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TREATMENT OF FUSING QUARTZ

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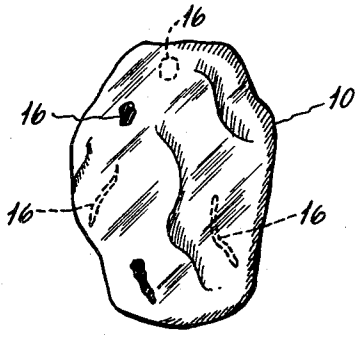



Fig. 1

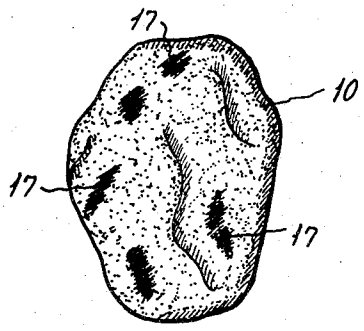



Fig. 2

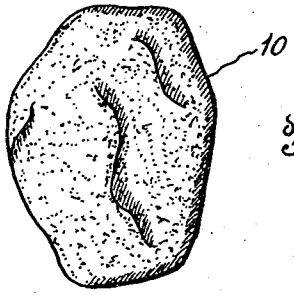



Fig. 3

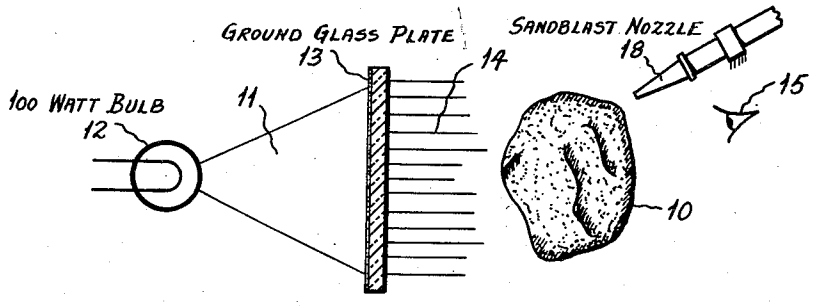



Fig. 4

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# TREATMENT OF FUSING QUARTZ

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4 Claims. (Cl. 51—282)

This invention relates to the beneficiation of quartz and is more particularly concerned with the examination and treatment of quartz crystal to remove surface and internal impurities and defects to provide high quality fusing quartz.

The fusing quartz industry uses natural quartz crystal to produce the fused quartz of the quality necessary for industrial purposes. In certain industrial grades of fused quartz, it is essential that the raw quartz used be of the highest quality containing no impurities. Products such as delay lines, optical lens and prism combinations, necessitate a careful selection of raw material in order to obtain a pure final product. The raw material is either in pyramid or irregular form, and generally contains many surface incrustations, inclusions or other flaws. It has been the general practice, heretofore, to remove the impurities from the raw crystal by cobbing, or by thermal shock flaming. Both of these operations, however, are able to remove only surface impurities in the crystal, and are not effective where the impurity is deep or internal, such as occurs many times when there is an inclusion of a foreign substance running through the crystal. Such inclusions make the crystal unusable for fusing, since, to remove the inclusion or inclusions, it would generally so diminish the crystal as to be uneconomic.

In the thermal shock flaming and in the cobbing operation for removal of impurities or flaws in the crystal, a great deal of good and usable quartz is lost due to the type of operation, where the fracturing is done crudely and necessarily without precision, and the labor cost is high.

As a consequence, both of the methods generally employed are expensive and inefficient. The amount of quartz in the raw form totally unusable due to deep or internal impurities is also a large percentage of all quartz found. In addition, both of the methods employed are difficult to control and small smooth stones, whether round or faced cannot be treated by cobbing or flaming. In order to employ either of these methods, it is necessary that the operator be skilled and exercise a great deal of judgment in removing the impurities. To an extent the function of inspection and processing are combined, since the operator removing the impurities by the known methods must alternately immerse the crystal in an examining fluid to find the impurities, and then flame or cob. As a result of this difficult processing, the manufacturers of fusing quartz products must pay premium prices for the raw quartz crystals which also must be selected so as to be large in size, the proper shape for cleaning, and have the proper clarity. Generally, in the conventional treatment of quartz, the usual weight loss is from fifty (50%) per cent to seventy-five (75%) per cent of the original stone.

In accordance with the process of this invention, it is possible to produce pure quartz from a wide variety of shapes, sizes and forms of raw quartz not previously usable with a minimum of weight loss, and by operators relatively unskilled. In particular, small stones hitherto considered totally reject and unusable are now the basis



for this process and the raw material, therefore, becomes a negligible economic factor, and in unlimited supply. This process allows the quartz to be inspected visually for gross defects, internal cracks, inclusions or veils, and then worked to remove the flaws with the minimum of weight loss, and in a highly selective manner.

For a better understanding of this invention, reference is made to the drawings in which:

Figure 1 is a plan view of a quartz crystal showing typical flaws, impurities or inclusions.

Figure 2 is a plan view of the same piece of quartz shown in Figure 1, after inspection and marking.

Figure 3 is a plan view of the quartz of Figure 1, after removal of the impurities in Figures 1 and 2, and

Figure 4 is a schematic view of inspection device in plan.

In accordance with the process of this invention, a piece of quartz crystal **10**, which may be either of the conventional pyramid form having side faces, or pebble shaped is given a quick visual examination to determine whether there are gross defects or complete internal cracks or flaws. After such inspection, approximately 150 pounds of quartz pieces of which **10** is an example, are placed in a conventional sand-blast tumbler, where they are left for a period of approximately two hours, which is generally sufficient time to produce a frosted surface on each individual piece of quartz in the tumbler, and dislodge mechanically weak projections.

The frosted quartz is then removed from the tumbler and is ready for inspection. To inspect the frosted quartz a beam of light **11**, produced by an ordinary 100 watt projection bulb **12** is sent through a ground glass plate **13**. A bowl of milky water or similar means of producing a diffused beam of light may be substituted for the plate of ground glass. The quartz **10** to be inspected is then moistened in water and held in the beam of diffused light **14**, and the inspector **15** then can examine the quartz for all defects whether surface or internal. It has been found preferable that the inspector take a position at an angle to the diffused beam of light. When the beam **11** shines through the quartz **10**, the light hitting the defects in or on the quartz, projects or silhouettes them out onto the frosted surface of the quartz **10**, in the same way a shadowgraph projects upon a beaded screen. The defects **16** show up as light on a dark background, or dark on a light or milky background, depending on angle of light versus position of defect. When the defects shown in the inspection as described above have been found, they are marked by painting, or using crayon to mark the location as at **17**. It has been found helpful to differentiate the depth of the defects noted by varying the color of the marking, as a working signal to the sandblast operator.

This is an improvement over present oil or compensating liquid immersion methods, since oils, etc. are expensive, become quickly contaminated, and change their refractive index and must be constantly purified, and the quartz must be degreased afterwards.

The defects noted in the inspection, having been marked, the quartz **10** is then sandblasted. The blast from the nozzle **18**, which is preferably in fixed position removes the defects in the quartz **10** since the operator can rotate and manipulate the quartz under the blast from the nozzle, either manually or by other conventional methods. The inspection and sandblasting of individual pieces of quartz may be repeated with minimum loss of time and weight.

This method of inspecting and removing the defects of the quartz is easy to operate, and economical in its results since the losses in obtaining pure quartz for fusing vary between ten (10%) per cent and twenty-five (25%) per cent in reject classifications of quartz, as against losses of from fifty (50%) per cent to seventy-five (75%) per cent of especially selected premium priced quartz hereto-

fore required, with attendant high labor costs. It may thus be seen that the cost of fusing quartz prepared in accordance with this new method will be greatly reduced and open the field for the use of fusing quartz to a wider variety of applications, heretofore not economically feasible.

Having described my invention I claim:

1. A process for the removal of defects in raw quartz crystals consisting of sandblasting the surface of said quartz to produce a frosted surface, inspection of said quartz, marking of the defects shown by subjecting said quartz to a beam of light passing through a surface to cause said beam to diffuse, and removing the defects by sandblasting.

2. A process for purifying raw quartz crystals consisting of treating said quartz to obtain a frosted surface, subjecting said quartz to a diffused beam of light to localize defects in said quartz, marking said defects, and removing said defects by sandblasting.



3. A process for removal of defects in raw quartz crystals consisting of treating said crystals to produce a frosted outer surface, subjecting said crystal to a beam of diffused light to localize said defects, marking of the areas of said defects on the outer surface, and removing said defects by sandblasting.

4. A process for removal of defects in raw quartz crystals consisting of treating said crystals to produce a frosted surface, subjecting said crystal to a beam of diffused light to localize said defects, marking the locations of said defects, and removing said defects by sandblasting the crystal in the marked areas.

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