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(54) Abrading ultra-hard stones.

(57) A diamond compact, particularly a thermally stable diamond compact, is used to cut or kerf an ultra-hard stone, particularly a diamond stone.

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Description

ABRADING ULTRA-HARD STONES

BACKGROUND OF THE INVENTION

This invention relates to the abrading of ultra-hard stones, particularly diamond.

Diamond gem stones may be cut into a variety of shapes and sizes depending on the applications to which they are to be put. For example, thin slivers of diamond may be cut from a gem stone diamond for use as surgical blades. The cutting tool which is generally used is a phosphor-bronze disc having fine diamond particles embedded in a peripheral cutting edge. A limitation of this tool is that cutting can only be effected along certain soft planes of the diamond.

Kerfing is a process whereby a shallow groove is cut into a diamond stone. Kerfing is usually carried out using a phosphor-bronze disc as described above.

SUMMARY OF THE INVENTION

The present invention provides the use of a diamond compact in the cutting or kerfing of an ultra-hard stone, particularly a diamond stone.

Thus, the invention provides a method of cutting or kerfing an ultra-hard stone including the steps of providing a diamond compact with a cutting edge, bringing that cutting edge into contact with the ultra-hard stone and moving the cutting edge relative to the stone to cause it to kerf or cut the stone.

DESCRIPTION OF EMBODIMENTS

Diamond compacts are well known in the art and comprise a mass of diamond particles bonded into a polycrystalline hard conglomerate. The diamond content of compacts is 70 percent by volume or higher. Compacts are made under conditions of elevated temperature and pressure similar to those used to synthesise diamond.

Diamond compacts may contain a second phase which consists of or contains a diamond catalyst. Such diamond compacts are on the market and are described, for example, in US Patent Specifications Nos 3,745,623 and 4,063,909. Diamond compacts of this type are usually prone to degradation at temperatures above 750 to 800° C.

Diamond compacts are also known which are thermally stable at temperatures of 1200° C in an inert or non-oxidising atmosphere. These compacts will either have no second phase or a second phase which does not adversely affect the diamond at higher temperatures. An example of a thermally stable diamond compact which contains a second phase is one wherein the second phase consists essentially of silicon in the form of the metal and/or carbide. Thermally stable diamond compacts are described in US Patent Specifications Nos 4,224,380 and 4,534,773 and British Patent Specification No 2,158,086.

Thermally stable diamond compacts are preferred in the practice of the invention.

The polycrystalline nature of a diamond compact allows it to be used to cut or kerf a diamond stone in any direction which gives it an advantage over the known phosphor-bronze disc. Further, cooler cutting can be achieved with less risk of damage to the stone and the cutting process is not affected by imperfections in the stone.

The invention lies in the use of a diamond compact in the cutting or kerfing of an ultra-hard stone. The steps used in the cutting and kerfing of the ultra-hard stone will be the same as those conventionally used. Generally, the diamond compact will be provided in the form of a disc with a fine cutting edge. Typically this cutting edge will have a thickness of no more than 0,5 to 1 mm. The compact will be rotated, e.g. at a rotational speed of 80 to 300 rpm, and the rotating compact edge brought into contact with the ultra-hard stone and progressively moved therein. Slivers or slices can be cut off the stone or a shallow groove can be cut therein.

Claims

1. A method of cutting or kerfing an ultra-hard stone including the steps of providing a diamond compact with a cutting edge, bringing the cutting edge into contact with the stone and moving the cutting edge relative to the stone to cause it to kerf or cut the stone.

2. A method according to claim 1 wherein the ultra-hard stone is a diamond stone.

3. A method according to claim 1 or claim 2 wherein the diamond compact is thermally stable at a temperature of 1200° C in an inert or non-oxidising atmosphere.

4. A method according to any of the preceding claims wherein the cutting edge has a thickness of 0,5 to 1 mm.

5. A method according to any of the preceding claims wherein the diamond compact is in the form of a disc with the cutting edge being provided on the periphery thereof.