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- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

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Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

[Continued on next page]

- (54) Title: INDICATION OF USE OF WAVEFRONT PARALLEL PROCESSING IN VIDEO CODING

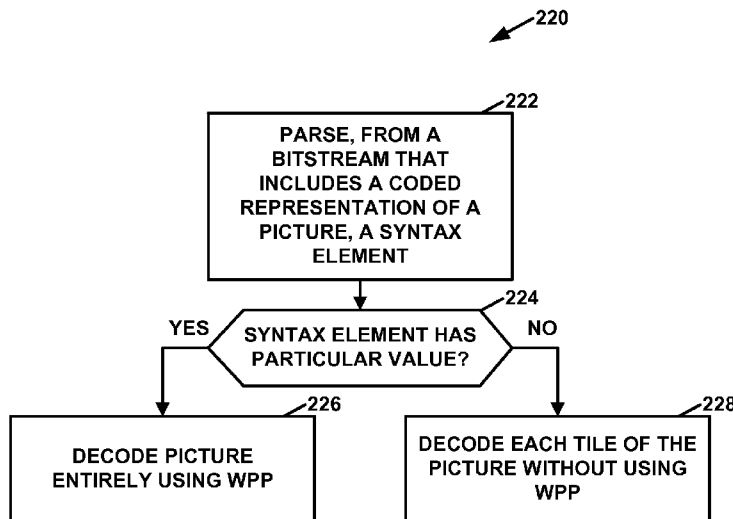


FIG. 5

(57) Abstract: A video encoder generates a bitstream that includes a syntax element that indicates whether a picture is encoded according either a first coding mode or a second coding mode. In the first coding mode, the picture is entirely encoded using wavefront parallel processing (WPP). In the second coding mode, each tile of the picture is encoded without using WPP and the picture may have one or more tiles. A video decoder may parse the syntax element from the bitstream. In response to determining that the syntax element has a particular value, the video decoder decodes the picture entirely using WPP. In response to determining that the syntax element does not have the particular value, the video decoder decodes each tile of the picture without using WPP.





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- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/070680

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04N7/26
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	C-W HSU ET AL: "Wavefront Parallel Processing with Tiles", 6. JCT-VC MEETING; 97. MPEG MEETING; 14-7-2011 - 22-7-2011; TORINO; (JOINT COLLABORATIVE TEAM ON VIDEO CODING OF ISO/IEC JTC1/SC29/WG11 AND ITU-T SG.16); URL: HTTP://WFTP3.ITU.INT/AV-ARCH/JCTVC-SITE/, no. JCTVC-F063, 15 July 2011 (2011-07-15), XP030009086,	1,4,10, 13,19, 22,28, 31,37-40
Y	abstract section 2 first paragraph section 3 first paragraph figure 1 ----- -/--	2,3,5-9, 11,12, 14-18, 20,21, 23-27, 29,30, 32-36

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 9 August 2013	Date of mailing of the international search report 19/08/2013
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Regidor Arenales, R
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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2012/070680

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	COBAN M ET AL: "AHG4: Unification of picture partitioning schemes", 7. JCT-VC MEETING; 98. MPEG MEETING; 21-11-2011 - 30-11-2011; GENEVA; (JOINT COLLABORATIVE TEAM ON VIDEO CODING OF ISO/IEC JTC1/SC29/WG11 AND ITU-T SG.16); URL: HTTP://WFTP3.ITU.INT/AV-ARCH/JCTVC-SITE/,, no. JCTVC-G315, 9 November 2011 (2011-11-09), XP030110299, section 2.1.1	2,3,6,7, 11,12, 15,16, 20,21, 24,25, 29,30, 33,34
A	page 3, last paragraph	1,4,8, 10,13, 17,19, 22,26, 28,31, 35,37-40
Y	----- HOROWITZ (EBRISK) M: "JCT-VC BoG report: tiles and wavefront parallel processing", 7. JCT-VC MEETING; 98. MPEG MEETING; 21-11-2011 - 30-11-2011; GENEVA; (JOINT COLLABORATIVE TEAM ON VIDEO CODING OF ISO/IEC JTC1/SC29/WG11 AND ITU-T SG.16); URL: HTTP://WFTP3.ITU.INT/AV-ARCH/JCTVC-SITE/,, no. JCTVC-G1025, 26 November 2011 (2011-11-26), XP030111009, page 6, line 8	8,17,26, 35
A		1-4,6,7, 10-13, 15,16, 19-22, 24,25, 28-31, 33,34, 37-40
Y	----- FULDSETH (CISCO) A ET AL: "Tiles", 6. JCT-VC MEETING; 97. MPEG MEETING; 14-7-2011 - 22-7-2011; TORINO; (JOINT COLLABORATIVE TEAM ON VIDEO CODING OF ISO/IEC JTC1/SC29/WG11 AND ITU-T SG.16); URL: HTTP://WFTP3.ITU.INT/AV-ARCH/JCTVC-SITE/,, no. JCTVC-F335, 16 July 2011 (2011-07-16), XP030009358, section 2.3.1 section 2.4	5,14,23, 32
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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2012/070680

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	<p>GORDON C ET AL: "Wavefront Parallel Processing for HEVC Encoding and Decoding", 6. JCT-VC MEETING; 97. MPEG MEETING; 14-7-2011 - 22-7-2011; TORINO; (JOINT COLLABORATIVE TEAM ON VIDEO CODING OF ISO/IEC JTC1/SC29/WG11 AND ITU-T SG.16); URL: HTTP://WFTP3.ITU.INT/AV-ARCH/JCTVC-SITE/,, no. JCTVC-F274, 16 July 2011 (2011-07-16), XP030009297, section 4 figure 3</p>	9,18,27, 36
X,P	<p>-----</p> <p>COBAN M ET AL: "AHG4: On tiles and wavefronts", 10. JCT-VC MEETING; 101. MPEG MEETING; 11-7-2012 - 20-7-2012; STOCKHOLM; (JOINT COLLABORATIVE TEAM ON VIDEO CODING OF ISO/IEC JTC1/SC29/WG11 AND ITU-T SG.16); URL: HTTP://WFTP3.ITU.INT/AV-ARCH/JCTVC-SITE/,, no. JCTVC-J0123, 3 July 2012 (2012-07-03), XP030112485, the whole document</p> <p>-----</p>	1-40

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/070680

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-4, 6-8, 10-13, 15-17, 19-22, 24-26, 28-31, 33-35, 37-40

Method for signalling information related to the coding mode used to encode video data.

2. claims: 5, 14, 23, 32

Method for signalling information related to the partition scheme of video data using tiles.

3. claims: 9, 18, 27, 36

Method for entropy encoding coding tree blocks (CTBs) in a slice using wavefront parallel processing (WPP).
