Trials@uspto.gov
571-272-7822

Paper 42
Entered: September 14, 2020

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

UNIFIED PATENTS, LLC,
Petitioner,

v.

KOREAN ADVANCED INSTITUTE OF SCIENCE AND TECHNOLOGY, KOREAN BROADCASTING SYSTEM, and HEVC ADVANCE LLC,
Patent Owner.

IPR2019-00725
Patent 9,838,720 B2

Before DENISE M. POTHIER, TREVOR M. JEFFERSON, and SHEILA F. McSHANE, *Administrative Patent Judges.*

POTHIER, *Administrative Patent Judge.*

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. Background and Summary

Unified Patents, LLC ("Petitioner") filed a Corrected Petition[1] (Paper 10, "Pet.") requesting institution of an *inter partes* review of claims 1–6 ("the challenged claims") of U.S. Patent No. 9,838,720 B2 (Ex. 1001, "the '720 patent"). Korean Advanced Institute of Science and Technology, Korean Broadcasting System, and HEVC Advance LLC (collectively "Patent Owner") filed a Preliminary Response. We granted Petitioner's request for additional briefing to address the issues of whether a document is a printed publication (Issue 1) and whether the claims of the '720 patent are entitled to a particular priority date (Issue 2) and to submit related declarations. Paper 11, 1. The parties submitted additional briefing and testimonial evidence. Papers 12, 14; Ex. 1044. Subsequently, we instituted *inter partes* review of the challenged claims. Paper 15 ("Dec. Inst.").

Patent Owner requested rehearing of the Decision to Institute. Paper 18 ("Req. Reh'g"). We denied the request. Paper 20 ("Reh'g Dec.").

Following institution, Patent Owner filed a Response (Paper 21, "PO Resp."), Petitioner filed a Reply (Paper 25, "Reply"), and Patent Owner filed a Sur-Reply (Paper 30,"Sur-reply"). A hearing was held on June 15, 2020, and a transcript of the hearing has been made part of the record. Paper 41.

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

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[1] We granted Petitioner's Unopposed Motion Seeking to Correct Clerical Mistake in Petition and ordered Petitioner to submit a Corrected Petition. Paper 9, 4.

For the reasons discussed below, we conclude that Petitioner has shown by a preponderance of the evidence that claims 1–6 of the '720 patent are unpatentable.

B. Related Matters

Patent Owner indicates U.S. Application No. 16/572,704 "is currently pending before the Patent Office and shares a claim of priority with the '720 patent to U.S. Patent Application No. 13/202,906" ("the '906 application"), which issued into U.S. Patent 9,485,512 B2 ("the '512 patent"). Paper 37, 1; Ex. 1006, codes (10), (21).

The parties indicate that they are unaware of any other, related matter involving the '720 patent. Pet. 1; Paper 4, 2.

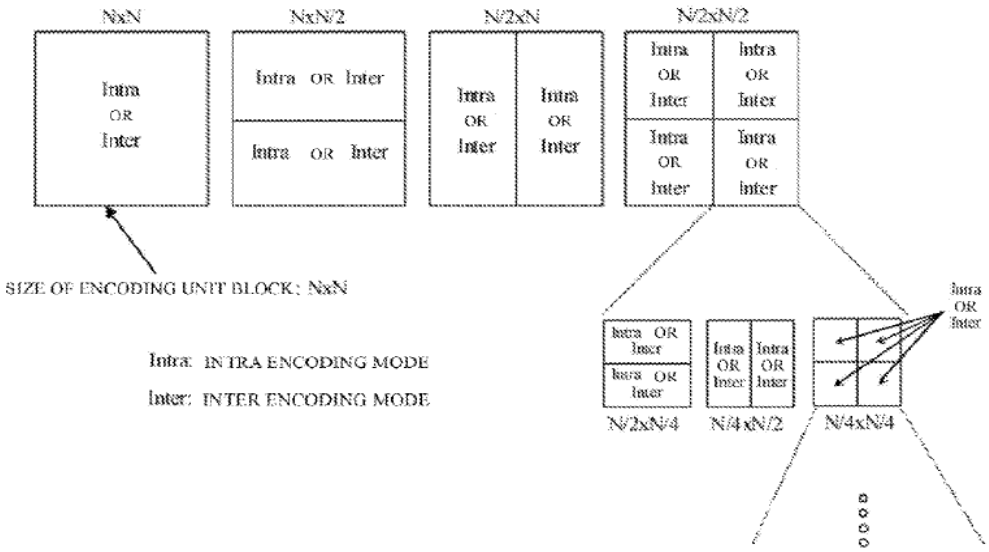
C. The '720 Patent (Ex. 1001)

The '720 patent issued December 5, 2017, from an application filed September 7, 2016, and indicates the '720 patent is a "[c]ontinuation of application No. 13/202,906, filed as application No. PCT/KR2010/001125 on Feb. 23, 2010, now Pat. No. 9,485,512." Ex. 1001, code (63); *id.*, codes (22), (45), 1:10–18; Ex. 1006, codes (10), (21)–(22), (86).

The '720 patent concerns a video encoding and decoding method that divides a picture into division blocks and encodes and decodes the division blocks. Ex. 1001, code (57), 1:23–26. Encoding efficiency can be improved by encoding and decoding division blocks (or sub-division blocks) using both inter and intra predictions and encoding a block video signal using square transforms or non-square transforms based on the division block's size. *Id.* at 1:23–33. These techniques attempt to resolve encoding efficiency, which degrades with high or ultra-high definition video encoding or when an encoding unit is a super-macroblock (e.g., size of 32x32 or

more) "that has the same or greater size than a macroblock" (e.g., size of 16x16). *Id.* at 2:41–42; *id.* at 2:4–7, 2:18–49, 5:29–40.

An exemplary super-macroblock, shown below as an NxN unit block on the far left, is reproduced from the '720 patent's Figure 2:



Id., Fig. 2. The above Figure 2 illustrates a super-macroblock (e.g., NxN unit block) divided into sub-blocks or division block types (e.g., two Nx(N/2) blocks, two (N/2)xN blocks, or four (N/2)x(N/2) blocks). *Id.* at 6:1–8, code (57), Fig. 2. The sub-blocks are encoded using intra or inter prediction encoding, and the super-macroblock can be encoded so that both intra and inter prediction encoding modes can be used in the final encoding mode to increase video encoding efficiency. *Id.* at 6:1–15, code (57), Fig. 2; *see id.* at 6:58–7:34, Fig. 3.

The '720 patent further discusses transform encoding "a residual signal of a super-macroblock having an increased size." *Id.* at 6:26–27. For example, the '720 patent describes "selectively applying a square transform kernel having a size of 16x16 or more, which is greater than existing sizes of

4x4 and 8x8, or a non-square transform kernel having a size of 16x8, 8x16, or more for a non-square transform according to a size of a division block." *Id.* at 6:29–34. Equation 2 of the '720 patent is a possible calculation if a square transform kernel having a size of 16x16 or more is applied to a super-macroblock:

$$Y=AX$$

where X denotes an NxN input video signal matrix, A denotes an NxN square transform kernel matrix, and Y denotes a transform coefficient matrix. *Id.* at 6:35–41. Equation 3 of the '720 patent includes a possible calculation for a non-square sub-block:

$$Y=A_1XA_2$$

where X denotes an Mx(M/2) input video signal matrix, A_1 denotes an MxM square transform kernel matrix, A_2 denotes an (M/2)x(M/2) transform kernel matrix, and Y denotes a transform coefficient matrix. *Id.* at 6:41–49.

D. The Challenged Claims

The '720 patent has six claims. *Id.* at 9:5–10:58. Petitioner challenges all six claims. Independent claim 1 is reproduced below.

> 1. A method of video decoding, comprising:
> [a] dividing a decoding unit block within a current slice into four first sub-decoding-unit-blocks;
> [b] dividing at least one first sub-decoding-unit-block among the four first sub-decoding-unit-blocks into four second sub-decoding-unit-blocks,
> [c] wherein each of the second sub-decoding-unit-blocks is a basis of a prediction mode, and
> [d] wherein the prediction mode for each of the second sub-decoding-unit-blocks is intra prediction mode or inter prediction mode;
> [e] transforming at least one second sub-decoding-unit-block among the four second sub-decoding-unit-blocks using a

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