Aug. 31, 1937. C. A. BIELING 2,091,249

METHOD OF AND APPARATUS FOR WORKING MATERIALS

Filed Oct. 25, 1935

FIG. 1

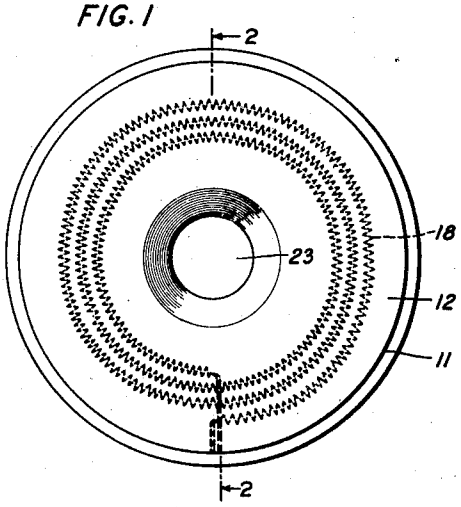


FIG. 2

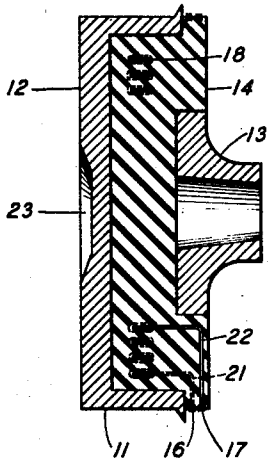


FIG. 3

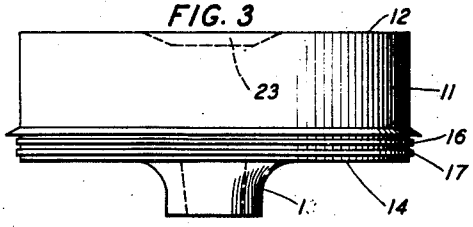


FIG. 4

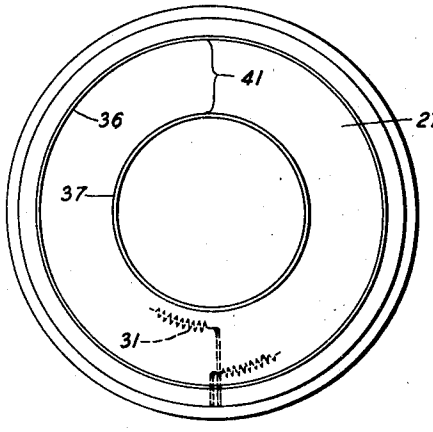
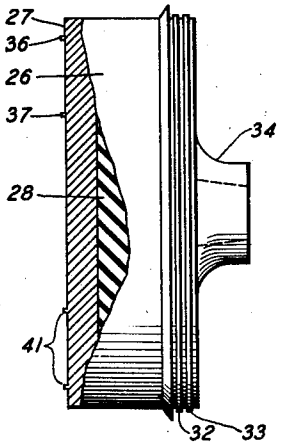


FIG. 5



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2,091,249

METHOD OF AND APPARATUS FOR WORKING MATERIALS

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6 Claims. (Cl. 51—278)

This invention relates to a method of and apparatus for working material and particularly to a method of and apparatus for working materials which are particularly susceptible to breakage at certain definite temperatures.

An object of the invention is to facilitate working materials which are particularly susceptible to breakage at certain definite temperatures.

Another object of the invention is to prevent breakage of Rochelle salt crystals during working (grinding, shaping etc.) thereof.

A more specific object of the invention is to control the temperature of a Rochelle salt body within predetermined definite limits during working thereof.

In the preparation of Rochelle salt plates, which are commonly used as piezoelectric elements in such electrical circuits as oscillators and wave filters, it is common practice to cut a number of plates in the form of relatively thin, substantially flat, slabs from a larger crystal. As a rule these slabs, even when cut by means of the accurate and precise apparatus now existing in modern laboratories, are not of the exact size desired and, in many cases, the major surfaces do not present the high degree of plane parallelism required to give the plate the highly accurate characteristics which will be demanded of it. It is usual, therefore, to finish the surfaces of the slabs by the use of the type of grinding plate commonly referred to as a lap.

It has been observed that breakage of the Rochelle salt slabs is very common when they are worked by means of laps and similar tools of the type heretofore known, it having been determined by applicant that this breakage is due largely to the fact that a rapid change of dimension takes place in the Rochelle salt body at a temperature of approximately 24° C., this dimensional change being sufficient to cause a thin slab of Rochelle salt to literally fly to pieces. In order to prevent this breakage this critical temperature must either be avoided or must be approached and passed through slowly and at a controllable rate. In accordance with the lapping and other similar working processes as heretofore practised no particular attention has been paid to the temperature of the lap or other tools; the usual result being that, at the start of the operation, both the tool and slab are slightly above the critical temperature referred to in view of the fact that the ordinary room temperature is about 26° C. During the working process, however, the tool and slab are cooled due to the movement of the tool, the temperature of the slab soon being lowered to the critical point whereupon breakage occurs.

In accordance with a feature of the present invention means is provided whereby the temperature of the Rochelle salt body may be brought to a point above the critical before the start of the lapping or other working process and may be maintained at that point during the entire working process.

In accordance with a particular embodiment of the invention an electric heating unit is positioned within the tool used in working the Rochelle salt body by means of which unit the temperature of the tool may be maintained between predetermined limits. By virtue of heat conductance the temperature of the Rochelle salt body being worked upon may of course be controlled by controlling the temperature of the tool.

It has been found that the invention is particularly valuable when applied to laps and that its use in that connection results in substantially eliminating breakage of the Rochelle salt slabs during the lapping process. The invention is therefore being described and illustrated as specifically applied to laps but it should be understood that the invention is not by any means limited to such use.

A complete understanding of the invention and appreciation of the various features thereof may be obtained by considering the following detailed description in connection with the annexed drawing, in which:

Fig. 1 is a top view of a lap, an electric heater unit provided in accordance with a feature of the present invention being shown by dotted lines;

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is a side elevation of the lap shown in Fig. 1;

Fig. 4 is a top view of a lap similar generally to that shown in Fig. 1 but modified by the addition of two retaining rims; and

Fig. 5 is a side elevation of the lap shown in Fig. 4, the view being in partial section to show more clearly the arrangement of the retaining rims.

Referring now to the drawing and first to Figs. 1, 2 and 3 a lap 11 is shown having a grinding face 12 and a mounting hub 13. As shown more clearly in Fig. 2, a centrally located portion 14 of insulation material is provided, two slip rings 16 and 17 being exteriorly mounted on this portion. As shown in Fig. 2 and by the dotted lines in Fig. 1, an electrical heater unit 18 is mounted in insulating portion 14, the terminals 21 and 22 of the unit being connected respectively to slip rings 16 and 17.

A depressed portion 23 is provided in grinding face 12 and serves to prevent the accumulation of abrasive dust at the center of the lap during grinding.

During use, the lap is preferably rotatably connected by hub 13 with a suitable driving source (not shown), brushes of the ordinary type being provided to slidably connect slip rings 16 and 17

with a suitable power source, such as a battery. An abrasive is preferably applied to face 12 and the work is, in accordance with ordinary practice, supported in contact with face 12 by a matrix or nest.

The provision of heater unit 18 allows the temperature of the lap to be brought to any desired value before the start of the process and to be maintained at such value during the entire process. As pointed out above this is a particularly desirable feature when certain materials are being worked which are subject to a rapid dimensional change at certain so-called critical temperatures. For example, when grinding a Rochelle salt body which, as pointed out above, is subject to a rapid change of dimension at a temperature of approximately 24° C., the lap would be brought to a temperature of, say for example, 27° C., before start of the grinding operation. During the grinding process the heater unit would be utilized to hold the temperature of the lap and work at this point, overcoming the cooling effect of rotation of the lap which normally would bring the temperature of the Rochelle salt body down to the critical point resulting in breakage.

Referring now to Figs. 4 and 5, a modified form of lap 26 is shown. Lap 26 is, in general, similar to lap 11 described above being provided with a similar grinding face 27, insulating portion 28, heater unit 31, slip rings 32 and 33 and mounting hub 34.

Lap 26 differs, however, from the lap previously described in that two rims, 36 and 37, respectively, are formed on the grinding face 27. The provision of these rims results, in effect, in formation of a troughed portion 41 on the face of the lap. This form of lap is particularly valuable for working very thin plates such, for example, as quartz plates used as piezo-electric elements. Such plates, due to their thinness and fragility, are difficult to support and move by the type of matrix usually used in the lapping process. With the present form of lap, however, use of a matrix is not necessary, the plates being placed in the troughed portion 41, and being held therein during rotation of the lap by rims 36 and 37. It is intended that lap 26 be used as the "upper" lap during the lapping process and that the "lower" lap (which may be the same as lap 26 except that the rims 36 and 37 are omitted) remain stationary.

While certain specific embodiments of the invention have been selected for detailed description, the invention is not of course limited in its application to the embodiments described. For example, the heater unit may of course be used in connection with other tools and is not limited in its application to laps. In short, the embodiments described should be taken as illustrative of the invention rather than as restrictive thereof.

What is claimed is:

1. In the process of working a Rochelle salt body of the type which is subject to a rapid change of dimension at approximately 24° C. by means of a tool which when in use tends to lower the temperature of the Rochelle salt body, the method of preventing breakage of the Rochelle salt body during working due to a change of dimension which comprises applying sufficient heat to said Rochelle salt body during the working process to prevent the temperature thereof being lowered by the action of said tool to approximately 24° C.

2. In the process of working a Rochelle salt body of the type which is subject to a rapid change of dimension at approximately 24° C. by means of a tool which when in use tends to lower the temperature of the Rochelle salt body, the method of preventing breakage of the Rochelle salt body during working due to a change of dimension which comprises heating said tool and applying sufficient heat therefrom to said Rochelle salt body to prevent the temperature of said Rochelle salt body being lowered to approximately 24° C. by the action of said tool.

3. In the process of working a Rochelle salt body of the type which is subject to a rapid change of dimension at a certain definite temperature, the method of preventing the normal cooling effect of a working tool from lowering the temperature of the Rochelle salt body from the temperature at which working is started to said definite temperature which comprises applying heat to said Rochelle salt body during the working process.

4. In the process of working a Rochelle salt body of the type which is subject to a rapid change of dimension at a certain definite temperature including an operation performed by a tool which tends to lower the temperature of said Rochelle salt body, the method of preventing breakage of the Rochelle salt body due to a change of dimension which comprises maintaining the temperature of the Rochelle salt body above said critical temperature during the process of working.

5. In the process of working a Rochelle salt body, of the type which is subject to a sufficiently rapid change of dimension at a temperature approximately two degree centigrade below normal room temperature to cause breakage thereof, by means of a tool which when in use tends to lower the temperature of the Rochelle salt body more than two degrees centigrade, the method of preventing breakage of the Rochelle salt body during working due to a change of dimension which comprises starting the working process with the temperature of the Rochelle salt body approximately at normal room temperature and applying sufficient heat to the Rochelle salt body during the working process to prevent the temperature thereof being lowered as much as two degrees centigrade by the action of said tool.

6. In the process of working a Rochelle salt body, of the type which is subject to a sufficiently rapid change of dimension at a temperature approximately two degrees centigrade below normal room temperature to cause breakage thereof, by means of a tool which when in use tends to lower the temperature of the Rochelle salt body more than two degrees centigrade, the method of preventing breakage of the Rochelle salt body during working due to a change of dimension which comprises starting the working process with the temperature of the Rochelle salt body approximately at normal room temperature and heating said tool and applying sufficient heat therefrom to said Rochelle salt body during the working process to prevent the temperature thereof being lowered as much as two degrees centigrade by the action of said tool.

CARL A. BIELING.