

PATENT SPECIFICATION

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(54) IMPROVEMENTS RELATING TO GEM STONES

(71) We, SPECTRUM DIAMONDS (PROPRIETARY) LIMITED, a South African Company, of 44 Main Street, Johannesburg, South Africa, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to faceting gem stones, particularly diamonds.

The invention consists in a method of faceting a bruted gem stone held in a pot provided with a surrounding guide ring comprising forming a plurality of facets by polishing on a polishing surface and terminating the polishing of each facet when the ring contacts the polishing surface.

The invention also consists in a method of faceting a bruted gem stone held in a pot provided with a surrounding guide ring comprising forming a pair of touching facets common to the stone and pot by polishing on a polishing surface using the ring as a datum to terminate the polishing of each facet when the ring contacts the polishing surface in such a manner that the stone touching pot is provided with a sharp upper edge with a projecting peak between the facets, and then forming a further facet on the stone between the original facets by polishing away part of the original facets and using the projecting peak on the pot as a datum for terminating the polishing of said further facet when the peak contacts the polishing surface.

The invention also consists in a method of faceting a bruted gem stone held in a pot provided with a surrounding guide ring comprising forming a first series of touching facets around the stone and pot by polishing each facet on a polishing surface at the same polishing angle and terminating the polishing of each facet when the ring contacts the polishing surface whereby the pot is provided with a sharp stone touching upper edge with projecting peaks between its facets, then forming a second series of

facets around the stone between its original facets removing portions of its original facets by polishing each further facet on a polishing surface at the same polishing angle, which is different to the polishing angle for the original series of facets and terminating the polishing of each further facet when one of the pot peaks joining a pair of original facets formed thereon contacts the polishing surface.

The invention still further consists in a gem stone faceted by a method as set out in any of the three preceding paragraphs.

The invention will now be described by way of an example with reference to the drawings accompanying the Provisional Specification, showing the formation of the 24 bottom facets of a full cut diamond.

In the drawings:—

Figs. 1 and 2 are plan views of a diamond showing, respectively, the two stages of forming the 24 bottom facets according to a conventional method of diamond polishing.

Figs. 3 and 4 are plan views of a diamond held in a pot showing, respectively, the two stages of forming the 24 bottom facets according to the invention, and

Fig. 5 is a sectional view of the front end of a holder with a gem carrying pot positioned therein ready for polishing by a method according to the invention.

In the conventional technique, first, as shown in Fig. 1, the eight main facets 1 to 8 are formed by polishing with the stone held against a polishing surface at the required angle for these facets, these facets being formed alternately on opposite sides of the stone to obtain the correct balance. For example, first facet 1 would be polished then facet 5, then facet 7, then facet 3 and so on. After the main facets 1 to 8 are formed the sixteen "halves" 9 to 24 are polished (see Fig. 2) by steepening the angle of polishing about 1 degree to an angle suitable for the halves.

In a method according to the invention however, it is possible to first form the six-

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teen halves 1a to 16a in succession around the stone, by polishing each at its required angle (see Fig. 3) and then to form the eight main facets 17a to 24a (see Fig. 4) in succession around the stone by changing the polishing angle it will be seen that the resultant faceting is the same as in the conventional method.

In carrying out the method according to the invention, a bruted stone is first inserted into a conventional metal press pot *a* (see Fig. 5) of elongated pear shape with a stone holding cavity at its front end, the pot wall around the cavity being axially slit to provide a circumferential series of radially sprung stonegripping fingers *b*, *c*, *d*. The stone is gripped in the fingers around its girdle section so that the bottom of the stone projects from the pot as shown, for polishing.

The pot is pre-inserted in the front end of an elongate holder *e*. At the front end, the holder provides a pot holding cavity *f* surrounded by an inner metal sleeve *g*, an insulating sleeve *h* and an outer metal sleeve *j*. A bore through the length of the holder (not shown) communicates with the front cavity *f*, and a tight fitting axially slidable surrounding metal guide ring *k* is provided.

When the pot is gripped in the holder, it is necessary to set the ring *k* at a suitable lengthwise position along the holder so that its rim *l* can be used as a guide for terminating polishing of the 16 halves facets. The subtended angle α between an imaginary pair of lines *X* and *Y* would be about 98 degrees. The position of the pot and holder is adjusted so that lines *X* and *Y* run through the edge portions *m* of the stone and the edge portions *n* of the pot. Then, the ring *k* is adjusted so that the outside of its rim *l* just touches lines *X* and *Y*. This arrangement ensures that when the halves are polished on a polishing surface with the pot axis inclined to the surface at an angle $\frac{1}{2}\alpha$, portions *m* of the stone and *n* of the pot will be polished away before the ring *k* contacts the polishing surface. In this manner, when the halves 1a to 16a are polished a series of facets 1b to 16b will also be formed around the pot, and the pot will acquire a sharp scalloped stone touching edge with peaks such as A1, A2, A3, A4 between the facets (see Fig. 3). It is desirable that the pot and ring be initially relatively positioned so that during polishing a sufficient amount of the pot will be removed to ensure that it is provided with a sharp stone touching scalloped upper edge.

When the holder ring has been set, the holder is placed in the chuck of a polishing machine in which the chuck is carried at the end of a tang or bar mounted adjacent a horizontal polishing wheel for vertical

movement towards and away from the wheel surface and horizontal reciprocation across the surface for zoning purposes. The arm may be fulcrumed at its rear end for pivotal vertical movements toward and away from the wheel surface, or it may be mounted in guides for translating vertical movements. In either case, it is preferred to provide a dashpot and mercury column control system for controlling movements of the arm onto the wheel surface.

The chuck is mounted for rotational movement about its axis so that different facets can be presented to the wheel, and for orbital motion about a vertical axis so that, if necessary, the direction of polishing for a particular facet can be adjusted. The chuck axis is itself adjustable for inclination so that the required angle can be established first for the 16 halves and then for the eight main facets.

The machine may have an electric control system including means for automatically lifting the chuck off the wheel when the pot or outer ring contacts the wheel and means for indexing the chuck about its axis in 22½ degree steps for polishing the 16 halves, and then in 45 degree steps, offset by 11½ degrees from the 22½ degree steps, for polishing the 8 main facets. In a machine having such a control circuit polishing is effected in the following manner.

The chuck axis is set at the angle required for polishing the halves, and the machine is set in operation. The arm lowers onto the rotating wheel surface and commences polishing the first half facet, say 1a. When portion *m* of this facet and portion *n* of the pot have been polished away, the ring lip *l* comes into contact with the wheel surface. This causes an electric circuit to be completed through the wheel, ring and holder signalling a control to lift the arm off the wheel, index the chuck one 22½ degree step about its axis and again lower the arm towards the wheel for polishing the next facet 2a. (It should be noted that during the faceting of the halves, no electric circuit is established through the wheel and holder when the pot contacts the wheel surface, because the pot is insulated from the holder by sleeve *h*.)

The faceting of the halves and the pot thus proceeds until the complete ring of the 16 facets, as shown in Fig. 3, is completed.

Then, an electrical connection is established between the pot and the holder, for example through the bore in the holder, and the inclination of the chuck axis is adjusted to that required for polishing the 8 main facets.

Polishing again commences along line B say to produce main facet 17a. This polishing proceeds until peak A2 formed on the

pot during the faceting of the halves contacts the polishing surface. Then an electric circuit is established through the wheel, pot and holder signalling the control system to lift the arm, rotate the chuck through 45 degrees about its axis and again lower the arm so that polishing commences along line C to produce facet 18a. This again proceeds until peak A4 of the pot contacts the wheel when the procedure is repeated. In this manner, the complete ring of main facets is formed.

Whilst the method according to the invention has been described above as being effected automatically using an electric control system to terminate the polishing of each facet, it is to be understood that the method according to the invention is not dependent on such a system and could be performed manually by visual inspection of each facet or semi-automatically using an electric control only to give an indication when the outer holder ring *l* or the pot *r* contacts the polishing surface by establishment of an electric conducting path.

WHAT WE CLAIM IS:—

1. A method of faceting a bruted gem stone held in a pot provided with a surrounding guide ring comprising forming a plurality of facets by polishing on a polishing surface and terminating the polishing of each facet when the ring contacts the polishing surface.

2. A method of faceting a bruted gem stone held in a pot provided with a surrounding guide ring comprising forming a pair of touching facets common to the stone and pot by polishing on a polishing surface using the ring as a datum to terminate the polishing of each facet when the ring contacts the polishing surfaces in such a manner that the stone touching the pot is provided with a sharp upper edge with a projecting peak between the facets, and then forming a further facet on the stone between the original facets by polishing away part of the original facets and using the projecting peak on the pot as a datum for terminating the polishing of said further facet when the peak contacts the polishing surface.

3. A method of faceting a bruted gem stone held in a pot provided with a surrounding guide ring comprising forming a

first series of touching facets around the stone and pot by polishing each facet on a polishing surface at the same polishing angle and terminating the polishing of each facet when the ring contacts the polishing surface whereby the pot is provided with a sharp stone touching upper edge with projecting peaks between its facets, then forming a second series of facets around the stone between its original facets removing portions of its original facets by polishing each further facet on a polishing surface at the same polishing angle which is different to the polishing angle for the original series of facets and terminating the polishing of each further facet when one of the pot peaks joining a pair of original facets formed thereon contacts the polishing surface.

4. The method of claim 3, wherein adjacent facets of the first series are formed successively around the stone by indexing the stone about its axis in rotational steps each of 360° divided by the number of facets required in the first series between each faceting operation.

5. The method of claim 3, wherein an electrical conducting path is established between the ring and the polishing surface when the ring touches the surface during the polishing of each facet of the first series to indicate when polishing of the facet should be terminated, the pot being electrically insulated from the ring during polishing of the first series of facets.

6. The method of claim 5, wherein an electrical conducting path is established between the pot and the polishing surface when the pot touches the surface during the polishing of each facet of the second series to indicate when polishing of the facet should be terminated.

7. A gem stone faceted by a method as claimed in any of the preceding claims.

8. A method of faceting a gem stone substantially as herein described with reference to Figs. 3, 4 and 5 of the accompanying drawings.

9. A gem stone faceted substantially as herein described with reference to Figs. 3, 4 and 5 of the accompanying drawings.

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pot during the faceting of the halves contacts the polishing surface. Then an electric circuit is established through the wheel, pot and holder signalling the control system to lift the arm, rotate the chuck through 45 degrees about its axis and again lower the arm so that polishing commences along line C to produce facet 18a. This again proceeds until peak A4 of the pot contacts the wheel when the procedure is repeated. In this manner, the complete ring of main facets is formed.

Whilst the method according to the invention has been described above as being effected automatically using an electric control system to terminate the polishing of each facet, it is to be understood that the method according to the invention is not dependent on such a system and could be performed manually by visual inspection of each facet or semi-automatically using an electric control only to give an indication when the outer holder ring 1 or the pot 2 contacts the polishing surface by establishment of an electric conducting path.

WHAT WE CLAIM IS:—

1. A method of faceting a bruted gem stone held in a pot provided with a surrounding guide ring comprising forming a plurality of facets by polishing on a polishing surface and terminating the polishing of each facet when the ring contacts the polishing surface.

2. A method of faceting a bruted gem stone held in a pot provided with a surrounding guide ring comprising forming a pair of touching facets common to the stone and pot by polishing on a polishing surface using the ring as a datum to terminate the polishing of each facet when the ring contacts the polishing surfaces in such a manner that the stone touching the pot is provided with a sharp upper edge with a projecting peak between the facets, and then forming a further facet on the stone between the original facets by polishing away part of the original facets and using the projecting peak on the pot as a datum for terminating the polishing of said further facet when the peak contacts the polishing surface.

3. A method of faceting a bruted gem stone held in a pot provided with a surrounding guide ring comprising forming a

first series of touching facets around the stone and pot by polishing each facet on a polishing surface at the same polishing angle and terminating the polishing of each facet when the ring contacts the polishing surface whereby the pot is provided with a sharp stone touching upper edge with projecting peaks between its facets, then forming a second series of facets around the stone between its original facets removing portions of its original facets by polishing each further facet on a polishing surface at the same polishing angle which is different to the polishing angle for the original series of facets and terminating the polishing of each further facet when one of the pot peaks joining a pair of original facets formed thereon contacts the polishing surface.

4. The method of claim 3, wherein adjacent facets of the first series are formed successively around the stone by indexing the stone about its axis in rotational steps each of 360° divided by the number of facets required in the first series between each faceting operation.

5. The method of claim 3, wherein an electrical conducting path is established between the ring and the polishing surface when the ring touches the surface during the polishing of each facet of the first series to indicate when polishing of the facet should be terminated, the pot being electrically insulated from the ring during polishing of the first series of facets.

6. The method of claim 5, wherein an electrical conducting path is established between the pot and the polishing surface when the pot touches the surface during the polishing of each facet of the second series to indicate when polishing of the facet should be terminated.

7. A gem stone faceted by a method as claimed in any of the preceding claims.

8. A method of faceting a gem stone substantially as herein described with reference to Figs. 3, 4 and 5 of the accompanying drawings.

9. A gem stone faceted substantially as herein described with reference to Figs. 3, 4 and 5 of the accompanying drawings.

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