(12) **United States Patent**
Sandrew

(10) Patent No.: **US 7,181,081 B2**
(45) Date of Patent: **Feb. 20, 2007**

(54) **IMAGE SEQUENCE ENHANCEMENT SYSTEM AND METHOD**

(75) Inventor: **Barry B. Sandrew**, Encinitas, CA (US)

(73) Assignee: **Legend Films Inc.**, San Diego, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 267 days.

(21) Appl. No.: **10/450,970**

(22) PCT Filed: **May 6, 2002**

(86) PCT No.: **PCT/US02/14192**

§ 371 (c)(1),
(2), (4) Date: **Jun. 18, 2003**

(87) PCT Pub. No.: **WO02/091302**

PCT Pub. Date: **Nov. 14, 2002**

(65) **Prior Publication Data**

US 2004/0131249 A1   Jul. 8, 2004

Related U.S. Application Data

(60) Provisional application No. 60/288,929, filed on May 4, 2001.

(51) **Int. Cl.**
G06K 9/40   (2006.01)
(52) **U.S. Cl.** **382/254**; 382/165; 382/282; 348/100; 348/586
(58) **Field of Classification Search** 382/103, 382/104, 107, 171, 282, 283, 284, 165, 274; 358/538, 540, 453, 464; 348/584, 100, 586, 348/97
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

|			
3,619,051 A	11/1971	Wright	
3,705,762 A	12/1972	Ladd et al.	
4,021,841 A	5/1977	Weinger	
4,149,185 A	4/1979	Weinger	
4,606,625 A	8/1986	Geshwind	
4,642,676 A	2/1987	Weinger	
4,755,870 A	7/1988	Markle et al.	
4,903,131 A	2/1990	Lingemann et al.	
4,984,072 A	1/1991	Sandrew	
5,038,161 A *	8/1991	Ki 396/340	
5,050,984 A	9/1991	Geshwind	

(Continued)

Primary Examiner—Bhavesh M. Mehta
Assistant Examiner—Yosef Kassa
(74) *Attorney, Agent, or Firm*—Dalina Law Group P.C.

(57) **ABSTRACT**

Scenes from motion pictures to be colorized are broken up into separate elements, composed of backgrounds/sets or motion/onscreen-action. These background and motion elements are combined into single frame representations of multiple frames as tiled frame sets or as a single frame composite of all elements (i.e., both motion and background) that then becomes a visual reference database that includes data for all frame offsets which are later used for the computer controlled application of masks within a sequence of frames. Each pixel address within the visual reference database corresponds to a mask/lookup table address within the digital frame and X, Y, Z location of subsequent frames that were used to create the visual reference database. Masks are applied to subsequent frames of motion objects based on various differentiating image processing methods. The gray scale determines the mask and corresponding color lookup from frame to frame as applied in a keying fashion.

49 Claims, 34 Drawing Sheets
(21 of 34 Drawing Sheet(s) Filed in Color)
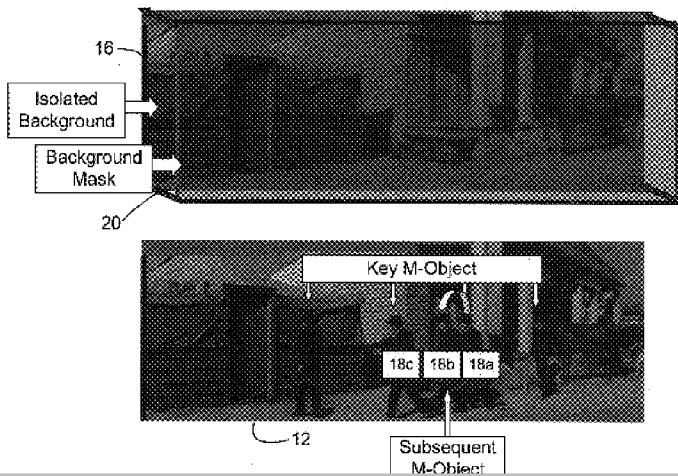
U.S. PATENT DOCUMENTS

5,093,717	A		3/1992	Sandrew
5,252,953	A		10/1993	Sandrew et al.
5,328,073	A		7/1994	Blanding et al.
5,534,915	A		7/1996	Sandrew
5,684,715	A		11/1997	Palmer
5,729,471	A		3/1998	Jain et al.
5,748,199	A		5/1998	Palm
5,767,923	A		6/1998	Coleman
5,778,108	A		7/1998	Coleman
5,784,175	A		7/1998	Lee
5,784,176	A		7/1998	Narita
5,835,163	A		11/1998	Liou et al.
5,841,512	A		11/1998	Goodhill
5,899,861	A		5/1999	Friemel et al.
5,912,994	A		6/1999	Norton et al.
5,920,360	A		7/1999	Coleman
5,959,697	A		9/1999	Coleman
5,982,350	A	*	11/1999	Hekmatpour et al. 345/629
5,990,903	A	*	11/1999	Donovan 345/589
6,014,473	A		1/2000	Hossack et al.
6,025,882	A		2/2000	Geshwind
6,049,628	A		4/2000	Chen et al.
6,056,691	A		5/2000	Urbano et al.
6,067,125	A		5/2000	May
6,086,537	A		7/2000	Urbano et al.
6,102,865	A		8/2000	Hossack et al.
6,119,123	A		9/2000	Elenbaas et al.
6,132,376	A		10/2000	Hossack et al.
6,141,433	A	*	10/2000	Moed et al. 382/103
6,201,900	B1		3/2001	Hossack et al.
6,211,941	B1	*	4/2001	Erland 352/45
6,222,948	B1		4/2001	Hossack et al.
6,226,015	B1		5/2001	Danneels et al.
6,228,030	B1		5/2001	Urbano et al.
6,263,101	B1		7/2001	Klein et al.
6,271,859	B1		8/2001	Asente
6,360,027	B1		3/2002	Hossack et al.
6,364,835	B1		4/2002	Hossack et al.
6,373,970	B1		4/2002	Dong et al.
6,390,980	B1		5/2002	Peterson et al.
6,416,477	B1		7/2002	Jago
6,445,816	B1	*	9/2002	Pettigrew 382/162
6,707,487	B1	*	3/2004	Aman et al. 348/169

* cited by examiner

Figure 1

Figure 2

16

Isolated Background

Background Mask

20

Figure 3

Key M-Object

18c | 18b | 18a

12

Subsequent M-Object

Figure 4

20

Background Mask

22 — 22 / 22

M-Object Masks

M-Objects

18c | 18b | 18a

Isolated Background

16

Figure 5A

Key frame is the only frame fully masked with color lookup tables

	1	2	3	4	5	6	
	7	8	9	10	11	12	
	13	14	15	16	17	18	
	19	20	21	22	23	24	
	25	26	27	28	29	30	
	31	32	33	34	35	36	

Frame numbers

Floating Tool Bar
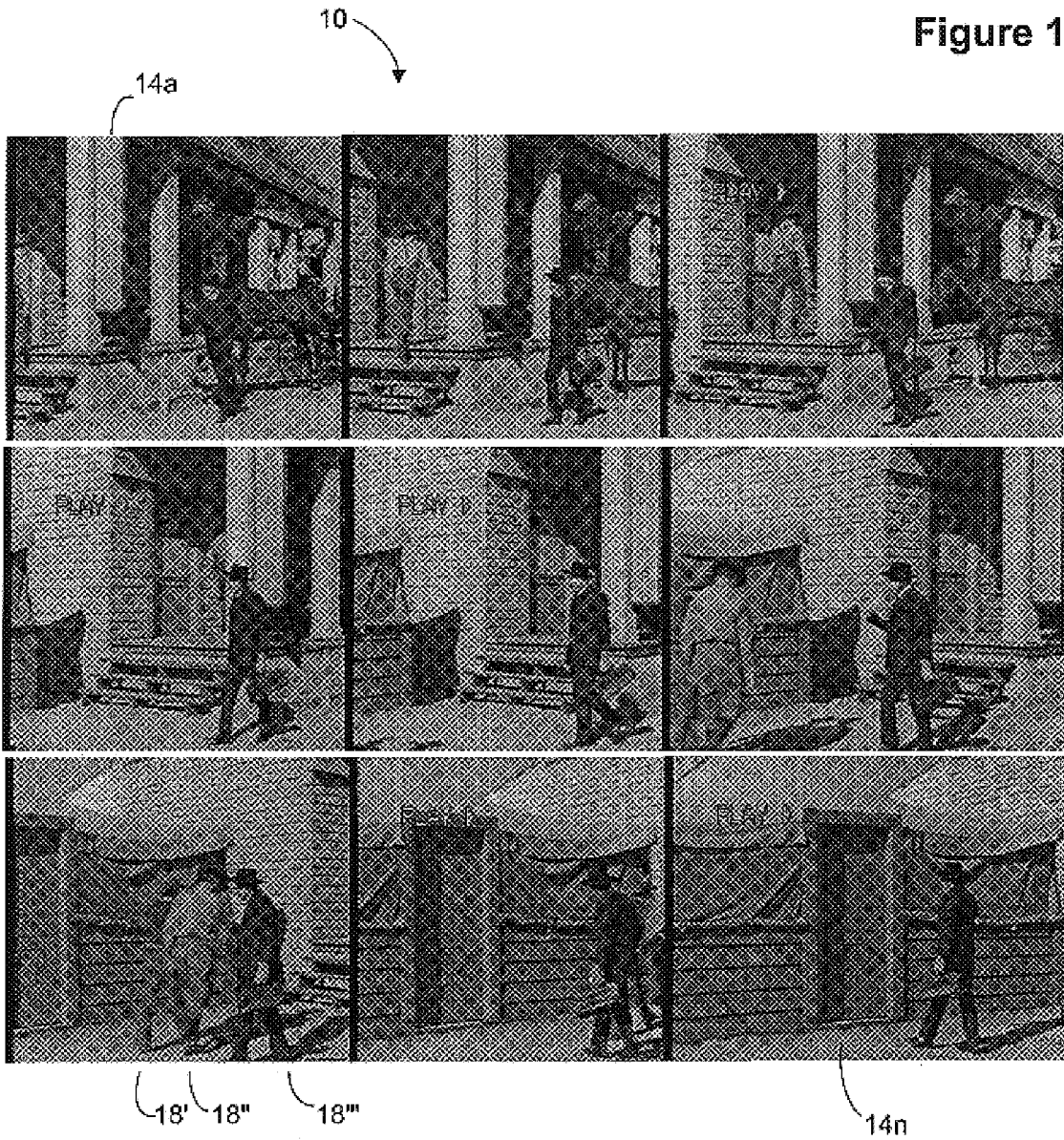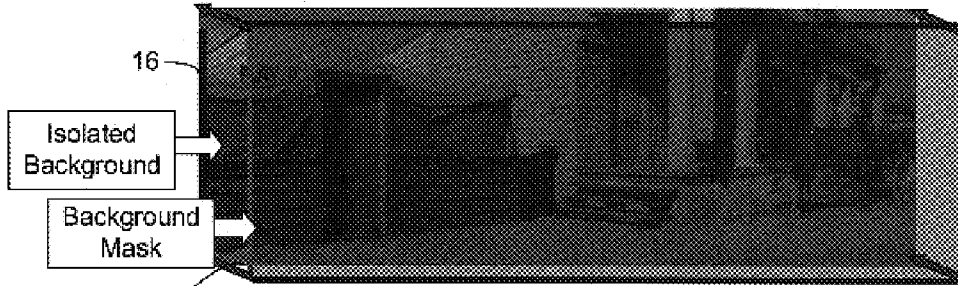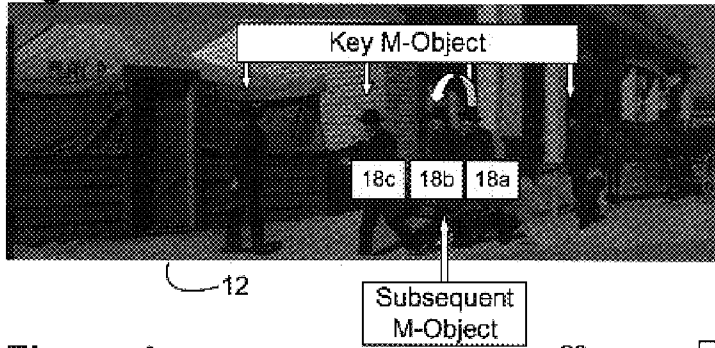
Figure 5B

DOCKET ALARM
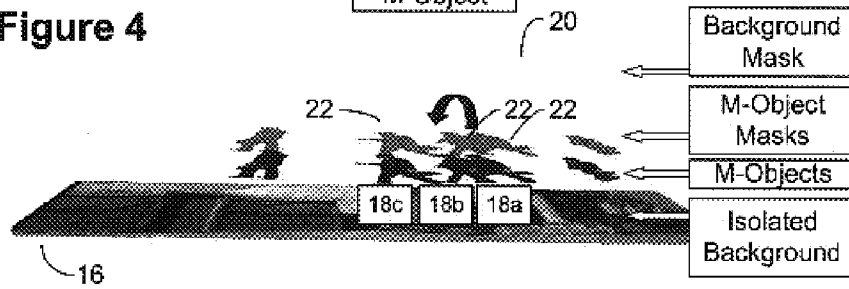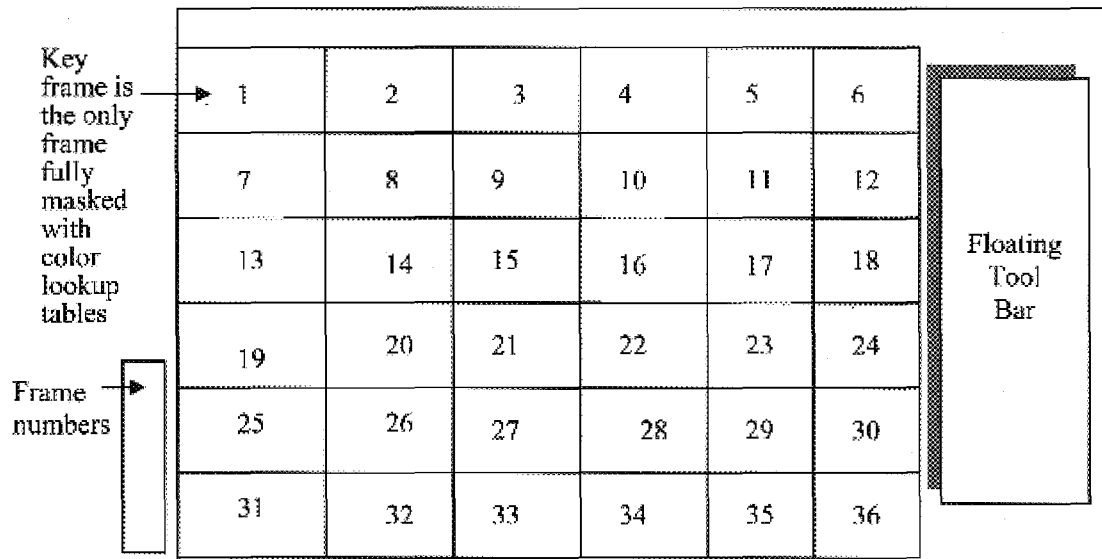
Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts

Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research

With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips

Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.

fastcase®
Smarter legal research.