Paper No. 27

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte STEPHEN G. SOUTHLAND

Appeal No. 1999-2010
Application No. 08/684,635

ON BRIEF

Before BARRETT, FLEMING, and LALL, Administrative Patent Judges

LALL, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134 from the Examiner's final rejection[1] of claims 1 to 10, 15 to 18, 20 to 31 33 and 35. Claims 11 to 14, 19, 32, 34 and 36 have been indicated by the examiner to contain allowable subject matter.

[1]Several amendments after the final rejections were filed, see paper nos. 12, 15 and 22. However, the claims on appeal have not been amended.

The invention is directed to a new manufacturing technique for making the bodies of drag bits for drilling rock formations.

Most of these bits comprise steel or cemented tungsten carbide bodies in which are molten natural diamond or cutter inserts having a layer of polycrystalline diamond. Even the smallest of these bits have price tags which may exceed $100,000 each. Any improvement in the cost of such bits is highly desirable. The invention concerns a manufacturing technique by which the cost of the bodies in which the diamonds or diamond inserts are mounted can be reduced. Typically, the manufacture of these bits involves a lot of cutting and machining. It is not unusual in some bit designs to remove more metal from the original bar than is left in the final bit body. Such extensive machining is costly. According to this invention, instead of controlling an NC (numerical control) milling machine, a CAD file is used to control a rapid prototyping apparatus. This is used to build, layer by layer, a plastic body having the shape of a desired steel drill bit body. A minimal amount of hand finishing may be required in some

locations, but the rapid prototyping technique produces very near net shape products. Such a replica of a bit body can be produced in a stable plastic. One then forms a somewhat flexible rubber layer on the plastic body to have an internal surface complementary to the plastic bit replica. The rubber layer is peeled off and used as a mold to receive a liquid wax which solidifies to form a replica of a bit body. Once again the rubber mold is removed and the wax replica is then used in a more or less conventional lost wax technique for producing a mold cavity for sand casting or the like. Molten steel cast into the lost wax cavity produces a bit body requiring very little cleanup before the polycrystalline diamond inserts are brazed into place. Most of the hand labor of making a mold for a bit is thus eliminated. A further understanding of the invention is obtained by the following claim:

> 1. A method for making an earth boring bit having cutting elements comprising the steps of:
>
> determining a bit body geometry desired for drilling a specific earth formation;

generating a computer aided design of the bit body geometry;

employing an automated layering device for constructing a mold based on the computer aided design;

forming a bit body in the mold having the desired geometry as a complement to the mold; and

mounting cutting elements on the bit body.

The examiner relies upon the following references:

Southland	4,852,671	Aug. 01, 1989
Smith	5,544,550 (filed May 09, 1995)	Aug. 13, 1996

Claims 1 to 10, 15 to 18, 20 to 31, 33 and 35 stand rejected under 35 U.S.C. § 103 as being unpatentable over Smith in view of Southland.

Rather than repeat the arguments of appellant and the examiner, we make reference to the briefs[2] and the answer for the respective details thereof.

OPINION

[2] A reply brief was filed as paper no. 25 and entered into the record. The examiner filed no further response.

We have considered the rejections advanced by the examiner and the supporting arguments. We have, likewise, reviewed the appellant's arguments set forth in the briefs.

We reverse.

In our analysis, we are guided by the general proposition that in an appeal involving a rejection under 35 U.S.C. § 103, an

examiner is under a burden to make out a prima facie case of obviousness. If that burden is met, the burden of going forward then shifts to the applicant to overcome the prima facie case

with argument and/or evidence. Obviousness is then determined on the basis of the evidence as a whole and the relative persua-siveness of the arguments. See In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992).

ANALYSIS

We begin our analysis with independent claim 1.

On page 4 of the examiner's answer, the examiner explains the manner in which claim 1 is rejected over Smith and Southland. Among other things, the examiner contends, id,

that Smith shows "generating a computer aided design of the bit body geometry . . . ; forming an automated layering device for constructing a mold based on the computer aided design . . . ". At the same time, the examiner states, id, that "[h]owever, Southland, teaches a preparation and a use of molds . . . to provide an improved drilling and provide recess for the cutting elements." Appellant argues, brief at page 9 and 10, that

> [C]olumn 4, lines 9-13 [of Smith state] that "a drill bit may be fabricated directly from the CAD-generated solid model without the necessi1y of designing and fabricating molds and without the delicate, artistic hand labor currently required by bit details." (Emphasis added.)
>
> Applicant's process on the other hand expressly throughout the description and claims relates to a method for making molds in which rock drill bodies are cast.

Appellant also argues, id at page 9, that "[t]he Southland patent concerns the polycrystalline diamond cutting elements themselves and is specifically concerned with how the cutting elements are cooled. There is no description whatsoever about how a rock bit body is made and nothing about the preparation and use of molds." The examiner, in the "Response to Argument" section on page 9 of the answer, disagrees with

appellant by merely reciting columns and line numbers from the Smith and Southland patents.

First, we note the inconsistency in the examiner's position. The examiner alleges that the Smith patent shows the use of molds in the manufacture of a drill bit, however, at the same time, the examiner suggests using Southland for the teaching of using a mold for the manufacture of a drill bit. Our own reading of the Smith patent confirms the observation made by appellant. Along the appellant's line of reasoning, we quote from Smith at column 2, lines 59 to 64 that:

> The present invention contemplates a method of fabricating matrix-type rotary bits for subterranean drilling without the need for preparation and use of molds as employed in the prior art for definition of the bit profile, including the face, nose, flank, shoulder, and gage as well as other, freer details of exterior surface topography of the bit.

That is, the Smith reference discloses the design of a bit from a CAD program fed directly into a numerically controlled machine to manufacture the bit without having to first make a mold and then manufacture the prototype. We also agree with

appellant that Southland has nothing to do with the use of a mold in any part of the manufacturing of a bit of any kind. The Southland patent is related to diamond cutting elements and the manner in which a cutting disc carrying the elements comprises a relief formed in an outer peripheral edge of the substrate of the disc to form a pair of cutting points separated by the relief, and the stud of the disc includes a channel aligned with the relief for conducting fluid to the relief to cool and clean the cutting points. Therefore, Southland is directed to the cooling of a bit by having a special channel on the substrate mating with a relief within a bit, rather than the use of a mold in the manufacturing of a bit. Therefore, we do not agree with the examiner that the combination of Smith and Southland teaches the obviousness of claim 1.

The other independent claims, namely, 21, 27 and 35, contain limitations corresponding to the limitations discussed above in

regard to claim 1. Therefore, for the same rationale, we also

do not sustain the obviousness of independent claims 21, 27 and 35 over Smith and Southland. The dependent claims 2 to 10, 15 to 18, 20, 22 to 26, 28 to 31 and 33 also fall with the respective independent claims.

In conclusion, the decision of the examiner rejecting claims 1 to 10, 15 to 18, 20 to 31, 33 and 35 under 35 U.S.C. § 103 over Smith in view of Southland is reversed.

REVERSED

LEE E. BARRETT Administrative Patent Judge	)	
MICHAEL R. FLEMING Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
PARSHOTAM S. LALL Administrative Patent Judge	)	

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CHRISTIE, PARKER & HALE
P.O. BOX 7068
PASADENA, CA 91109-7068