

EXHIBIT D



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(12) **United States Patent**
Washino

(10) **Patent No.:** **US 8,228,979 B2**
(45) **Date of Patent:** **Jul. 24, 2012**

(54) **WIDE-BAND MULTI-FORMAT AUDIO/VIDEO PRODUCTION SYSTEM WITH FRAME-RATE CONVERSION**

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(73) Assignee: **Multi-Format, Inc.**, Little Ferry, NJ (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **12/348,804**

(22) Filed: **Jan. 5, 2009**

(65) **Prior Publication Data**

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Related U.S. Application Data

(63) Continuation of application No. 10/117,496, filed on Apr. 5, 2002, now Pat. No. 7,474,696, which is a continuation of application No. 09/305,953, filed on May 6, 1999, now Pat. No. 6,370,198, which is a continuation-in-part of application No. 08/834,912, filed on Apr. 7, 1997, now Pat. No. 5,999,220.

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(51) **Int. Cl.**

H04B 1/66 (2006.01)
H04N 7/01 (2006.01)

(52) **U.S. Cl.** **375/240.01**; 348/446

(58) **Field of Classification Search** 348/555, 348/556, 722, 441, 445, 448, 426, 432, 454, 348/558, 568, 446; 375/240.26, 240.29, 375/240.01, 240.16, 240.24

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,633,293 A 12/1986 Powers
(Continued)

FOREIGN PATENT DOCUMENTS

EP 314873 5/1989
(Continued)

OTHER PUBLICATIONS

G Demos, "An Example of Hierarchy of Formats for HDTV," SMPTE Journal, Sep. 1992, pp. 609-617.

(Continued)

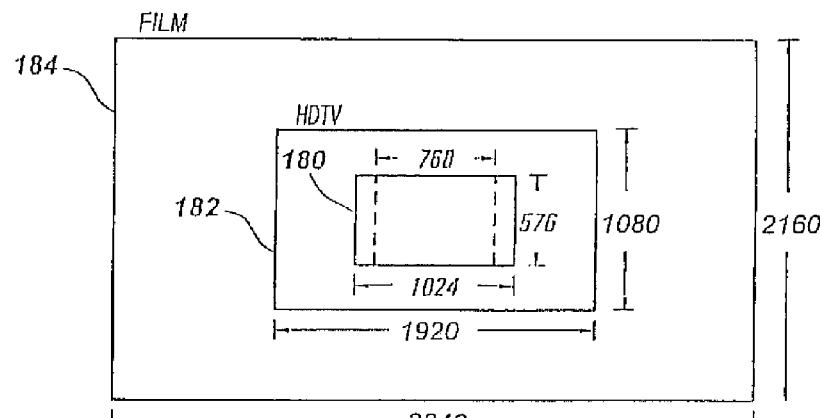
Primary Examiner — Behrooz Senfi

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(57) **ABSTRACT**

A multi-format digital video production system enables a user to process an input video program to produce an output version of the program in a final format which may have a different frame rate, pixel dimensions, or both. An internal production format of 24 fps is preferably chosen to provide the greatest compatibility with existing and planned formats associated with HDTV standard 4:3 or widescreen 16:9 high-definition television, and film. Images are re-sized horizontally and vertically by pixel interpolation, thereby producing larger or smaller image dimensions so as to fill the particular needs of individual applications. Frame rates are adapted by inter-frame interpolation or by traditional schemes, including "3:2 pull-down" for 24-to-30 fps conversions. Simple speed-up (for 24-to-25 conversions) or slow-down (for 25-to-24 conversions) for playback, or by manipulating the frame rate itself using a program storage facility with asynchronous reading and writing capabilities. The step of converting the signal to a HDTV format is preferably performed using a modified upconversion process for wideband signals (utilizing a higher sampling clock frequency) and a resizing to HDTV format frame dimensions in pixels.

14 Claims, 14 Drawing Sheets



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U.S. PATENT DOCUMENTS

5,045,932 A	9/1991	Sharman et al.
5,243,433 A	9/1993	Hailey et al.
5,327,235 A	7/1994	Richards et al.
5,329,309 A *	7/1994	Dorricott et al. 348/97
5,331,346 A	7/1994	Shields et al.
5,335,013 A *	8/1994	Faber 348/104
5,384,598 A	1/1995	Rodriguez et al.
5,444,491 A *	8/1995	Lim 348/441
5,444,492 A *	8/1995	Kihara 348/445
5,519,438 A	5/1996	Elliott et al.
5,532,749 A	7/1996	Hong et al.
5,537,157 A	7/1996	Washino et al.
5,600,377 A	2/1997	David et al.
5,608,464 A	3/1997	Woodham et al.
5,617,218 A	4/1997	Rhodes
5,701,383 A	12/1997	Russo et al.
5,706,290 A	1/1998	Shaw et al.
5,724,101 A	3/1998	Haskin
5,754,248 A *	5/1998	Faroudja 348/474
5,771,073 A	6/1998	Lim
5,812,204 A	9/1998	Baker et al.
5,832,085 A	11/1998	Inoue et al.
5,835,150 A	11/1998	Choi et al.
5,838,381 A	11/1998	Kasahara et al.
5,999,220 A *	12/1999	Washino 348/441
6,356,945 B1	3/2002	Shaw et al.
6,370,198 B1 *	4/2002	Washino 375/240.26
6,542,198 B1	4/2003	Hung et al.
6,549,240 B1 *	4/2003	Reitmeier 348/459

6,656,945 B2	12/2003	Campbell et al.
6,906,687 B2 *	6/2005	Werner 345/8
7,864,865 B2 *	1/2011	Hatti et al. 375/240.25
2002/0118296 A1 *	8/2002	Schwab et al. 348/441

FOREIGN PATENT DOCUMENTS

EP	514012	11/1992
WO	WO-9315586	8/1993

OTHER PUBLICATIONS

J.S. Lim, "A Proposal for an HDTV/ATV Standard with Multiple Transmission Formats," SMPTE Journal, Aug. 1993, pp. 699-702.
 W.E. Bretl, "3SNTSC-A 'Leapfrog' Production Standard for HDTV," SMPTE Journal, Mar. 1989, pp. 173-178.
 B. Hunt, G. Kennel, L. DeMarsh, S. Kristy, "High-Resolution Electronic Intermediate System for Motion-Picture Film," SMPTE Journal, Mar. 1991, pp. 156-161.
 A. Kaiser, H. Mahler, R. McMann, "Resolution Requirements for HDTV Based Upon the Performance of 35mm Motion-Picture Films for Theatrical Viewing," SMPTE Journal, Jun. 1985, pp. 654-659.
 Y. Ide, M. Sasuga, N. Harada, T. Nishizawa, "A Three-CCD HDTV Color Camera," SMPTE Journal, Jul. 1990, pp. 532-537.
 G. Reitmeier, C. Carlson, E. Geiger, D. Westerkamp, "The Digital Hierarchy—A Blueprint for Television in the 21st Century," SMPTE Journal, Jul. 1992, pp. 466-470.
 L. Thorpe, T. Hanabusa, "If Progressive Scanning is So Good, How Bad is Interlace?", SMPTE Journal, Dec. 1990, p. 972-86.

* cited by examiner

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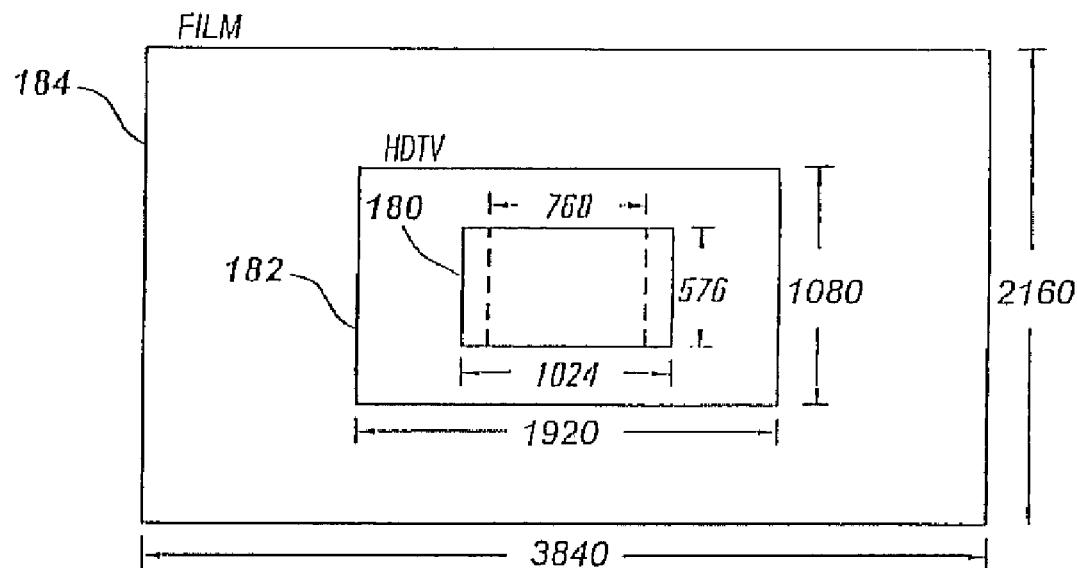


Figure 1a

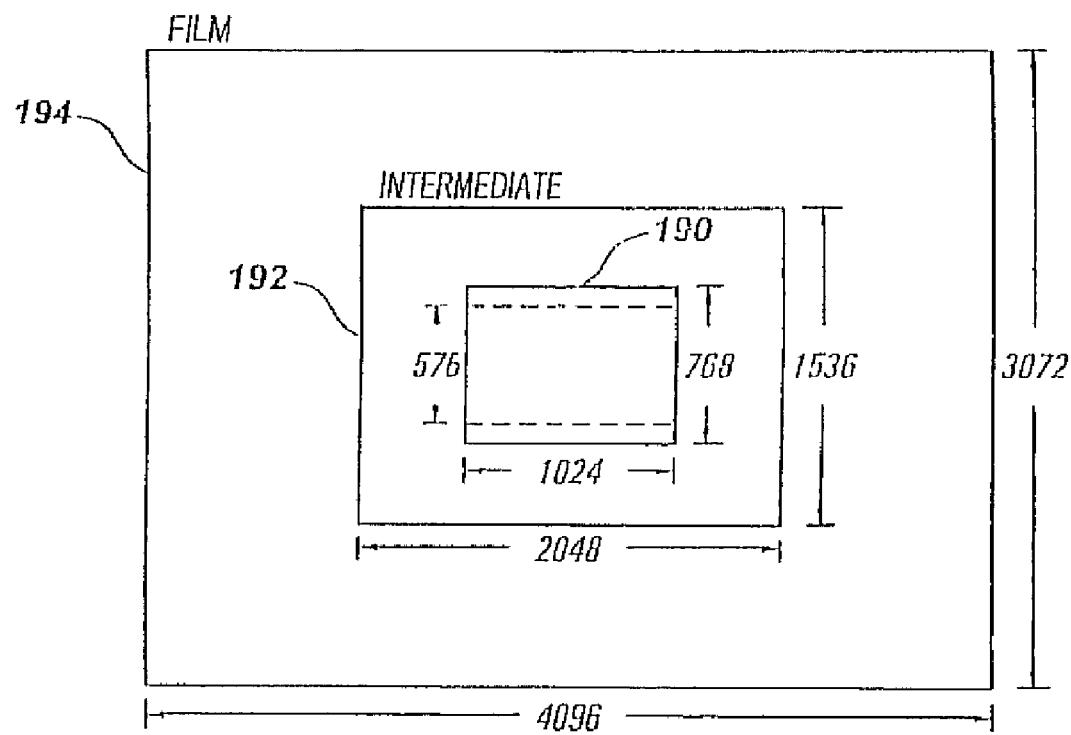


Figure 1b

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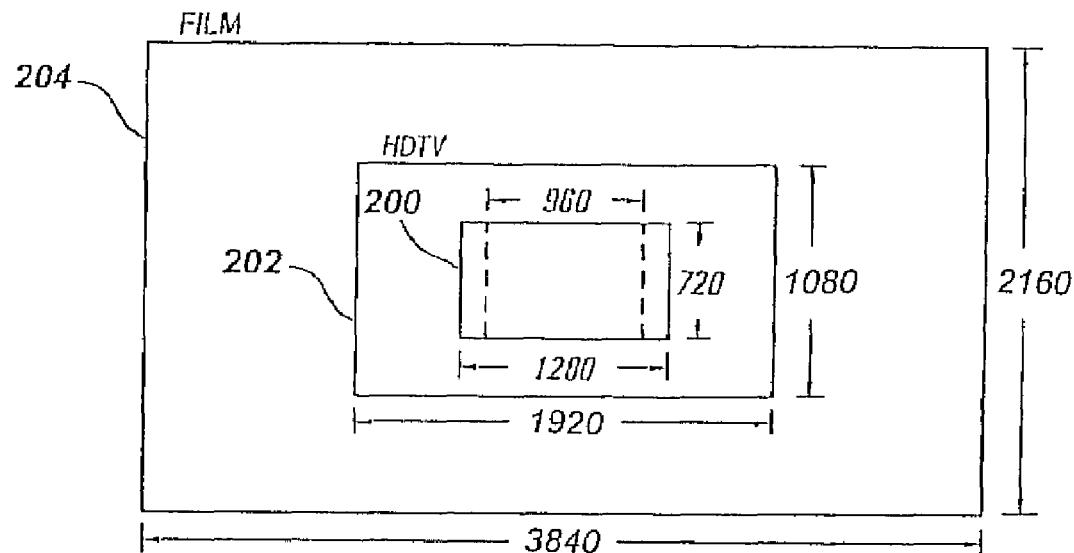


Figure 1c

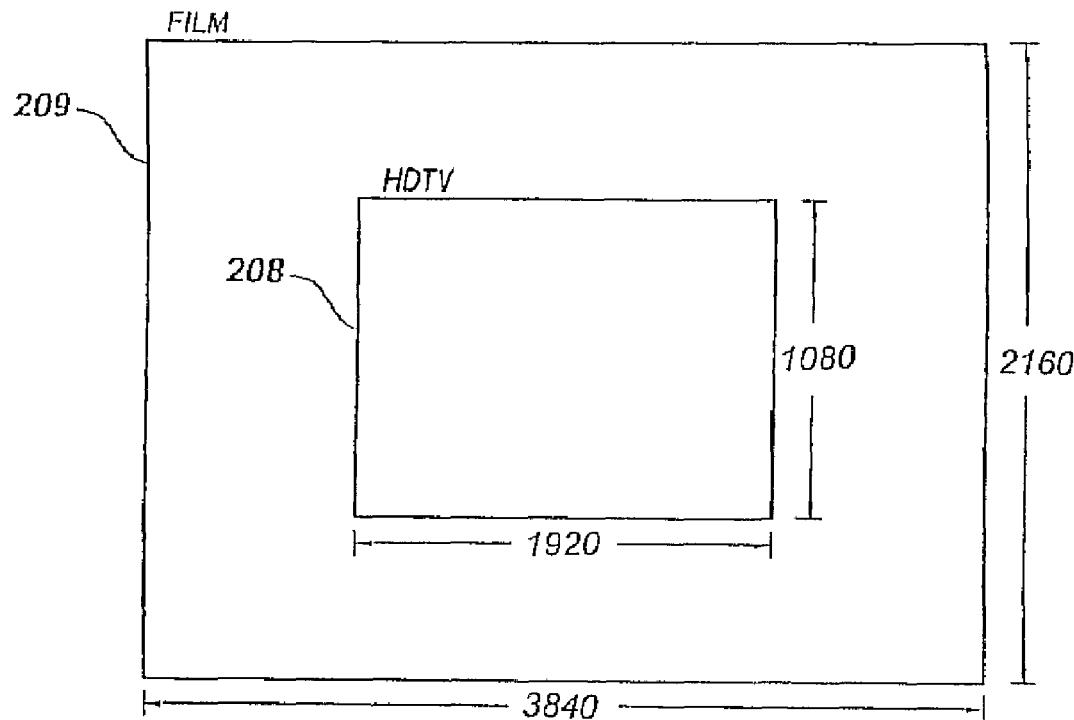


Figure 1d

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