The opinion in support of the decision being entered today was **not** written for publication and is **not** binding precedent of the Board.

Paper No. 20

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte WEI-JIUNG TSUNG

Appeal No. 2004-1530
Application No. 09/870,770

HEARD: December 12, 2004

Before FRANKFORT, STAAB, and McQUADE, Administrative Patent Judges.
STAAB, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on an appeal from the final rejection of claims 1-9, all the claims currently pending in the application.

Appellant's invention pertains to a differential gear assembly having an optimized number of gear teeth on the side gears and the pinion mate gears. A further understanding of the invention can be

derived from a reading of exemplary claim 1, which reads as follows:

1. A differential assembly comprising:

a rotatable differential case;

a pair of side gears rotatably mounted within said differential case; and

a set of spaced apart differential pinion mate gears rotatably supported by apinion shaft and drivingly engaging said side gears to allow differential rotation therebetween;

wherein a sum of a first number of teeth of any one of said side gears and a second number of teeth of any one of said pinion mate gears is less than nineteen.

As evidence of obviousness, the examiner relies upon appellant's admitted prior art (AAPA) as set forth in the application specification at page 1, line 15, through page 2, line 12; and page 6, line 14, through page 7, line 13.

Claims 1-9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over AAPA.

Reference is made to appellant's main and reply briefs (Paper Nos. 10 and 12) and to the final rejection and examiner's answer (Paper Nos. 6 and 11) for the respective positions of appellant and the examiner regarding the merits of this rejection. In addition,

appellant relies upon certain exhibits[1] appended to the main brief and the declaration of Todd Smith[2] appended to the reply brief as evidence of the state of the art at the time of appellant's invention.

Discussion

In rejecting the appealed claims under 35 U.S.C. § 103(a), the examiner correctly found that the appealed claims differ from AAPA only in the claim limitations regarding number of teeth on the side gears and the number of teeth on pinion mate gears, and in the relationships between these numbers (e.g., the sum of and/or the difference between these numbers). Regarding these limitations, the examiner takes the following position:

> Applicant has also admitted in the disclosure from line 14 of page 6 of the specification until line 13 on page 7 of the specification that it was known to one skilled in the art at the time the invention was made that gear strength for any single pitch diameter is proportional to the number of teeth. Therefore, the number of teeth on the side gear and the number of teeth on the pinion gear are both result-effective variables.

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[1]These include a publication entitled "Passenger Car Drive Axle Gear Design" by GLEASON WORKS (Exhibit A) and what appears to be excerpts from a book entitled "Handbook of Gears," pages T44-T45 (Exhibit B).

[2]The declaration in question is incorrectly identified as an affidavit. The examiner has indicated in the advisory letter mailed September 10, 2003 (Paper No. 15) that the reply brief and declaration have been entered and considered.

> It has previously been held that it is not inventive to discover optimum ranges of [sic] by routine experimentation where the general conditions of the claim are disclosed in the prior art. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). The particular variable must first be recognized as being result-effective before the determination of optimum ranges of the variables may be characterized as routine experimentation. *In re Antoine*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977). Because it has been shown that the number of teeth on any one of the side gears and the number of teeth on any one of the pinion gears are result-effective variables, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize these tooth numbers in the differential admitted to be prior art by applicant by selecting them such that: A. the sum [of] the number of teeth of the side gear and the number of teeth of the pinion mate gear is less than, or alternatively, no greater than nineteen; B. the difference between the number of teeth of the side gear and the number of teeth of the pinion mate gear is no greater than three; and C. the number of teeth of the side gear and the number of teeth of the pinion mate gear each is no greater that eleven. [Final rejection, page 3].

In the present case, appellant’s independent claims differ from AAPA in that they call for, among other things, the number of teeth on the side gear and the number of teeth on the pinion mate gear to be such that *the sum* of these numbers is either less than nineteen (claims 1 and 4) or no greater than nineteen (claims 5, 7 and 9). These limitations are consistent with appellant’s disclosure at the bottom of page 2 of the specification that the *combination* of side gear and pinion side gear should have numbers of teeth optimized to provide improved power density and reduced

size. Given appellant's purpose for selecting a *combination* of side gear and pinion mate gear, and the lack of any teaching in AAPA of selecting the number of teeth on the side gear *and* the number of teeth of the pinion mate gear so that the *combination* thereof achieves a desired result, we cannot accept the examiner's position that it would have been obvious to modify AAPA in a manner to arrive at the subject matter of appellant's independent claims. In this regard, the examiner's theory of obviousness based on the principle of discovering the optimum value of a variable does not apply here because the variable in question (i.e., the *sum* of the number of teeth on the side gear and the number of teeth on the pinion mate gear) has not been shown by the examiner to be recognized in the art as being a result effective variable. *In re Antoine,* 559 F.2d 618, 621, 195 USPQ 6, 8-9 (CCPA 1977).

In what may be termed an alternative theory of obviousness, the examiner takes Official Notice "of the fact that the relationship between the number of teeth on the side gear and the number of teeth on the pinion mate gear, whether expressed as a sum, a difference, or a ratio, determines the rate of rotation of a wheel that has lost traction" (final rejection, page 4).[3] On this

[3]In that appellant does not appear to challenge the
(continued...)

basis, the examiner concludes that "it would have been obvious to one of ordinary skill in the art to optimize the number of teeth of the pinion mate gear and the side gear in the differential admitted to be prior art such that the limitations of claims 1-9 are met" (final rejection, page 4).

This alternative theory of obviousness likewise is not well taken. It is not clear to us, and the examiner has not adequately explained, why one of ordinary skill in the art would have any interest or incentive whatsoever in selecting a combination of side gear and pinion mate gear for a differential to provide a particular rate of rotation of a wheel that has lost traction. This is especially so in that it is common practice to explicitly design differential gearing to have "limited slip" capabilities so that when a wheel losses traction, the opposite wheel does not freely spin. Thus, even in view of the examiner's taking of Official Notice, there is no teaching aside from the hindsight knowledge first gained from reading appellant's disclosure for modifying AAPA in a manner that would have resulted in the claimed

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[3](...continued)
examiner's taking of Official Notice in this regard, we accept the examiner's statement as being a fair representation of what is well-known to those of ordinary skill in the art.

subject matter. It follows that we also cannot sustain the standing rejection based on the examiner's alternative rationale.

The decision of the examiner finally rejecting the appealed claims is reversed.

REVERSED

CHARLES E. FRANKFORT Administrative Patent Judge	)	
LAWRENCE J. STAAB Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
JOHN P. McQUADE Administrative Patent Judge	)	

LJS/lp

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