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CRYSTAL GROWING APPARATUS

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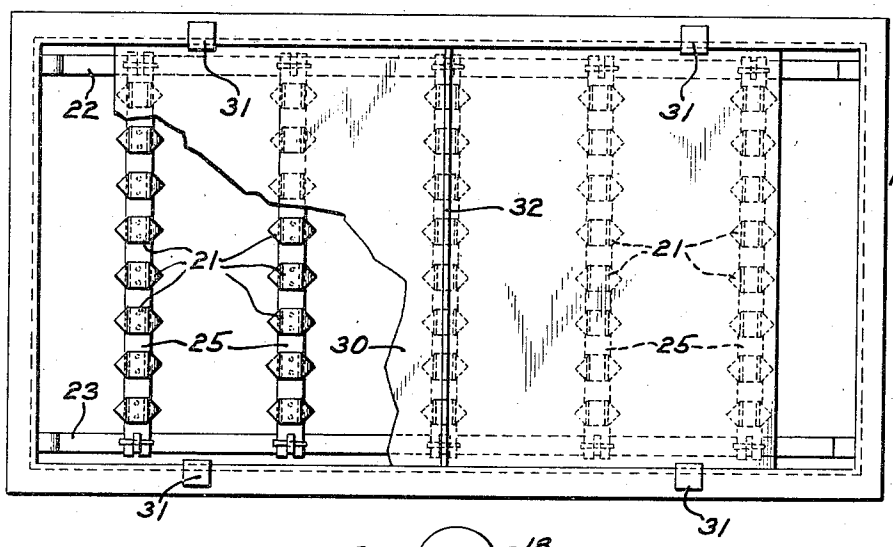


FIG. 2

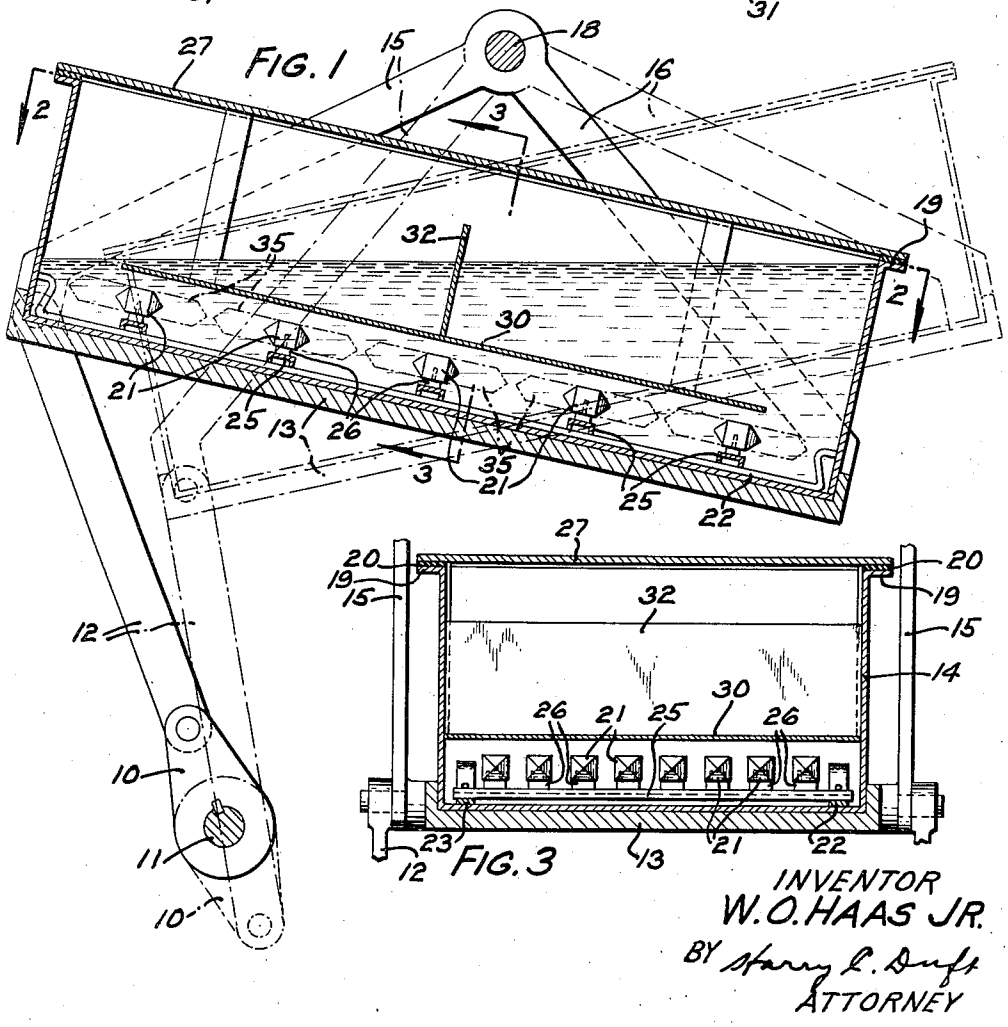


FIG. 1

FIG. 3

INVENTOR
W. O. HAAS JR.
BY Harry C. Duft
ATTORNEY

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CRYSTAL GROWING APPARATUS

Walter O. Haas, Jr., Chicago, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York

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6 Claims. (Cl. 23—273)

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This invention relates to crystal growing apparatus and more particularly to tanks for use in the production of piezoelectric crystals.

In the manufacture of crystals for piezoelectric devices, seed crystals have been mounted in tanks containing a solution of the salt from which the crystals are formed and the tanks are then rocked while gradually reducing the temperature of the bath to form crystals, whereby the solution adjacent the growing crystals is continually circulated or replaced with a stronger solution. In the ordinary crystal growing tanks, the flow of the crystallizing solution is different in the various areas of the tank; for example, the solution at the extreme ends of the tank rises and falls, whereas a greater amount of movement or greater flow occurs at the central portions of the tank.

It is an object of the present invention to provide a crystal growing tank in which all effective areas of the tank have substantially the same amount of flow of the crystallizing solution and to increase the flow of solution.

In accordance with one embodiment of the invention, a crystal producing tank is provided having suitable framework placed on the bottom thereof for supporting seed crystals in a plurality of rows and directly over and in close proximity to the upper surfaces of the seed crystals there is disposed a baffle, which extends to points adjacent the ends of the tank. The baffle extends into engagement with the sides of the tank and has a central portion extending therefrom which is of such height that it will effectively block the flow of crystallizing solution from one end of the tank to the other over the top of the baffle, whereby the crystallizing solution will flow in a substantially equal volume past all of the seed crystals.

A complete understanding of the invention may be had by reference to the following detailed description wherein

Fig. 1 is a sectional view through a crystal growing tank embodying the features of the present invention, together with a diagrammatic showing of mechanism for rocking and supporting the tank;

Fig. 2 is a plan sectional view taken substantially along the line 2—2 of Fig. 1 in the direction of the arrows, parts being broken away to more clearly illustrate the details of construction of those parts positioned beneath it; and

Fig. 3 is a transverse vertical sectional view taken substantially along the line 3—3 of Fig. 1 in the direction of the arrows.

In the drawings, wherein like reference characters designate the same parts throughout the several views, mechanism is shown for rocking the crystal growing tank, which comprises a crank 10, mounted upon a shaft 11, which may be driven by any suitable power driving mechanism (not shown). The crank 10 has a link 12 pivotally connected to it and to a supporting framework 13, on which one or more crystal growing tanks 14 may be supported. The framework 13 is, in turn, supported by angularly disposed arms 15 and 16, which are interconnected at their upper ends and are pivoted on a suitable pivot shaft 18. Thus, the tank 14 or a series of tanks mounted on the framework 13 may be slowly rocked by imparting rotation to the shaft 11.

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The tank 14 has a flange 19 formed on its upper edge for supporting a gasket 20, on which a cover plate 27 rests. A crystal supporting framework, which serves to hold a group of seed crystals 21 in position in the tank, comprises two longitudinally extending members 22 and 23, which are bent at their ends, as indicated at 24, so that they will resiliently engage the ends of the tank 14. The longitudinally extending members 22 and 23 have a plurality of channel members 25 suitably attached to them and extending transversely of the tank. Each of the channel members 25 has a plurality of blocks 26 mounted on it, to which the seed crystals are suitably attached.

Supported in spaced relation to and closely adjacent to the upper surfaces of the seed crystals 21 is a baffle member 30, which extends from side to side of the tank 14 and extends to a point adjacent to each end of the tank 14. The ends of the baffle member 30 are spaced from the tank a distance approximately equal to the distance from the upper surface of the bottom of the tank to the lower surface of the baffle 30. The baffle 30 has four brackets 31 attached to it, which are bent over at their upper ends to engage the upper surface of the flange 19 and thus support the baffle 30 in the proper position. The baffle 30 thus extends substantially horizontally and at its center has attached to it a vertically extending baffle 32.

In the operation of the apparatus, a body of crystallizing solution 33 in the tank 14 will, when the tank is rocked, flow through the space between the end of the baffle 30 and the end of the tank and since the distances between the ends of the baffle and the ends of the tank are substantially equal to the distance from the bottom of the tank to the bottom of the baffle, the flow of liquid will be uniform for all of the crystals. The central vertically extending baffle 32 will prevent fluid at the right side of it from moving over the top of the baffle when the tank is rocked from

the full line position (Fig. 1) to the dotted line position. When the tank is rocked from the dotted line position to the full line position, the solution to the left of the baffle **32** will be forced to travel under the baffle **30** and thus the flow of crystallizing solution will be maintained uniform through the entire area where the crystals **21** are growing from the size shown by full lines to that shown by the dot and dash lines **35**.

What is claimed is:

1. An apparatus for growing crystals in a solution comprising a substantially rectangular tank for receiving a supply of crystallizing solution, means rockably supporting said tank, a holding means within the tank constructed to hold and support crystals above the bottom of the tank, baffle means within the tank in substantially parallel relation to the bottom of the tank and in spaced relation to the ends of the tank, said baffle means comprising means extending upwardly substantially centrally of the tank whereby flow of solution from end to end of the tank above the baffle may be prevented and restricted to flow between the baffle and the bottom of the tank when the tank is rocked.

2. An apparatus for growing crystals in a solution comprising a substantially rectangular tank for receiving a supply of crystallizing solution, means rockably supporting said tank, baffle means within the tank in substantially parallel relation to the bottom of the tank and in spaced relation to the bottom of and to the ends of the tank, said baffle means including means extending upwardly therefrom substantially centrally of the tank whereby flow of solution from end to end of the tank above the baffle may be prevented and restricted to flow between the baffle and the bottom of the tank when the tank is rocked, and a holding means within the tank constructed to hold and support crystals above the bottom of the tank and below the horizontal baffle means.

3. An apparatus for growing crystals in a solution comprising a substantially rectangular tank for receiving a supply of crystallizing solution, means rockably supporting said tank, crystal supports on the bottom of the tank arranged to hold the crystals above the bottom of the tank, and baffle means within the tank in substantially parallel relation to the bottom of the tank and above the crystal supports and in spaced relation to the ends of the tank, said baffle means including means extending upwardly substantially centrally of the tank whereby the solution is prevented from flowing from end to end of the tank above the baffle and is restricted to flow from end to end of the tank between the baffle and the bottom of the tank when the tank is rocked.

4. An apparatus for growing crystals in a solution comprising a substantially rectangular tank for receiving a supply of crystallizing solution, means supporting said tank for rocking movement about a pivot above the top of the tank, crystal supports on the bottom of the tank arranged to hold the crystals above the bottom of the tank, baffle means within the tank in substantially parallel relation to the bottom of the tank and above the crystal supports and in spaced relation to the ends of the tank, said baffle means including means extending upwardly substantially midway between the ends of said baffle means whereby the solution is prevented from flowing from end to end of the tank above the baffle and is restricted to flow from end to end of the tank between the baffle and the bottom of the tank.

5. An apparatus for growing crystals in a solution comprising a substantially rectangular tank for receiving a supply of crystallizing solution, said tank having a greater length than width or height, means for supporting the tank for rocking movement about an axis parallel to the ends of the tank, crystal supports on the bottom of the tank arranged to hold the crystals above the bottom of the tank, and baffle means within the tank above the crystal supports in substantially parallel relation to the bottom of the tank and in spaced relation to the ends of the tank, said baffle means including means extending upwardly substantially midway between the ends of the tank whereby the solution is prevented from flowing from end to end of the tank above the baffle and is restricted to flow from end to end of the tank between the baffle and the bottom of the tank when the tank is rocked.

6. An apparatus for growing crystals in a solution comprising a substantially rectangular tank for receiving a supply of crystallizing solution, said tank having a greater length than width or height, means for supporting the tank for rocking movement about an axis parallel to the ends of the tank, crystal supports on the bottom of the tank arranged to hold the crystals above the bottom of the tank, baffle means in the tank comprising a main baffle disposed above the crystal supports in parallel relation to the bottom of the tank and extending from side to side of the tank and with the ends of said baffle spaced from the ends of the tank a distance substantially equal to the distance of the main baffle from the bottom of the tank, and an auxiliary baffle extending upwardly from the main baffle substantially midway between the ends thereof and extending from side to side of the tank, said baffle means serving to prevent the flow of solution from end to end of the tank above the main baffle and to insure the flow of solution between the baffle and the bottom of the tank when the tank is rocked.

WALTER O. HAAS, JR.

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

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