UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

CALIFORNIA INSTITUTE OF TECHNOLOGY,
Patent Owner.

Case IPR2017-00701
Patent 7,421,032

PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE

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I. INTRODUCTION

Caltech's Patent Owner Response ("POR") repeats arguments that the Board has already rejected and fails to rebut Petitioner's showing that the challenged claims are unpatentable. First, Caltech mischaracterizes the teachings of the Ping, MacKay, and Divsalar references. Second, Caltech has failed to demonstrate secondary considerations of non-obviousness. Finally, Caltech mischaracterizes the testimony of Petitioner's expert, Professor Davis.

II. ARGUMENT

A. Caltech Fails to Overcome Petitioner's Showing that the Challenged Claims are Obvious

1. *Claims 1 and 4-10 are Obvious in view of Ping, MacKay, Divsalar, and Luby97*

The Petition showed that Ping in view of MacKay, Divsalar, and Luby97 renders claims 1 and 4-10 obvious. For at least five reasons, Caltech's arguments about the combination are incorrect. First, Caltech's argument rests on the proposition that, although MacKay is irregular, the uneven weights in MacKay could be limited to columns corresponding to parity bits. (POR, 18.) Caltech's premise is incorrect—MacKay does teach uneven weights for columns corresponding to information bits, which, when combined with Divsalar's repeater, discloses irregular repetition. Second, even if that proposition were true (it is not), Caltech's argument would still fail. Third, contrary to Caltech's assertions, Ping discloses an LDGM matrix. Fourth, Caltech fails to overcome Petitioner's showing that it would have been obvious to modify Ping to be a non-systematic code. Fifth, Caltech fails to show that a POSA would not have been motivated to combine the references.

i. Contrary to Caltech's argument, MacKay teaches that information bits appear in a variable number of subsets.

Caltech's suggestion that it is unclear in MacKay whether a column of the parity check matrix corresponds to an information bit or a parity bit is incorrect. (POR, 18.) To even attempt to make this argument, Caltech must ignore MacKay's actual disclosure. MacKay teaches profiles, *e.g.*, 93y, that correspond to parity check matrices. (Ex. 1102, 1450.) Those matrices have uneven column weights. For example, as shown in MacKay's Figure 2, in 93y matrices, most columns have weight three but some columns have weight nine. MacKay also teaches that codes with such parity check matrices, *i.e.*, matrices with uneven column weights, can outperform their regular counterparts. (Ex. 1165, ¶¶20-24.)[1]

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[1] After submitting his declaration, Dr. Davis relocated to Europe pursuant to a Fulbright Global Scholar Award. (Ex. 1173, ¶2.) As a result, he was unavailable to work on the Reply. (*Id.*) Petitioner's Reply is instead supported by the Declaration of Dr. Frey.

Caltech only attempts to contend that the correspondence between information bits and the columns of a parity check matrix may be unclear in ***some*** of MacKay's parity check matrices (*e.g.*, profile 93y). Caltech does not (and cannot) dispute that this correspondence is perfectly clear in other disclosed matrices (*e.g.*, profile 193y). In particular, in Figures 5 and 6, MacKay states that the first K columns (all columns to the left of the diagonal) correspond to information bits. (Ex. 1102, 1452 ("Bits t_1 … t_K are defined to be source bits."); Ex. 2038, 269:2-12.) As shown in profile 193y, some of these information bits correspond to columns with weight nine and others correspond to columns with weight three, *i.e.*, some information bits appear in nine subsets and others appear in three subsets. MacKay's Figures 5 and 6 thus clearly teach that information bits appear in a variable number of subsets, which results in some information bits contributing to more parity bits than others.[2] Using those weightings in Ping results in information bits appearing in variable numbers of subsets (*i.e.*, either nine or three) as claimed. (Ex. 1165, ¶¶20-24.)

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[2] Also, as explained below, repeating some information bits more than others was, in view of Divsalar, an obvious way to implement having some information bits contribute to more parity bits than others.

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