

Aug. 15, 1944.

J. O. LE VAN

2,355,877

PROCESSING CRYSTALLINE STRUCTURES

Filed Aug. 18, 1942

FIG. 1.

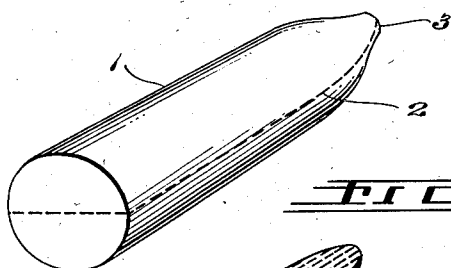


FIG. 2.

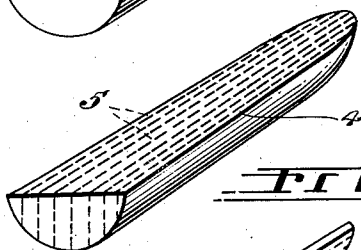


FIG. 3.

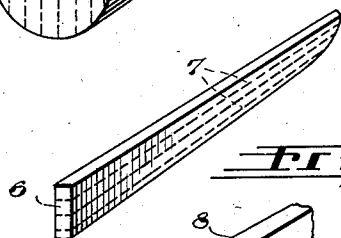


FIG. 4.

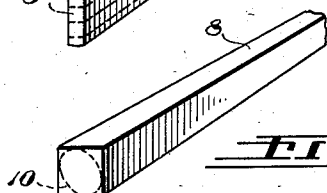


FIG. 5.

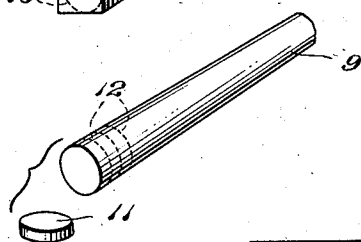


FIG. 6.



FIG. 7.



FIG. 8.

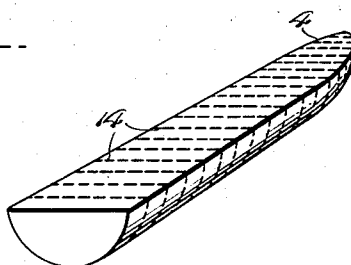


FIG. 9.

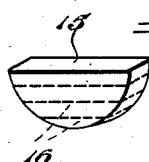


FIG. 10.

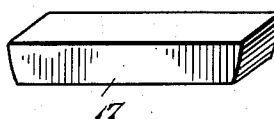
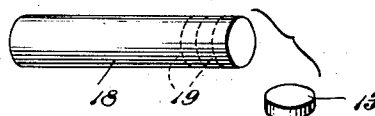


FIG. 11.



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2,355,877

PROCESSING CRYSTALLINE STRUCTURES

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Application August 18, 1942, Serial No. 455,263

1 Claim. (Cl. 125—30)

This invention is concerned with the manufacture of button-like objects of non-metallic crystalline material and has for an object the provision of a new and improved method of making same.

Another object is to provide a new and improved method of forming jewels.

Another object is to provide a time, equipment and material saving process for making jewels.

Other and further objects will be apparent from the following specification and from the drawing.

Referring to the drawing:

Fig. I represents a synthetic jewel boule with the approximate plane of first division shown as a dotted line;

Fig. II illustrates one of the approximate halves of the boule of Fig. I, showing the planes along which cuts are to be made when forming pivot jewels.

Fig. III represents one of the cut out sections from the structure of Fig. II showing the planes along which the next cuts are to be made;

Fig. IV represents one of the cut out sections from the structure of Fig. III;

Fig. V illustrates the section of Fig. IV with the corners removed, with one transverse section cut off and with lines indicating the planes of further cut offs;

Fig. VI illustrates the next operation on each cut off section from the structure of Fig. V, with the dotted lines indicating by their inclosure the outline of the section at the end of the operation;

Fig. VII illustrates the next operation after that of Fig. VI, in which the section is formed to accurate peripheral contour, usually circular;

Fig. VIII represents a boule section like that of Fig. II, showing the planes along which cuts are to be made when forming end jewels;

Fig. IX represents a section cut from the structure of Fig. VIII, showing the planes of the next cuts to be made and is comparable to Fig. III;

Fig. X represents a stick section as cut from the structure of Fig. IX and is comparable to Fig. IV; and

Fig. XI represents the stick of Fig. X with the corners removed, with one transverse section cut off and with indications of the planes of further cut offs. This figure is comparable to Fig. V.

A customary method of forming jewels for timepiece or instrument bearing jewels or for similar uses has been to form a substantially square or other flat sided block, to remove the corners of the block and then form a curved,

usually substantially circular peripheral contour on the block.

This method had many disadvantages, particularly in that the corner removing operation was time consuming and expensive and tended to cause breakage beyond the necessary corner removal. It also necessitated, because of the thicknesses involved, the use of individual and relatively heavy and thick saws or cutters, causing substantial loss of valuable material in the form of unusable scrap fragments and powder.

This invention is directed to a new, useful, time, equipment and money saving method which obviates the above disadvantages particularly in that the time and money consuming operation of removing corners from individual blocks is avoided by first removing the corners from an elongated flat sided stick of jewel material and thereafter cutting already peripherally rounded blocks from the stick. Since the rounded stick presents less thickness than has been met in the prior art process, thinner cutters may be used and in such multiples as would be impractical in thicker, more unwieldy saws. Also by cutting the original block or synthetic boule into long flat sided sticks, the scrap fragments are relatively long in at least one direction, and may often be salvaged, at least in part, for small jewels. Using a thin cutter is also saving in that loss in the form of cut out material is substantially reduced.

A boule, or crystal of non-metallic synthetic material, as illustrated in Fig. I, is the starting point. Such boules are customarily made in single crystal form for processing into timepiece or instrument bearing jewels. The material may be, for example, aluminum oxide to form a colorless jewel, or aluminum oxide plus a coloring material such as chromium oxide to give it a red color. Other coloring materials may readily be used to provide any one of a variety of colors.

Such boules have a natural longitudinally central plane of division. The boule is substantially of cylindrical contour, tapering to a point at one end.

The natural plane of division of boule 1 is indicated by dotted line 2. The first step of the process is to break off the tapered end 3 of the boule. This action splits the boule substantially in half along its natural plane of division. One of the halves is shown in Fig. II as 4.

From this point on there are two possible groups of steps which may be used, both of which are representative of this invention.

One group, as illustrated in Figs. II through IV, is used to produce pivot jewels, and the other

group, Figs VIII through X, is used to produce end jewels. The finishing operations, of Figs. V and XI are the same, and the operations of Figs. VI and VII are common to both procedures.

Pivot jewels are those which are finally formed with an opening in which the end of a shaft is adapted to rotate as in a bearing. Endstones or end jewels are those on one surface of which the end of a shaft is to rest and rotate. Thus by changing the direction of the cuts as shown by the differences of Figs. II and VIII, the same planes of greatest strength are presented to the best advantage in both instances.

In the first group of steps, the pivot jewel group, the half boule 4 is cut, usually with a circular diamond charged saw, longitudinally along the planes indicated by dotted lines 5 to form several substantially rectangular sections such as the one illustrated as 6 in Fig. III. Such scrap sections as are formed by the original outer surface pieces during this cutting operation are long in at least one direction and frequently can be salvaged to make smaller or thinner jewels.

Each of the sections 6 are then cut, again by a diamond charged circular saw, along the plane lines 7 to form jewel sticks of substantially square cross section. One of these is indicated as 8, Fig. IV.

Each of the sticks 8 is processed to form a substantially cylindrical stick, as 9, Fig. V. This processing may be accomplished by a suitable rattling device or by grinding the stick in a centerless grinder or by other similarly suitable methods. The end outline of that portion of stick 8 which is to become stick 9 is represented by dotted line 10, Fig. IV.

The substantially cylindrical stick 9 is then transversely cut to length in the form of buttons like 11 along plane lines 12. A stick like 9 presents less material to be cut in such a transverse cutting operation than is encountered in the prior art method of cutting off so that thinner and lighter saws and a plurality of saws simultaneously cutting, may be used.

The prior art method may be understood by reference to Figs. VIII, IX and X. The cuts

shown in these views are the same as those of the prior art, and in addition, the sticks like that of Fig. X were cut transversely to form individual square blocks instead of discs like those of this invention represented by 11, Fig. V, and 13, Fig. XI. The greater amount of material thus presented by the square formation required stronger and thicker saws for this operation which is comparable to the cut off of this invention as illustrated in Figs. V and XI with consequent considerable loss of material from saw cuts.

After the cutting off operation of this invention as illustrated in Fig. V or XI, each button or disc 11 or 13 is surfaced on the flat sides as shown in Fig. VI and peripherally, as shown in Fig. VII.

The endstone process, illustrated in Figs. VIII through XI utilizes the same steps, types of cutting actions and tools, as does the pivot jewel process except that the cuts are made through the material at right angles to the cuts made for the pivot jewels. This action presents the same planes of strength in the finished endstone jewel to the same advantage as they are presented in the finished pivot jewel since the direction of wearing force applied to the pivot jewel is at right angles to that applied to the endstone jewel.

In Fig. VIII, the half boule 4 is the same as that in Fig. II, and the cuts 14 correspond to cuts 5 in Fig. II. In Fig. IX the section 15 corresponds to section 6 of Fig. III, and cuts 16 correspond to cuts 7. In Fig. X, stick 17 corresponds to stick 8 of Fig. IV, and in Fig. XI cylinder 18, cuts 19 and button 13 correspond to cylinder 9, cuts 12, and button 11 of Fig. V.

Having described my invention, I claim:

A method of making watch jewels from boules comprising splitting a boule lengthwise substantially along the crystallographic axis, cutting the half boule so that the plane of cut is normal to the plane of split to form a slab, cutting said slabs in a plane normal to the plane of the first cut to form sticks, rounding the edges of said sticks to form cylinders, and cutting said cylinders normal to the longitudinal axis to form roundels.

JAMES OLIVER LE VAN.