SUMITOMO METAL MINING COMPANY LIMITED

of (a) 11-3, 5-chome, Shinbashi, Minato-ku, Tokyo, JAPAN

I hereby apply for the grant of a (*c) Standard Patent for an invention entitled (d) "TIPS FOR BITS IN A BORING DEVICE"

which is described in the accompanying (c) provisional specification.

For Patents of Addition only.

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<th>NUMBER</th>
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For Patents of Addition (Section 72):

I/we request that the Patent maybe granted as a Patent of Addition to the Patent applied for on Application No. (a)

in the name of (b)

My/Our address for service is ARTHUR S. CAVE & CO., Patent and Trade Mark Attorneys, 1 Alfred Street, Sydney, New South Wales, Australia 2000.

28th April, 1983

Sydney

To:

Commissioner of Patents

ARTHUR S. CAVE & CO.

PATENT AND TRADE MARK ATTORNEYS

SYDNEY
PATENT DECLARATION (NON-CONVENTION)
COMMONWEALTH OF AUSTRALIA
Patents Act 1952

DECLARATION IN SUPPORT OF AN APPLICATION FOR A PATENT

In support of the Application made by (a) SUMITOMO METAL MINING CO., LTD.

for a patent for an invention entitled: (b) TIPS FOR BURRS IN A BORING DEVICE.

1. We (c) Masamichi FUJIMORI... 

of (d) c/o Sumitomo Metal Mining Co., Ltd., of 11-3, 5-chome, Shinbashi, Minato-ku, Tokyo, Japan 

do solemnly and sincerely declare as follows:—

1. I am/we are the applicant(s) for the patent.

(Or, in the case of an application by a body corporate:)

1. I am/we are authorized by (e) SUMITOMO METAL MINING CO., LTD. 

the applicant for the patent to make this declaration on its behalf.

2. I am/we are the actual inventor(s) of the invention.

(Or, where a person other than the inventor is the applicant.)

2. (f) SHO TAKANO...

of (g) 657, Chibakuro, Narita City, Chiba Prefecture, Japan

is/are the actual inventor(s) of the invention and the facts upon which the applicant(s) is/are entitled to make the application are as follows:— (h)

The applicant is the assignee of the invention from the said invention.

Declared at Tokyo this 10th day of February 1986.

To: The Commissioner of Patents

SUMITOMO METAL MINING CO., LTD.
Masamichi FUJIMORI, President

ARTHUR S. CAVE & CO.
PATENT AND TRADE MARK ATTORNEYS
SYDNEY
1. A rotary bit for a cutter of the kind comprising a cutter body having two or three cutter branches on each of which a rotary bit is mounted for rotation about an axis inclined relative to the axis of the cutter body, the rotary bit including a tip secured to an outer surface of the bit comprising a body of hard metal and, embedded in the body, a diamond compact exposed along the crest of an outer surface extending across the full width of the body at one end thereof.
COMPLETE SPECIFICATION

FOR OFFICE USE

Short Title:

Int. Cl:

Application Number: 14070/83

Lodged:

Complete Specification Lodged:

Accepted:

Lapsed:

Published:

Priority:

Related Art:

TO BE COMPLETED BY APPLICANT

Name of Applicant: SUMITOMO METAL MINING COMPANY LIMITED

Address of Applicant: 11-3, 5-chome, Shinbashi, Minato-ku, Tokyo, JAPAN

Actual Inventor: Sho TAKANO

Address for Service: ARTHUR S. CAVE & CO., Patent and Trade Mark Attorneys, 1 Alfred Street, Sydney, New South Wales, Australia, 2000.

Complete Specification for the invention entitled:

"TIPS FOR BITS IN A BORING DEVICE"

The following statement is a full description of this invention, including the best method of performing it known to me:-
TIPS FOR BITS IN A BORING DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention:

This invention relates to tips for bits or cutters in a boring device which is used for drilling a deep hole such as an oil well, in the ground, or obtaining a geological sample of the soil for a survey of the strata under the ground.

2. Description of the Prior Art:

Bits of the type to which this invention relates are shown by way of example in FIGURE 1, the bits of which having been in the commercial market by Smith Tools Company, Hughes Tool Company or Varel Manufacturing Company. The bits are attached rotatably by bearings to the lower ends of two or three cutter branches projecting from a cutter body symmetrically relative to its longitudinal axis. The cutter body is adapted for connection with a drill pipe. The bits are forced through a well to carry out the drilling work. As a strong impact and a heavy friction are applied to tip blades on the bits, the heat of friction is accumulated in the bits. Therefore, water is supplied to the bits through the drill pipe to remove the heat therefrom. The borings are discharged through the space between the outer surface of the drill pipe and the bore wall.

FIGURE 2 shows a tip secured to the shank of a bit, and having a blade which cuts the wall of a bore.
or its bottom 8. The blade 7 has a ridge 9 which is subjected to a heavy friction as it is urged against the bottom 8 of the bore by the pressure transmitted from a source on the ground.

The conventional tips are made of a hard metal obtained by sintering a mixture of a powder of hard particles such as of tungsten or titanium carbide with a powder of a metal of the iron group such as nickel or cobalt, or such an alloy in which diamond particles are dispersed, or diamond particles per se. The hard metal is tough, since it has a structure in which the hard particles are bonded together by the binder metal such as nickel or cobalt, but it is inferior to diamond in hardness. Diamond is hard, but low in impact resistance. The harder the material, the higher it is in wear resistance. The wear of the hard metal starts to occur in the binder metal, whether it may contain diamond particles or not, and its chipping becomes serious with the separation of hard particles. The application of an impact to diamond gives rise to its gradual chipping.

**SUMMARY OF THE INVENTION**

It is an object of this invention to eliminate the drawbacks of the prior art and provide an improved tip for a bit in a boring device. This object is attained by a tip which comprises a body made of a hard metal, and a man-made diamond compact embedded in the body so that it may be exposed along the top of a ridge and along the entire length of the ridge.
BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a longitudinal sectional view of a conventional bit for a boring device;
FIGURE 2 is an enlarged view taken in the direction of an arrow in FIGURE 1, and showing the relationship of the bit, tip and bore wall;
FIGURES 3 to 5 show a tip embodying this invention in front elevation, side elevation and bottom plan, respectively;
FIGURES 6 to 8 show another tip embodying this invention in front elevation, side elevation and bottom plan, respectively;
FIGURE 9 is a side elevational view of the diamond compact employed in the tip shown in FIGURES 6 to 8;
FIGURE 10 is a bottom plan view of still another tip embodying this invention;
FIGURE 11 is a side elevational view of the diamond compact employed in the tip shown in FIGURE 10; and
FIGURES 12 and 13 are bottom plan views of further embodiments of this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIGURES 3 to 5 of the drawings, a tip 6 embodying this invention comprises a generally cylindrical body 10 formed from a hard metal, and having a symmetrical roof-shaped end which defines a ridge 9 in its center. The hard metal is of the type which has hereinbefore been described. A generally T-shaped diamond compact
11 is embedded in the roof-shaped end of the body 10, and exposed in a blade 7 and along the entire length of the ridge 9.

Referring to FIGURES 6 to 9, a tip 6 according to another embodiment of this invention comprises a generally cylindrical body 10 formed from a hard metal, and having a spherical end surface. A diamond compact 11 is embedded diametrically in the spherical end of the body 10, and exposed in such a way that it may form a straight line when viewed in bottom plan, as shown in FIGURE 8. The diamond compact 11 is a part-circular member as shown in FIGURE 9, and has a radius which is equal to that of the spherical surface of the body 10, so that it may not project therefrom.

In practice, a plurality of these tips are attached to the shank of a bit in such a manner that their diamond compacts 11 may lie in parallel to the direction of rotation of the bit.

Different forms of tips embodying this invention are shown in FIGURES 10 to 13. The bore drilled by the bit does not always have a flat bottom surface. If the bore has a stepped bottom surface, some of the tips are required to cut a vertical surface of a stepped portion. In such a case, the body 10 of the tip is likely to get worn by friction if the diamond compact 11 is provided only along the ridge 9. This problem is solved by the tips shown in
FIGURES 10 to 13. The tip 6 shown in FIGURE 10 has additional diamond compacts 12 embedded in the hard metal at right angles to the diamond compact 11. The diamond compacts 12 are shown in side elevation in FIGURE 11. FIGURES 12 and 13 show a greater number of additional diamond compacts 12 which are radially disposed.

According to this invention, a diamond compact or compacts are embedded when the body is made of the powder of the hard metal, and the assembly is sintered in a customary way.

According to the tip of this invention, the heavy friction to which the blade 7 and the ridge 9 are subjected as a result of the pressure being applied therethrough to the bottom of the bore being drilled is borne by the diamond compact 11, or compacts 11 and 12 so that the hard metal body 10 may be protected against any substantial wear. The hard metal body 10 is sufficiently tough to absorb any impact arising during the drilling operation to protect the diamond compact or compacts 11 and 12. The tip of this invention, therefore, has a longer life than any conventional tip. The tip of this invention is particularly beneficial for use in a bit area having a relatively small radius of rotation where the tip is subjected to a friction rather than an impact.
additional light angles are shown which are projected or powder on a heavy surface subjected enough to the dia- grammatic wear. This absorb any contact the conventional artificial us of either
The claims defining the invention are as follows:

1. A rotary bit for a cutter of the kind comprising a cutter body having two or three cutter branches on each of which a rotary bit is mounted for rotation about an inclined relative to an axis of the cutter body, the rotary bit including a tip secured to an outer surface of the bit and comprising a body of hard metal and, embedded in the body, a diamond compact exposed along the crest of an outer surface extending across the full width of the body at one end thereof.

2. A bit according to claim 1, wherein the diamond compact is exposed in a straight line along the crest.

3. A bit according to claim 2, further including a pair of additional diamond compacts disposed at right angles to the first mentioned diamond compact.

4. A bit according to claim 2, further including a plurality of additional diamond compacts disposed radially relative to the first mentioned diamond compact.

5. A bit according to claim 1, wherein the diamond compact is generally T-shaped.

6. A bit according to claim 1, wherein the body is made of powdered metal, the diamond compact being embedded in the body prior to sintering thereof.

7. A rotary bit for a branched cutter, constructed and arranged substantially as hereinbefore described with reference to and as illustrated in Figures 3 to 13 of the accompanying drawings.

DATED this 5th day of May 1986.

SUMITOMO METAL MINING CO. LTD
By Its Patent Attorneys
ARTHUR S. CAVE & CO.
FIG. 8

FIG. 9

FIG. 10

FIG. 11

FIG. 12

FIG. 13