystals, their faces or surfaces will be positioned at given angles with respect to the path of movement of the fixture relative to the cutting members and also relative to the planes of the supporting elements 15. It will be observed that the groove 28 continues not only through the supporting elements 15 but through the side member 11 and spacing members 16 as illustrated in Fig. 3.

In Fig. 1 the fixture is shown in combination with a cutting apparatus 25 which includes grooved rollers 38, 39, 40 and 41 to receive a plurality of cutting members 42 which in the present embodiment are endless strand-like members. The cutting members 42 in traveling in their guided paths about the rollers, driven by the rotation of the roller 38 through suitable means (not shown), travel into a liquid or solution 45 to become saturated therewith. The liquid 45 in the present embodiment of the invention is water, maintained at a given level, whereby the cutting members will be submerged therein during their travel about the rollers. The temperature of the water may be controlled within narrow limits by means well known in the art and not illustrated in the figures. Since the

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synthetic crystals are water soluble and the cutting members are saturated with water the cutting members will dissolve or otherwise cut paths through the crystal 33 during movement of the crystal relative to the cutting members. The crystals are held in place on the fixture by a tacky "mud," or mixture of clay and water. While other adhesive substances may be used, they must be of such a nature as not to interfere with the free interchange of water and dissolved crystalline material. For example, a material having an oily constituent could not be used, since it would clog the string and prevent proper cutting action.

The fixture or the carriage 10 thereof is mounted for longitudinal movement on parallel bars 46 by the aid of grooved guide blocks 47 mounted on the under surfaces of the carriage. The means for moving the fixture relative to the cutting members 42 includes a threaded shaft 49 mounted in suitable bearings 50 and rotated in a given direction at a predetermined speed by suitable means (not shown). A threaded segment 51 supported by an arm 52 is pivotally secured to the carriage for removable connection with the threaded shaft 49 to cause movement of the fixture relative to the cutting members during rotation of the threaded shaft.

When the fixture is to be employed for cutting the articles or crystals 33, it is placed upon the parallel bars 46 with the retaining member 23 removed and the segment 51 out of engagement with the shaft 49. The fixture is then moved to cause the leading ends of the supporting elements 15 to move beyond the cutting members 42 causing them to enter the guideways between the supporting elements. The retaining member 23 is then inserted in place with the leading ends of the supporting members entering their respective notches 24 and by this means, the free ends of the supporting elements are firmly held in their respective equally spaced parallel positions by tightening the thumb screws 20 to rigidly secure the retaining member in place. The fixture is now in position for repeated operations in cutting the synthetic crystals into portions of equal thicknesses. The crystal is placed in the groove 28 so that the surfaces 34 and 35 will rest on their respective surfaces 30 and 31 of the supporting elements after which the member 51 is moved into engagement with the threaded shaft 49. The fixture will be moved to the right at a given speed, causing the cutting members 42 to cut their individual paths through the crystal, eventually cutting the crystal into a plurality of parts of equal thicknesses, which parts originally assumed given angular positions in the crystal.

After one crystal has been cut into a given number of parts, these parts may be removed from the fixture. The fixture may then be returned to its starting position after disconnecting the member 51 from the threaded shaft. The fixture is now in position for the cutting of another crystal or article. All that is required is the placing of the crystal in the proper position in the groove 28 and again connecting the member 51 to the threaded shaft.

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. A holding fixture for a crystal to be cut into portions of given thicknesses by a traversable cutting member, comprising a plurality of parallel supporting elements, means disposed terminally of said elements to maintain fixed spaced positions therebetween, and a groove formed in and extending across said spaced parallel supporting members shaped to constitute a crystal seat which will present said crystal to said cutting member in such a position that portions cut therefrom during traverse of said crystal relative to said cutting member will have desired angular orientations relative to the atomic planes of said crystal.

2. A holding fixture for a crystal to be cut into portions of given thicknesses by a plurality of cutting members, comprising a plurality of parallel supporting elements having grooves formed therein and aligned to define surfaces adapted to support said crystal with a desired orientation and means disposed terminally of said elements to maintain fixed spaced relations therebetween whereby relative movement of said fixture relative to said cutting members will permit production of crystal portions having a desired orientation relative to the atomic planes of said crystals.

3. A holding fixture for a crystal to be cut into portions of given thicknesses by a cutting member, comprising a unit supported for movement in a given path relative to said cutting member and comprising supporting elements having a plurality of spaces therebetween parallel with the said path and in alignment with said cutting member, said supporting elements also having aligned V-shaped notches to receive and support said crystal in a given angular position relative to the said path whereby said crystal will be cut at a given angular position and orientation relative to the crystalline axes thereof by said cutting member during movement of said unit relative thereto.

4. A holding fixture for an article having

inherent crystalline axes to be cut into portions of given thicknesses by a cutting member to be directed at given angles through said article relative to said axes comprising a unit supported for movement in a given path relative to said cutting member and comprising supporting elements having a plurality of spaces therebetween parallel with the said path and in alignment with said path and said cutting member, and notched portions formed in said supporting elements and aligned to form grooves extending transversely of the said path to receive and support said article in given angular positions relative to the said path, whereby the said article will be cut at a given angular position and orientation relative to the crystalline axes thereof by said cutting member during movement of said unit relative thereto.

5. In combination with a string saw having a plurality of parallel string members and a table traversable relative thereto, means for holding crystals to be cut, comprising a plurality of spaced parallel supporting plates arranged to act as guides for the passage of said string members; means, removable to permit terminal entry of said string members between said plates, for rigidly maintaining parallel alignment of said plates; and seat portions so formed in said plates as to present said crystal to said string members rotated 45 degrees about the X axis and 27 degrees to the direction of traverse of said crystal relative to said string saw.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,144,370	Gerlach	Jan. 17, 1939
2,361,961	Pruitt	Nov. 7, 1944
2,431,469	Eyles	Nov. 25, 1947