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(54) **SYSTEMS AND METHODS FOR IMAGE MONITORING OF CHECK DURING MOBILE DEPOSIT**

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G06Q 40/00 (2012.01)

(52) **U.S. Cl.**
USPC **705/45**; 705/44

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USPC 705/3–45
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,005,282	A	10/1961	Christiansen
3,341,820	A	9/1967	Grillmeier, Jr. et al.
3,576,972	A	5/1971	Wood
3,593,913	A	7/1971	Bremer
3,620,553	A	11/1971	Donovan
3,648,242	A	3/1972	Grosbard
3,800,124	A	3/1974	Walsh
3,816,943	A	6/1974	Henry
4,002,356	A	1/1977	Weidmann
4,060,711	A	11/1977	Buros
4,070,649	A	1/1978	Wright, Jr. et al.
4,128,202	A	12/1978	Buros
4,136,471	A	1/1979	Austin
4,205,780	A	6/1980	Burns
4,264,808	A	4/1981	Owens
4,305,216	A	12/1981	Skelton
4,321,672	A	3/1982	Braun

(Continued)

FOREIGN PATENT DOCUMENTS

EP	0 984 410	3/2000
KR	20040076131 A	8/2004

(Continued)

OTHER PUBLICATIONS

Mitek Systems: "ImageNet Mobile Deposit", 2 pages, San Diego, California.

(Continued)

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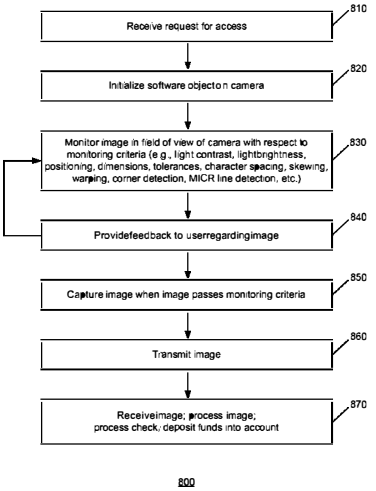
(57) **ABSTRACT**

An image of a check that is in the field of view of a camera is monitored prior to the image of the check being captured. The camera is associated with a mobile device. When the image of the check in the field of view passes monitoring criteria, an image may be taken by the camera and provided from the mobile device to a financial institution. The image capture may be performed automatically as soon as the image of the check is determined to pass the monitoring criteria. The check may be deposited in a user's bank account based on the image. Any technique for sending the image to the financial institution may be used. Feedback may be provided to the user of the camera regarding the image of the check in the field of view.

20 Claims, 8 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

4,433,436 A 2/1984 Carnes
4,454,610 A 6/1984 Sziklai
RE31,692 E 10/1984 Tyburski et al.
4,523,330 A 6/1985 Cain
4,636,099 A 1/1987 Goldston
4,640,413 A 2/1987 Kaplan
4,644,144 A 2/1987 Chandek
4,722,444 A 2/1988 Murphy
4,722,544 A 2/1988 Weber
4,727,435 A 2/1988 Otani et al.
4,774,663 A 9/1988 Musmanno
4,790,475 A 12/1988 Griffin
4,806,780 A 2/1989 Yamamoto
4,837,693 A 6/1989 Schotz
4,890,228 A 12/1989 Longfield
4,927,071 A 5/1990 Wood
4,934,587 A 6/1990 McNabb
4,960,981 A 10/1990 Benton
4,975,735 A 12/1990 Bright
5,022,683 A 6/1991 Barbour
5,053,607 A 10/1991 Carlson
5,146,606 A 9/1992 Grondalski
5,157,620 A 10/1992 Shaar
5,159,548 A 10/1992 Caslavka
5,191,525 A 3/1993 LeBrun
5,193,121 A 3/1993 Elischer et al.
5,220,501 A 6/1993 Lawlor
5,227,863 A 7/1993 Bilbrey et al.
5,229,589 A 7/1993 Schneider
5,237,159 A 8/1993 Stephens
5,257,320 A 10/1993 Etherington et al.
5,265,008 A 11/1993 Benton
5,321,816 A 6/1994 Rogan
5,347,302 A 9/1994 Simonoff
5,350,906 A 9/1994 Brody
5,373,550 A 12/1994 Campbell
5,419,588 A 5/1995 Wood
5,422,467 A 6/1995 Graef
5,444,794 A 8/1995 Uhland, Sr.
5,475,403 A 12/1995 Havlovick et al.
5,504,538 A 4/1996 Tsujihara
5,504,677 A 4/1996 Pollin
5,528,387 A 6/1996 Kelly et al.
5,577,179 A 11/1996 Blank
5,583,759 A 12/1996 Geer
5,590,196 A 12/1996 Moreau
5,594,225 A 1/1997 Botvin
5,598,969 A 2/1997 Ong
5,602,936 A 2/1997 Green
5,610,726 A 3/1997 Nonoshita
5,611,028 A 3/1997 Shibasaki
5,630,073 A 5/1997 Nolan
5,631,984 A 5/1997 Graf et al.
5,668,897 A 9/1997 Stolfo
5,673,320 A 9/1997 Ray
5,677,955 A 10/1997 Doggett
5,678,046 A 10/1997 Cahill et al.
5,679,938 A 10/1997 Templeton
5,680,611 A 10/1997 Rail
5,691,524 A 11/1997 Josephson
5,699,452 A 12/1997 Vaidyanathan
5,734,747 A 3/1998 Vaidyanathan
5,737,440 A 4/1998 Kunkler
5,748,780 A 5/1998 Stolfo
5,751,842 A 5/1998 Riach
5,784,503 A 7/1998 Bleecker, III et al.
5,830,609 A 11/1998 Warner
5,832,463 A 11/1998 Funk
5,838,814 A 11/1998 Moore
5,863,075 A 1/1999 Rich
5,870,456 A 2/1999 Rogers
5,870,724 A 2/1999 Lawlor
5,870,725 A 2/1999 Bellinger et al.
5,878,337 A 3/1999 Joao
5,893,101 A 4/1999 Balogh et al.
5,897,625 A 4/1999 Gustin
5,898,157 A 4/1999 Mangili et al.
5,901,253 A 5/1999 Tretter
5,903,878 A 5/1999 Talati
5,903,881 A 5/1999 Schrader
5,910,988 A 6/1999 Ballard
5,917,931 A 6/1999 Kunkler
5,924,737 A 7/1999 Schrupp
5,926,548 A 7/1999 Okamoto
5,930,778 A 7/1999 Geer
5,937,396 A 8/1999 Konya
5,940,844 A 8/1999 Cahill
5,982,918 A 11/1999 Mennie
5,987,439 A 11/1999 Gustin
6,012,048 A 1/2000 Gustin
6,014,454 A 1/2000 Kunkler
6,021,202 A 2/2000 Anderson
6,021,397 A 2/2000 Jones
6,029,887 A 2/2000 Furuhashi
6,030,000 A 2/2000 Diamond
6,032,137 A 2/2000 Ballard
6,038,553 A 3/2000 Hyde
6,053,405 A 4/2000 Irwin, Jr. et al.
6,073,119 A 6/2000 Bornemisza-wahr
6,085,168 A 7/2000 Mori
6,097,834 A 8/2000 Krouse
6,097,845 A 8/2000 Ng et al.
6,097,885 A 8/2000 Rayner
6,105,865 A 8/2000 Hardesty
6,141,339 A 10/2000 Kaplan et al.
6,145,738 A 11/2000 Stinson
6,151,423 A 11/2000 Melen
6,151,426 A 11/2000 Lee
6,159,585 A 12/2000 Rittenhouse
6,170,744 B1 1/2001 Lee
6,188,506 B1 2/2001 Kaiserman
6,189,785 B1 2/2001 Lowery
6,192,165 B1 2/2001 Irons
6,195,694 B1 2/2001 Chen
6,199,055 B1 3/2001 Kara
6,236,009 B1 5/2001 Emigh et al.
6,243,689 B1 6/2001 Norton
6,278,983 B1 8/2001 Ball
6,282,826 B1 9/2001 Richards
6,293,469 B1 9/2001 Masson et al.
6,304,860 B1 10/2001 Martin
6,314,452 B1 11/2001 Dekel
6,317,727 B1 11/2001 May
6,328,207 B1 12/2001 Gregoire et al.
6,330,546 B1 12/2001 Gopinathan et al.
6,339,658 B1 1/2002 Moccagatta
6,363,164 B1 3/2002 Jones
6,390,362 B1 5/2002 Martin
6,397,196 B1 5/2002 Kravetz
6,408,084 B1 6/2002 Foley
6,411,725 B1 6/2002 Rhoads
6,411,737 B2 6/2002 Wesolkowski et al.
6,411,938 B1 6/2002 Gates et al.
6,413,305 B1 7/2002 Mehta
6,417,869 B1 7/2002 Do
6,425,017 B1 7/2002 Dievendorff
6,429,952 B1 8/2002 Olbricht
6,439,454 B1 8/2002 Masson et al.
6,449,397 B1 9/2002 Che-chu
6,450,403 B1 9/2002 Martens
6,463,220 B1 10/2002 Dance et al.
6,464,134 B1 10/2002 Page
6,469,745 B1 10/2002 Yamada et al.
6,470,325 B1 10/2002 Leemhuis
6,505,178 B1 1/2003 Flenley
6,546,119 B2 4/2003 Ciolli et al.
6,574,609 B1 6/2003 Downs
6,578,760 B1 6/2003 Otto
6,587,837 B1 7/2003 Spagna
6,606,117 B1 8/2003 Windle
6,609,200 B2 8/2003 Anderson
6,611,598 B1 8/2003 Hayosh
6,614,930 B1 9/2003 Agnihotri et al.
6,643,416 B1 11/2003 Daniels

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,654,487 B1 11/2003 Downs, Jr.
6,661,910 B2 12/2003 Jones et al.
6,672,452 B1 1/2004 Alves
6,682,452 B2 1/2004 Quintus
6,695,204 B1 2/2004 Stinson
6,711,474 B1 3/2004 Treyz et al.
6,726,097 B2 4/2004 Graef
6,728,397 B2 4/2004 Mcneal
6,738,496 B1 5/2004 Van Hall
6,742,128 B1 5/2004 Joiner
6,745,186 B1 6/2004 Testa et al.
6,754,640 B2 6/2004 Bozeman
6,755,340 B1 6/2004 Voss
6,763,226 B1 7/2004 McZeal
6,781,962 B1 8/2004 Williams
6,786,398 B1 9/2004 Stinson
6,789,054 B1 9/2004 Makhlouf
6,796,491 B2 9/2004 Nakajima
6,806,903 B1 10/2004 Okisu et al.
6,813,733 B1 11/2004 Li
6,829,704 B2 12/2004 Zhang
6,844,885 B2 1/2005 Anderson
6,856,965 B1 2/2005 Stinson
6,863,214 B2 3/2005 Garner et al.
6,870,947 B2 3/2005 Kelland
6,883,140 B1 4/2005 Acker
6,898,314 B2 5/2005 Kung et al.
6,902,105 B2 6/2005 Koakutsu
6,913,188 B2 7/2005 Wong
6,931,591 B1 8/2005 Brown
6,934,719 B2 8/2005 Nally
6,957,770 B1 10/2005 Robinson
6,961,689 B1 11/2005 Greenberg
6,970,843 B1 11/2005 Forte
6,973,589 B2 12/2005 Wright
6,983,886 B2 1/2006 Natsukari et al.
6,993,507 B2 1/2006 Meyer
6,996,263 B2 2/2006 Jones et al.
6,999,943 B1 2/2006 Johnson
7,003,040 B2 2/2006 Yi
7,004,382 B2 2/2006 Sandru
7,010,155 B2 3/2006 Koakutsu et al.
7,010,507 B1 3/2006 Anderson
7,016,704 B2 3/2006 Pallakoff
7,039,048 B1 5/2006 Monta
7,058,036 B1 6/2006 Yu
7,062,099 B2 6/2006 Li et al.
7,062,456 B1 6/2006 Riehl et al.
7,062,768 B2 6/2006 Kubo
7,072,862 B1 7/2006 Wilson
7,076,458 B2 7/2006 Lawlor et al.
7,086,003 B2 8/2006 Demsky
7,092,561 B2 8/2006 Downs, Jr.
7,104,443 B1 9/2006 Paul et al.
7,113,925 B2 9/2006 Waserstein
7,114,649 B2 10/2006 Nelson
7,139,594 B2 11/2006 Nagatomo
7,140,539 B1 11/2006 Crews
7,163,347 B2 1/2007 Lugg
7,178,721 B2 2/2007 Maloney
7,181,430 B1 2/2007 Buchanan
7,184,980 B2 2/2007 Allen-Rouman et al.
7,197,173 B2 3/2007 Jones et al.
7,200,255 B2 4/2007 Jones
7,204,412 B2 4/2007 Foss, Jr.
7,216,106 B1 5/2007 Buchanan
7,219,082 B2 5/2007 Forte
7,219,831 B2 5/2007 Murata
7,249,076 B1 7/2007 Pendleton
7,252,224 B2 8/2007 Verma
7,257,246 B1 8/2007 Brodie et al.
7,266,230 B2 9/2007 Doran
7,290,034 B2 10/2007 Budd
7,299,970 B1 11/2007 Ching
7,299,979 B2 11/2007 Phillips
7,313,543 B1 12/2007 Crane
7,314,163 B1 1/2008 Crews et al.
7,321,874 B2 1/2008 Dilip
7,321,875 B2 1/2008 Dilip
7,325,725 B2 2/2008 Foss, Jr.
7,328,190 B2 2/2008 Smith et al.
7,330,604 B2 2/2008 Wu et al.
7,331,523 B2 2/2008 Meier et al.
7,336,813 B2 2/2008 Prakash et al.
7,343,320 B1 3/2008 Treyz
7,349,566 B2 3/2008 Jones et al.
7,356,505 B2 4/2008 March
7,377,425 B1 5/2008 Ma
7,379,978 B2 5/2008 Anderson
7,385,631 B2 6/2008 Maeno
7,386,511 B2 6/2008 Buchanan
7,391,897 B2 6/2008 Jones
7,391,934 B2 6/2008 Goodall et al.
7,392,935 B2 7/2008 Byrne
7,401,048 B2 7/2008 Rosedale
7,403,917 B1 7/2008 Larsen
7,406,198 B2 7/2008 Aoki et al.
7,421,107 B2 9/2008 Lugg
7,421,410 B1 9/2008 Schechtman et al.
7,427,016 B2 9/2008 Chimento
7,433,098 B2 10/2008 Klein et al.
7,437,327 B2 10/2008 Lam
7,440,924 B2 10/2008 Buchanan
7,447,347 B2 11/2008 Weber
7,455,220 B2 11/2008 Phillips
7,455,221 B2 11/2008 Sheaffer
7,460,108 B2 12/2008 Tamura
7,461,779 B2 12/2008 Ramachandran
7,461,780 B2 12/2008 Potts
7,471,818 B1 12/2008 Price
7,475,040 B2 1/2009 Buchanan
7,477,923 B2 1/2009 Wallmark
7,480,382 B2 1/2009 Dunbar
7,480,422 B2 1/2009 Ackley et al.
7,489,953 B2 2/2009 Griffin
7,490,242 B2 2/2009 Torres
7,497,429 B2 3/2009 Reynders
7,503,486 B2 3/2009 Ahles
7,505,759 B1 3/2009 Rahman
7,506,261 B2 3/2009 Satou
7,509,287 B2 3/2009 Nutahara
7,512,564 B1 3/2009 Geer
7,519,560 B2 4/2009 Lam
7,520,420 B2 4/2009 Phillips
7,520,422 B1 4/2009 Robinson et al.
7,536,354 B1 5/2009 deGroeve et al.
7,536,440 B2 5/2009 Budd
7,539,646 B2 5/2009 Gilder
7,540,408 B2 6/2009 Levine
7,542,598 B2 6/2009 Jones
7,545,529 B2 6/2009 Borrey et al.
7,548,641 B2 6/2009 Gilson et al.
7,566,002 B2 7/2009 Love et al.
7,571,848 B2 8/2009 Cohen
7,587,066 B2 9/2009 Cordery et al.
7,587,363 B2 9/2009 Cataline
7,590,275 B2 9/2009 Clarke et al.
7,599,543 B2 10/2009 Jones
7,599,888 B2 10/2009 Manfre
7,602,956 B2 10/2009 Jones
7,606,762 B1 10/2009 Heit
7,609,873 B2 10/2009 Foth et al.
7,619,721 B2 11/2009 Jones
7,620,231 B2 11/2009 Jones
7,620,604 B1 11/2009 Bueche, Jr.
7,630,518 B2 12/2009 Frew et al.
7,644,037 B1 1/2010 Ostrovsky
7,644,043 B2 1/2010 Minowa
7,647,275 B2 1/2010 Jones
7,668,363 B2 2/2010 Price
7,672,940 B2 3/2010 Viola
7,676,409 B1 3/2010 Ahmad
7,680,735 B1 3/2010 Loy
7,689,482 B2 3/2010 Lam

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,697,776 B2 4/2010 Wu et al.
7,698,222 B1 4/2010 Bueche, Jr.
7,702,588 B2 4/2010 Gilder
7,734,545 B1 6/2010 Fogliano
7,743,979 B2 6/2010 Fredman
7,753,268 B1 7/2010 Robinson et al.
7,761,358 B2 7/2010 Craig et al.
7,766,244 B1 8/2010 Field
7,769,650 B2 8/2010 Bleunven
7,792,752 B1 9/2010 Kay
7,792,753 B1 9/2010 Slater et al.
7,810,714 B2 10/2010 Murata
7,818,245 B2 10/2010 Prakash et al.
7,856,402 B1 12/2010 Kay
7,873,200 B1 1/2011 ●akes, III et al.
7,876,949 B1 1/2011 ●akes, III et al.
7,885,451 B1 2/2011 Walls et al.
7,885,880 B1 2/2011 Prasad et al.
7,894,094 B2 2/2011 Nacman et al.
7,896,232 B1 3/2011 Prasad et al.
7,900,822 B1 3/2011 Prasad et al.
7,903,863 B2 3/2011 Jones et al.
7,904,386 B2 3/2011 Kalra et al.
7,912,785 B1 3/2011 Kay
7,949,587 B1 5/2011 Morris et al.
7,950,698 B2 5/2011 Popadic et al.
7,962,411 B1 6/2011 Prasad et al.
7,970,677 B1 6/2011 ●akes, III et al.
7,974,899 B1 7/2011 Prasad et al.
7,978,900 B2 7/2011 Nepomniachtchi et al.
7,996,314 B1 8/2011 Smith et al.
7,996,315 B1 8/2011 Smith et al.
7,996,316 B1 8/2011 Smith et al.
8,001,051 B1 8/2011 Smith et al.
8,045,784 B2 10/2011 Price et al.
8,046,301 B1 10/2011 Smith et al.
8,060,442 B1 11/2011 Hecht et al.
8,116,533 B2 * 2/2012 Kiplinger et al. 382/112
8,204,293 B2 6/2012 Csulits et al.
8,235,284 B1 8/2012 Prasad et al.
8,320,657 B1 11/2012 Burks et al.
8,358,826 B1 1/2013 Medina, III et al.
8,422,758 B1 4/2013 Bueche, Jr.
2001/0004235 A1 6/2001 Maloney
2001/0014881 A1 8/2001 Drummond
2001/0016084 A1 8/2001 Pollard et al.
2001/0018739 A1 8/2001 Anderson
2001/0027994 A1 10/2001 Hayashida
2001/0037299 A1 11/2001 Nichols et al.
2001/0042171 A1 11/2001 Vermeulen
2001/0042785 A1 11/2001 Walker
2001/0043748 A1 11/2001 Wesolkowski et al.
2001/0047330 A1 11/2001 Gephart
2001/0054020 A1 12/2001 Barth et al.
2002/0001393 A1 1/2002 Jones
2002/0016763 A1 2/2002 March
2002/0016769 A1 2/2002 Barbara et al.
2002/0032656 A1 3/2002 Chen
2002/0038289 A1 3/2002 Lawlor et al.
2002/0052841 A1 5/2002 Guthrie
2002/0052853 A1 5/2002 Munoz
2002/0065786 A1 5/2002 Martens et al.
2002/0072974 A1 6/2002 Pugliese
2002/0075524 A1 6/2002 Blair
2002/0084321 A1 7/2002 Martens
2002/0087467 A1 7/2002 Mascavage, III et al.
2002/0107809 A1 8/2002 Biddle et al.
2002/0116329 A1 8/2002 Serbetcioglu
2002/0116335 A1 8/2002 Star
2002/0118891 A1 8/2002 Rudd
2002/0120562 A1 8/2002 ●piela
2002/0129249 A1 9/2002 Maillard et al.
2002/0133409 A1 9/2002 Sawano et al.
2002/0138522 A1 9/2002 Muralidhar
2002/0147798 A1 10/2002 Huang
2002/0150279 A1 10/2002 Scott
2002/0152160 A1 10/2002 Allen-Rouman et al.
2002/0152161 A1 10/2002 Aoike
2002/0152164 A1 10/2002 Dutta
2002/0152165 A1 10/2002 Dutta et al.
2002/0152169 A1 10/2002 Dutta
2002/0159648 A1 10/2002 Alderson et al.
2002/0171820 A1 11/2002 ●kamura
2002/0178112 A1 11/2002 Goeller
2002/0186881 A1 12/2002 Li
2002/0188564 A1 12/2002 Star
2002/0195485 A1 12/2002 Pomerleau et al.
2003/0005326 A1 1/2003 Flemming
2003/0023557 A1 1/2003 Moore
2003/0026609 A1 * 2/2003 Parulski 396/281
2003/0038227 A1 2/2003 Sesek
2003/0055756 A1 3/2003 Allan
2003/0055776 A1 3/2003 Samuelson
2003/0074315 A1 4/2003 Lam
2003/0075596 A1 4/2003 Koakutsu
2003/0075916 A1 4/2003 Gorski
2003/0081824 A1 5/2003 Mennie
2003/0093367 A1 5/2003 Allen-Rouman et al.
2003/0093369 A1 5/2003 Ijichi et al.
2003/0102714 A1 6/2003 Rhodes et al.
2003/0105688 A1 6/2003 Brown et al.
2003/0105714 A1 6/2003 Alarcon-Luther et al.
2003/0132384 A1 * 7/2003 Sugiyama et al. 250/330
2003/0139999 A1 7/2003 Rowe
2003/0159046 A1 8/2003 Choi et al.
2003/0167225 A1 9/2003 Adams
2003/0191615 A1 10/2003 Bailey
2003/0191869 A1 10/2003 Williams
2003/0200174 A1 10/2003 Star
2003/0212904 A1 11/2003 Randle et al.
2003/0217005 A1 11/2003 Drummond et al.
2003/0225705 A1 12/2003 Park et al.
2003/0233278 A1 12/2003 Marshall
2003/0233318 A1 12/2003 King et al.
2004/0010466 A1 1/2004 Anderson
2004/0012496 A1 1/2004 De Souza
2004/0013284 A1 1/2004 Yu
2004/0024626 A1 2/2004 Bruijning
2004/0024708 A1 2/2004 Masuda
2004/0030741 A1 2/2004 Wolton et al.
2004/0057697 A1 3/2004 Renzi
2004/0058705 A1 3/2004 Morgan
2004/0066031 A1 4/2004 Wong
2004/0069841 A1 4/2004 Wong
2004/0071333 A1 4/2004 Douglas et al.
2004/0076320 A1 4/2004 Downs, Jr.
2004/0078299 A1 4/2004 Down-Logan
2004/0080795 A1 4/2004 Bean et al.
2004/0089711 A1 5/2004 Sandru
2004/0093303 A1 5/2004 Picciallo
2004/0093305 A1 5/2004 Kight
2004/0103057 A1 5/2004 Melbert et al.
2004/0103296 A1 5/2004 Harp
2004/0109596 A1 6/2004 Doran
2004/0110975 A1 6/2004 ●sinski et al.
2004/0117302 A1 6/2004 Weichert
2004/0122754 A1 6/2004 Stevens
2004/0133511 A1 7/2004 Smith et al.
2004/0138974 A1 7/2004 Shimamura
2004/0148235 A1 7/2004 Craig
2004/0158549 A1 8/2004 Matena
2004/0165096 A1 8/2004 Maeno
2004/0170259 A1 9/2004 Park
2004/0210515 A1 10/2004 Hughes
2004/0210523 A1 10/2004 Gains et al.
2004/0228277 A1 11/2004 Williams
2004/0236647 A1 11/2004 Acharya
2004/0236688 A1 11/2004 Bozeman
2004/0240722 A1 12/2004 Tsuji et al.
2004/0245324 A1 12/2004 Chen
2004/0247199 A1 12/2004 Murai et al.
2004/0248600 A1 12/2004 Kim
2004/0252679 A1 12/2004 Williams
2004/0260636 A1 12/2004 Marceau

(56) **References Cited**

U.S. PATENT DOCUMENTS

2004/0267666 A1 12/2004 Minami
2005/0001421 A1 1/2005 Luth et al.
2005/0010108 A1 1/2005 Rahn et al.
2005/0021466 A1 1/2005 Buchanan et al.
2005/0030388 A1* 2/2005 Stavely et al. 348/222.1
2005/0033645 A1 2/2005 Duphily
2005/0033685 A1 2/2005 Reyes
2005/0033695 A1 2/2005 Minowa
2005/0035193 A1 2/2005 Gustin et al.
2005/0038746 A1 2/2005 Latimer et al.
2005/0038754 A1 2/2005 Geist
2005/0044042 A1 2/2005 Mendiola
2005/0044577 A1 2/2005 Jerding
2005/0049950 A1 3/2005 Johnson
2005/0071283 A1 3/2005 Randle et al.
2005/0075969 A1 4/2005 Nielson et al.
2005/0075974 A1 4/2005 Turgeon
2005/0078336 A1 4/2005 Ferlitsch
2005/0080725 A1 4/2005 Pick
2005/0082364 A1 4/2005 Alvarez et al.
2005/0086140 A1 4/2005 Ireland
2005/0086168 A1 4/2005 Alvarez
2005/0091161 A1 4/2005 Gustin
2005/0096992 A1 5/2005 Geisel
2005/0097019 A1 5/2005 Jacobs
2005/0097046 A1 5/2005 Singfield
2005/0097050 A1 5/2005 Orcutt
2005/0108164 A1 5/2005 Salafia
2005/0108168 A1 5/2005 Halpin
2005/0115110 A1 6/2005 Dinkins
2005/0125338 A1 6/2005 Tidwell et al.
2005/0125360 A1 6/2005 Tidwell et al.
2005/0127160 A1 6/2005 Fujikawa
2005/0131820 A1 6/2005 Rodriguez
2005/0143136 A1 6/2005 Lev et al.
2005/0149436 A1 7/2005 Elterich
2005/0168566 A1 8/2005 Tada
2005/0171899 A1 8/2005 Dunn
2005/0171907 A1 8/2005 Lewis
2005/0177499 A1 8/2005 Thomas
2005/0177518 A1 8/2005 Brown
2005/0182710 A1 8/2005 Anderson
2005/0188306 A1 8/2005 Mackenzie
2005/0205661 A1 9/2005 Taylor
2005/0209961 A1 9/2005 Michelsen
2005/0220324 A1* 10/2005 Klein et al. 382/112
2005/0228733 A1 10/2005 Bent
2005/0252955 A1 11/2005 Sugai
2005/0267843 A1 12/2005 Acharya et al.
2005/0268107 A1 12/2005 Harris et al.
2005/0269412 A1 12/2005 Chiu
2005/0273368 A1 12/2005 Hutten et al.
2005/0278250 A1 12/2005 Zair
2005/0281448 A1 12/2005 Lugg
2005/0281471 A1 12/2005 LeConte
2005/0281474 A1 12/2005 Huang
2005/0289030 A1 12/2005 Smith
2005/0289182 A1 12/2005 Pandian et al.
2006/0002426 A1 1/2006 Madour
2006/0004660 A1 1/2006 Pranger
2006/0017752 A1 1/2006 Kurzweil et al.
2006/0025697 A1 2/2006 Kurzweil
2006/0039628 A1 2/2006 Li et al.
2006/0039629 A1 2/2006 Li
2006/0041506 A1 2/2006 Mason et al.
2006/0045321 A1 3/2006 Yu
2006/0047593 A1 3/2006 Naratil
2006/0053056 A1 3/2006 Alspach-Goss
2006/0059085 A1 3/2006 Tucker
2006/0064368 A1 3/2006 Forte
2006/0080245 A1 4/2006 Bahl
2006/0085357 A1 4/2006 Pizarro
2006/0085516 A1 4/2006 Farr et al.
2006/0102704 A1 5/2006 Reynders
2006/0106691 A1 5/2006 Sheaffer
2006/0106717 A1 5/2006 Randle
2006/0110063 A1 5/2006 Weiss
2006/0112013 A1 5/2006 Maloney
2006/0115110 A1 6/2006 Rodriguez
2006/0115141 A1 6/2006 Koakutsu
2006/0118613 A1 6/2006 McMann
2006/0124730 A1 6/2006 Maloney
2006/0144924 A1 7/2006 Stover
2006/0144950 A1 7/2006 Johnson
2006/0161501 A1 7/2006 Waserstein
2006/0164682 A1 7/2006 Lev
2006/0166178 A1* 7/2006 Driedijk ..... 434/307 R
2006/0167818 A1 7/2006 Wentker et al.
2006/0182331 A1 8/2006 Gilson et al.
2006/0182332 A1 8/2006 Weber
2006/0186194 A1 8/2006 Richardson et al.
2006/0206506 A1 9/2006 Fitzpatrick
2006/0208059 A1 9/2006 Cable et al.
2006/0210138 A1 9/2006 Hilton et al.
2006/0212391 A1 9/2006 Norman et al.
2006/0214940 A1 9/2006 Kinoshita
2006/0215204 A1 9/2006 Miyamoto et al.
2006/0215230 A1 9/2006 Borrey et al.
2006/0222260 A1 10/2006 Sambongi et al.
2006/0229976 A1 10/2006 Jung
2006/0229986 A1 10/2006 Corder
2006/0238503 A1 10/2006 Smith
2006/0242062 A1 10/2006 Peterson
2006/0242063 A1 10/2006 Peterson
2006/0249567 A1 11/2006 Byrne
2006/0274164 A1 12/2006 Kimura et al.
2006/0279628 A1 12/2006 Fleming
2006/0282383 A1 12/2006 Doran
2006/0291744 A1 12/2006 Ikeda et al.
2007/0016796 A1 1/2007 Singhal
2007/0019243 A1 1/2007 Sato
2007/0022053 A1 1/2007 Waserstein
2007/0027802 A1 2/2007 VanDeburg et al.
2007/0030357 A1 2/2007 Levien et al.
2007/0031022 A1 2/2007 Frew
2007/0038561 A1 2/2007 Vancini et al.
2007/0041629 A1 2/2007 Prakash et al.
2007/0050292 A1 3/2007 Yarbrough
2007/0053574 A1 3/2007 Verma et al.
2007/0058851 A1 3/2007 Quine
2007/0063016 A1 3/2007 Myatt
2007/0064991 A1 3/2007 Douglas et al.
2007/0065143 A1 3/2007 Didow et al.
2007/0075772 A1 4/2007 Kokubo
2007/0076940 A1 4/2007 Goodall et al.
2007/0076941 A1 4/2007 Carreon et al.
2007/0077921 A1 4/2007 Hayashi
2007/0080207 A1 4/2007 Williams
2007/0082700 A1 4/2007 Landschaft et al.
2007/0084911 A1 4/2007 Crowell
2007/0086642 A1 4/2007 Foth
2007/0086643 A1 4/2007 Spier
2007/0094088 A1 4/2007 Mastie
2007/0094140 A1 4/2007 Riney et al.
2007/0100748 A1 5/2007 Dheer
2007/0110277 A1 5/2007 Hayduchok et al.
2007/0118472 A1 5/2007 Allen-Rouman et al.
2007/0122024 A1 5/2007 Haas et al.
2007/0127805 A1 6/2007 Foth et al.
2007/0129955 A1 6/2007 Dalmia
2007/0136198 A1 6/2007 Foth et al.
2007/0140545 A1 6/2007 Rossignoli
2007/0140594 A1 6/2007 Franklin
2007/0143208 A1 6/2007 Varga
2007/0150337 A1 6/2007 Hawkins et al.
2007/0156438 A1 7/2007 Popadic
2007/0168265 A1 7/2007 Rosenberger
2007/0171288 A1 7/2007 Inoue et al.
2007/0172107 A1 7/2007 Jones et al.
2007/0172148 A1 7/2007 Hawley
2007/0179883 A1 8/2007 Questembert
2007/0183000 A1 8/2007 Eisen et al.
2007/0183741 A1 8/2007 Lerman et al.
2007/0194102 A1 8/2007 Cohen

(56) **References Cited**

U.S. PATENT DOCUMENTS

2007/0198432 A1 8/2007 Pitroda et al.
2007/0203708 A1 8/2007 Polcyn et al.
2007/0208816 A1 9/2007 Baldwin et al.
2007/0217669 A1 9/2007 Swift et al.
2007/0233585 A1 10/2007 Ben Simon et al.
2007/0235518 A1 10/2007 Mueller et al.
2007/0235520 A1 10/2007 Smith et al.
2007/0241179 A1 10/2007 Davis
2007/0244782 A1 10/2007 Chimento
2007/0246525 A1 10/2007 Smith et al.
2007/0251992 A1 11/2007 Sharma et al.
2007/0255652 A1 11/2007 Tumminaro
2007/0255653 A1 11/2007 Tumminaro
2007/0255662 A1 11/2007 Tumminaro
2007/0258634 A1 11/2007 Simonoff
2007/0268540 A1 11/2007 Gaspardo et al.
2007/0271182 A1 11/2007 Prakash et al.
2007/0278286 A1 12/2007 Crowell et al.
2007/0288380 A1 12/2007 Starrs
2007/0288382 A1 12/2007 Narayanan et al.
2007/0295803 A1 12/2007 Levine et al.
2007/0299928 A1 12/2007 Kohli et al.
2008/0002911 A1 1/2008 Eisen
2008/0021802 A1 1/2008 Pendelton
2008/0040280 A1 2/2008 Davis et al.
2008/0052182 A1 2/2008 Marshall
2008/0059376 A1 3/2008 Davis
2008/0063253 A1 3/2008 Wood
2008/0068674 A1 3/2008 McIntyre
2008/0071721 A1 3/2008 Wang
2008/0080760 A1 4/2008 Ronca
2008/0086420 A1 4/2008 Gilder et al.
2008/0086421 A1 4/2008 Gilder
2008/0091599 A1 4/2008 Foss, Jr.
2008/0097899 A1 4/2008 Jackson et al.
2008/0103790 A1 5/2008 Abernethy
2008/0103967 A1 5/2008 Ackert et al.
2008/0113674 A1 5/2008 Baig
2008/0114739 A1 5/2008 Hayes
2008/0116257 A1 5/2008 Fickling
2008/0117991 A1 5/2008 Peddireddy
2008/0119178 A1 5/2008 Peddireddy
2008/0133411 A1 6/2008 Jones et al.
2008/0147549 A1 6/2008 Rathbun
2008/0156438 A1 7/2008 Stumphauzer et al.
2008/0162319 A1 7/2008 Breeden et al.
2008/0162350 A1 7/2008 Allen-Rouman et al.
2008/0162371 A1 7/2008 Rampell et al.
2008/0177659 A1 7/2008 Lacey et al.
2008/0180750 A1 7/2008 Feldman
2008/0208727 A1 8/2008 McLaughlin et al.
2008/0214180 A1 9/2008 Cunningham et al.
2008/0219543 A1 9/2008 Csulits
2008/0245869 A1 10/2008 Berkun et al.
2008/0247629 A1 10/2008 Gilder
2008/0247655 A1 10/2008 Yano
2008/0249931 A1 10/2008 Gilder
2008/0249951 A1 10/2008 Gilder et al.
2008/0262953 A1 10/2008 Anderson
2008/0275821 A1 11/2008 Bishop et al.
2008/0316542 A1 12/2008 Mindrum et al.
2009/0024520 A1 1/2009 Drory et al.
2009/0046938 A1 2/2009 Yoder
2009/0060396 A1 3/2009 Blessan et al.
2009/0066987 A1 3/2009 Inokuchi
2009/0108080 A1 4/2009 Meyer
2009/0110281 A1 4/2009 Hirabayashi
2009/0141962 A1 6/2009 Borgia et al.
2009/0166406 A1 7/2009 Pigg et al.
2009/0167870 A1 7/2009 Caleca et al.
2009/0171819 A1 7/2009 Emde et al.
2009/0171825 A1 7/2009 Roman
2009/0173781 A1 7/2009 Ramachadran
2009/0185738 A1 7/2009 Nepomniachtchi
2009/0190823 A1 7/2009 Walters
2009/0192938 A1 7/2009 Amos
2009/0236413 A1 9/2009 Mueller et al.
2009/0252437 A1 10/2009 Li
2009/0254447 A1 10/2009 Blades
2009/0281904 A1 11/2009 Pharris
2009/0284637 A1* 11/2009 Parulski et al. 348/333.12
2009/0313167 A1 12/2009 Dujari
2010/0007899 A1 1/2010 Lay
2010/0027679 A1 2/2010 Sunahara et al.
2010/0047000 A1 2/2010 Park et al.
2010/0057578 A1 3/2010 Blair et al.
2010/0061446 A1 3/2010 Hands et al.
2010/0082470 A1 4/2010 Walach
2010/0165015 A1 7/2010 Barkley et al.
2010/0226559 A1 9/2010 Najari et al.
2010/0260408 A1 10/2010 Prakash et al.
2010/0262522 A1 10/2010 Anderson et al.
2010/0312705 A1 12/2010 Caruso
2011/0112967 A1 5/2011 Anderson et al.
2011/0310442 A1 12/2011 Popadic et al.
2012/0229872 A1* 9/2012 Dolev 358/448
2013/0021651 A9 1/2013 Popadic et al.

FOREIGN PATENT DOCUMENTS

WO 2006/075967 A1 7/2006
WO 2006/136958 A2 12/2006

OTHER PUBLICATIONS

Mitek Systems: "Mitek Systems Launches First Mobile Check Deposit and Bill Pay Application", Jan. 22, 2008, 3 pages, San Diego, California.
Fisher, Dan M.: "Home Banking in the 21st Century: Remote Capture Has Gone Retail!", 4 pages.
White, J.M. et al., "Image Thresholding for Optical Character Recognition and Other Applications Requiring Character Image Extraction", IBM J. Res. Development, Jul. 1983, vol. 27, No. 4 (12 pgs).
Ritzer, J.R. "Hinky Dinky helped spearhead POS, remote banking movement", Bank Systems and Equipment, vol. 21, No. 12, Dec. 1984 (1 pg).
Dinan, R.F. et al., "Image Plus High Performance Transaction System", IBM Systems Journal, 1990 vol. 29, No. 3 (14 pgs).
Gupta, Amar et al., "An Integrated Architecture for Recognition of Totally Unconstrained Handwritten Numerals", WP#3765, Jan. 1993, Productivity from Information Technology "Profit" Research Initiative Sloan School of Management (20 pgs).
Masonson, L., "Check Truncation and ACH Trends—Automated Clearing Houses", healthcare financial management associate, http://www.findarticles.com/p/articles/mLm3276/is_n7_v47/ai_14466034/print, 1993 (2 pgs).
Zhang, C.Y., "Robust Estimation and Image Combining" Astronomical Data Analysis Software and Systems IV, ASP Conference Series, 1995 (5 pgs).
Kornai Andras et al., "Recognition of Cursive Writing on Personal Checks", Proceedings of International Workshop on the Frontiers in Handwritting Recognition, Cited in patent No. 7,900,822, as dated Sep. 1996, (6 pgs).
De Queiroz, Ricardo et al., "Mixed Raster Content (MRC) Model for Compound Image Compression", 1998 (14 pgs).
Rivlin, Alice M. et al., Chair, Vice Chair—Board of Governors, Committee on the Federal Reserve in the Payments Mechanism—Federal Reserve System, "The Federal Reserve in the Payments Mechanism", Jan. 1998 (41 pgs).
Tygar, J.D., Atomicity in Electronic Commerce, In ACM Networker, 2:2, Apr./May 1998 (12 pgs).
Anderson, Milton M. "FSML and Echeck", Financial Services Technology Consortium, 1999 (17 pgs).
"Full Service Direct Deposit", www.nonprofitstaffing.com/images/upload/dirdepform.pdf. Cited in patent No. 7,900,822, as dated 2001, (2 pgs).
Craig, Ben, "Resisting Electronic Payment Systems: Burning Down the House?", Federal Reserve Bank of Cleveland, Jul. 1999 (4 pgs).
Rose, Sarah et al., "Best of the We: The Top 50 Financial Websites", Money, New York, Dec. 1999, vol. 28, Iss. 12 (8 pgs).

(56) **References Cited**

OTHER PUBLICATIONS

Furst, Karen et al., "Internet Banking: Developments and Prospects", Economic and Policy Analysis Working Paper 2000-9, Sep. 2000 (60 pgs).

"Middleware", David E. Bakken, Encyclopedia of Distributed Computing, Kluwer Academic Press, 2001 (6 pgs).

Palacios, Rafael et al., "Automatic Processing of Brazilian Bank Checks". Cited in patent No. 7,900,822, as dated 2002 (28 pgs).

Wallison, Peter J., "Wal-Mart Case Exposes Flaws in Banking-Commerce Split", American Banker, vol. 167. No. 8, Jan. 11, 2002 (3 pgs).

Heckenberg, D. "Using Mac OS X for Real-Time Image Processing" Oct. 8, 2003 (15 pgs).

Burnett, J. "Depository Bank Endorsement Requirements," Bankersonline.com, http://www.bankersonline.com/cgi-bin/printview/printview.pl, Jan. 6, 2003 (3 pgs).

Blafore, Bonnie "Lower Commissions, Fewer Amenities", Better Investing, Madison Heights: Feb. 2003, vol. 52, Iss 6, (4 pgs).

"Direct Deposit Authorization Form", www.umass.edu/humres/library/DDForm.pdf, May 2003 (3 pgs).

"Electronic Billing Problem: The E-check is in the mail" American Banker—vol. 168, No. 95, May 19, 2003 (4 pgs).

Oxley, Michael G., From committee on Financial Services; "Check Clearing for the 21st Century Act", 108th Congress, 1st Session House of Representatives report 108-132, Jun. 2003 (20 pgs).

Shelby, Hon. Richard C. (Committee on Banking, Housing and Urban Affairs); "Check Truncation Act of 2003", calendar No. 168, 108th Congress, 1st Session Senate report 108-79, Jun. 2003 (27 pgs).

Knestout, Brian P. et al., "Banking Made Easy" Kiplinger's Personal Finance Washington, Jul. 2003, vol. 57, Iss 7 (5 pgs).

Oxley, Michael G., From the committee of conference; "Check Clearing for the 21st Century Act" 108th Congress, 1st Session Senate report 108-291, Oct. 1, 2003 (27 pgs).

Public Law 108-100, 108 Congress; "An Act Check Clearing for the 21st Century Act", Oct. 28, 2003, 117 STAT. 1177 (18 pgs).

Johnson, Jennifer J., Secretary of the Board; Federal Reserve System, 12 CFR Part 229, Regulation CC; Docket No. R 1176, "Availability of Funds and Collection of Checks". Cited in patent No. 7,900,822, as dated 2009, (89 pgs).

Mohl, Bruce, "Banks Reimbursing ATM Fee to Compete With Larger Rivals", Boston Globe, Boston, MA, Sep. 19, 2004 (3 pgs).

The Automated Clearinghouse, "Retail Payment Systems; Payment Instruments Clearing and Settlement: The Automated Clearinghouse (ACH)", www.ffiec.gov/ffiecinfobase/booklets/retailretail_02d.html, Cited in patent No. 7,900,822, as dated Dec. 2005 (3 pgs).

"Two Words Every Business Should Know: Remote Deposit," Canon, http://www.rpsolutions.com/rpweb/pdfs/canon_rdc.pdf, 2005 (7 pgs).

Wells Fargo 2005 News Releases, "The New Wells Fargo Electronic Deposit Services Break Through Banking Boundaries In The Age of Check 21", San Francisco Mar. 28, 2005, www.wellsfargo.com/press/3282005_check21Year=2005 (1 pg).

Constanzo, Chris, "Remote Check Deposit: Wells Captures A New Checking Twist", Bank Technology News Article—May 2005, www.americanbanker.com/btn_article.html?id=20050502YQ5QFSYG (2 pgs).

German Shegalov, Diplom-Informatiker, "Integrated Data, Message, and Process Recovery for Failure Masking in Web Services", Dissertation Jul. 2005 (146 pgs).

Credit Union Journal, "AFCU Averaging 80 DepositHome Transactions Per Day", Credit Union Journal, Aug. 15, 2005 (1 pg).

Federal Check 21 Act, "New Check 21 Act effective Oct. 28, 2004: Bank No Longer Will Return Original Cancelled Checks," Consumer Union's FAQ's and Congressional Testimony on Check 21, www.consumerlaw.org.initiatives/content/check21_content.html, Cited in patent No. 7,873,200, as dated Dec. 2005 (20 pgs).

BankServ, "DepositNow: What's the difference?" Cited in patent No. 7,970,677, as dated 2006, (4 pgs).

BankServ, Product Overview, http://www.bankserv.com/products/remotedeposit.htm, Cited in patent No. 7,970,677, as dated 2006, (3 pgs).

Blue Mountain Consulting, from URL: www.bluemontainconsulting.com, Cited in patent No. 7,900,822, as dated Apr. 26, 2006 (3 pgs).

Remotedepositcapture, URL:www.remotedepositcapture.com, Cited in patent No. 7,900,822, as dated 2006 (5 pgs).

Onlinecheck.com/Merchant Advisors, "Real-Time Check Debit", Merchant Advisors: Retail Check Processing Check Conversion, http://www.onlinecheck/wach/rcareal.htm, Cited in patent No. 7,900,822, as dated 2006 (2 pgs).

"Compliance with Regulation CC", http./www/federalreserve.gov/Pubs/regcc/regcc.htm, Jan. 24, 2006 (6 pgs).

Chiang, Chuck, The Bulletin, "Remote banking offered", http://bendbulletin.com/apps/pbcs.dll/article?AID=/20060201/BIZ0102/602010327&templ . . . Feb. 1, 2006 (2 pgs).

Federal Reserve Board, "Check Clearing for the 21st Century Act", FRB, http://www.federalreserve.gov/paymentsystems/truncation/, Mar. 1, 2006 (1 pg).

Fest, Glen., "Patently Unaware" Bank Technology News, Apr. 2006, Retrieved from the internet at URL:http://banktechnews.com/article.html?id=20064031T7612618 (5 pgs).

Bank Systems & Technology, Untitled Article, May 1, 2006, http://www.banktech.com/showarticle.jhtml?_articleID=187003126,

"Are you Winning in the Payment World?" (4 pgs).

Digital Transactions News, "An ACH-Image Proposal for Check Roils Banks and Networks" May 26, 2006 (3 pgs).

RemoteDepositCapture.com, Remote Deposit Capture News Articles from Jul. 6, 2006, "BankSery Announces New Remote Deposit Product Integrated with QuickBooks" (3 pgs).

RemoteDepositCapture.com, "PNC Bank to Offer Ease of Online Deposit Service Integrated with QuickBooks to Small Businesses", Remote Deposit Capture News Articles from Jul. 24, 2006, (2 pgs).

Dias, Danilo et al., "A Model for the Electronic Representation of Bank Checks", Brasilia Univ. Oct. 2006 (5 pgs).

"Check Fraud: A Guide to Avoiding Losses", All Net, http://all.net/books/audit/checkfraud/security.htm, Cited in patent No. 7,900,822, as dated 2007 (1 pg).

"What is check Fraud", National Check Fraud Center, http://www.ckfraud.org/ckfraud.html , Cited in patent No. 7,900,822, as dated 2007 (12 pgs).

"Remote Deposit" National City, http://www.nationalcity.com/smallbusiness/cashmanagement/remotedeposit/default.asp; Cited in patent No. 7,900,822, as dated 2007 (1 pg).

"Remote Deposit Capture", Plante & Moran, http://plantemoran.com/industries/fincial/institutions/bank/resources/community+bank+advisor/2007+sunumer+issue/remote+deposit+capture.htm, Cited in patent No. 7,900,822, as dated 2007 (3 pgs).

"Virtual Bank Checks", Morebusiness.com, http://www.morebusiness.com/running_yourbusiness/businessbits/d908484987.brc, Cited in patent No. 7,900,822, as dated 2007 (3 pgs).

Canon, ImageFormula CR-25/CR-55, "Improve Your Bottom Line with Front-Line Efficiencies", 0117W117, 1207-55/25-1 OM-BSP, Cited in U.S. Pat. No. 7,949,587 as dated 2007. (4 pgs).

"It's the easiest way to Switch banks", LNB, http://www.inbky.com/pdf/LNBswitch-kit10-07.pdf Cited in patent No. 7,996,316, as dated 2007 (7 pgs).

"Lesson 38—More Bank Transactions", Turtle Soft, http://www.turtlesoft.com/goldenseal-software-manual.lesson38.htm, Cited in patent No. 7,900,822, as dated 2007 (8 pgs).

"Personal Finance", PNC, http://www.pnc.com/webapp/unsec/productsandservice.do?siteareа=/PNC/home/personal/account+services/quick+switch/quick+switch+faqs, Cited in patent No. 7,900,822, as dated 2007 (12 pgs).

"Switching Made Easy," Bank of North Georgia, http://www.banknorthgeorgia.com/cmsmaster/documents/286/documents616.pdf, 2007 (7 pgs).

"Chapter 7 Payroll Programs," Uniform Staff Payroll System, http://www2.oecn.k12.oh.us/www/ssdt/usps/usps_user_guide_05.html, Cited in patent No. 7,900,822, as dated 2007 (9 pgs).

"Check 21 Solutions," Columbia Financial International, Inc. http://www.columbiafinancial.us/check21/solutions.htm, Cite in patent No. 7,900,822, as dated 2007 (8 pgs).

(56) **References Cited**

OTHER PUBLICATIONS

"Direct Deposit," University of Washington, http://www.washington.edu/admin/payroll/directdeposit.html, Cite in patent No. 7,900,822, as dated 2007 (3 pgs).
"Accept "Customer Not Present" Checks," Accept Check Online, http://checksoftware.com, Cited in patent No. 7,900,822, as dated 2007 (1 pg).
"Customer Personalized Bank Checks and Address Labels" Checks Your Way Inc., http://www.checksyourway.com htm web_pages/faq.htm, Cited in patent No. 7,900,822, as dated 2007 (6 pgs).
"Direct Deposit Application for Payroll", Purdue University, Business Office Form 0003, http://purdue.edu/payroll/pdf/directdepositapplication.pdf, Jul. 2007 (2 pgs).
"Frequently Asked Questions" Bank of America, http://www/bankofamerica.com/deposits/checksave/index.cfm?template-lc_faq_bymail, Cited in patent No. 7,900,822, as dated 2007 (2 pgs).
"Refractive index" Wikipedia, the free encyclopedia; http://en.wikipedia.org./wiki/refractiveindex.com Oct. 16, 2007 (4 pgs).
Patterson, Scott "USAA Deposit@Home—Another WOW moment for Net Banking", NextCU.com, Jan. 26, 2007 (5 pgs).
Remotedepsitcapture.com, LLC, "Remote Deposit Capture Overview," ROC Overview, http://remotedepositcapture.com/overview/RDC_overview.htm, Cited in patent No. 7,900,822, as dated Mar. 12, 2007 (4 pgs).
Board of Governors of the federal reserve system, "Report to the Congress on the Check Clearing for the 21st Century Act of 2003" Apr. 2007, Submitted to Congress pursuant to section 16 of the Check Clearing for the 21st Century Act of 2003, (59 pgs).
Image Master, "Photo Restoration: We specialize in digital photo restoration and photograph repair of family pictures", http://www.imphotorepair.com, Cited in patent No. 7,900,822, as downloaded Apr. 2007 (1 pg).
"Save on ATM Fees", RedEye Edition, Chicago Tribune, Chicago, IL Jun. 30, 2007 (2 pgs).
Associate of German Banks, SEPA 2008: Uniform Payment Instruments for Europe, Berlin, Cited in patent No. 7,900,822, as dated Jul. 2007, Bundesverbankd deutscher banker ev (42 pgs).
Affinity Federal Credit Union, "Affinity Announces Online Deposit," Aug. 4, 2005 (1 pg).
"Check 21—The check is not in the post", RedTitan Technology 2004 http://www.redtitan.com check21/htm (3 pgs).
Hartly, Thomas, "Banks Check Out New Image", Business First, Buffalo: Jul. 19, 2004, vol. 20, Issue 43, (3 pgs).
Wade, Will, "Early Notes: Updating Consumers on Check 21" American Banker Aug. 10, 2004 (3 pgs).
Rao, Bharat; "The Internet and The Revolution in Distribution: A Cross-Industry Examination"; Technology in Society; 1999; pp. 287-306; vol. 21, No. 3 (20 pgs).
Alves, Vander and Borba, Paulo; "Distributed Adapters Pattern: A Design for Object-Oriented Distributed Applications"; First Latin American Conference on Pattern Languages of Programming; Oct. 2001; pp. 132-142; Rio de Janeiro, Brazil (11 pgs).
Kiser, Elizabeth K.; "Modeling the Whole Firm: The Effect of Multiple Inputs and Financial Intermediation on Bank Deposit Rates;" FEDS Working Paper No. 2004-07; Jun. 3, 2003; pp. 1-46 (46 pgs).
DeYoung, Robert; "The Financial Performance of Pure Play Internet Banks"; Federal Reserve Bank of Chicago Economic Perspectives; 2001; pp. 60-75; vol. 25, No. 1 (16pgs).
Archive Index Systems; Panini My Vision X-30 or VX30 or X30 1994-2008 Archive Systems, Inc. P./O. Box 40135 Bellevue, WA USA 98015 (2 pgs).
Aradhye, Hrishikesh B., A generic method for determining up/down orientation of text in roman and non-roman scripts, Pattern Recognition Society, Dec. 13, 2004 (18 pages).
Liang, Jian et al., Camera-based analysis of text and documents: a survey, International Journal on Document Analysis and Recognitio, Jun. 21, 2005 (21 pages).
Luo, Xi-Ping et al., Design and implementation of a card reader based on build-in camera, Proceedings of the 17th International Conference on Pattern Recognition, 2004 (4 pages).
Zandifar, A., A video-based framework for the analysis of presentations/posters, International Journal on Document Analysis and Recognition, Feb. 2, 2005 (10 pages).
Doermann, David, et al., Progress in Camera-Based Document Image Analysis, Proceedings of the Seventh Int'l Conf. on Document Analysis and Recognition, 2003, 11 pages.
U.S. Appl. No. 12/549,443, Office Action dated May 8, 2012, 9 pages.
U.S. Appl. No. 12/549,443, Applicant's Office Action Response dated Aug. 28, 2012, 11 pages.
U.S. Appl. No. 13/922,686, Office Action mailed Oct. 16, 2013, 30 pages.
U.S. Appl. No. 13/922,686, Office Action dated Apr. 25, 2014, 50 pages.
"Adjusting Brightness and Contrast", www.eaglesoftware.com/adjustin.htm, retrieved on May 4, 2009 (4 pgs).
"Best practices for producing quality digital image files," Digital Images Guidelines, http://deepblue.lib.umich.edu/bitstream/2027.42/40247/1/Images-Best_Practice.pdf, downloaded 2007 (2 pgs).
"How to Digitally Deposit a Check Image", Smart Money Daily, Copyright 2008 (5 pgs).
"ImageNet Mobile Deposit Provides Convenient Check Deposit and Bill Pay to Mobile Consumers," Miteksystems, 2008 (2 pgs).
"Mitek Systems Announces Mobile Deposit Application for Apple iPhone," http://prnewswire.com/cgi-bin/stories/pl?ACCT=104&STORY=/www/story/10-01- . . . , Nov. 25, 2008 (2 pgs).
"WallStreetGrapevine.com" Stocks on the Rise: JADG, BKYI, MITK; Mar. 3, 2008 (4 pgs).
Albrecht, W. Steve, "Check Kiting: Detection, Prosecution and Prevention," The FBI Law Enforcement Bulletin, Nov. 1, 1993 (6 pgs).
Amber Avalona-Butler / Paraglide, "At Your Service: Best iPhone Apps for Military Lifestyle," Jul. 9, 2010 (2 pgs).
Automated Merchant Systems, Inc., "Electronic Check Conversion," http://www.automatedmerchant.com electronic_check_conversion.cfm, 2006, downloaded Oct. 18, 2006 (3 pgs).
BLM Technologies, "Case Study: Addressing Check 21 and RDC Error and Fraud Threats," Remote Deposit Capture News Articles from Jun. 11, 2007, Retrieved from http://www.remotedepositcapture.com News/june_11_2007.htm on Feb. 19, 2008 (5 pgs).
Bruene, Jim; "Check Free to Enable In-Home Remote Check Deposit for Consumers and Small Business", NetBanker. Com, Financial Insite, Inc., http://www. netbanker.com/2008/02/checkfree_to_enableinhome_rem.html, Feb. 5, 2008 (3 pgs).
Bruene, Jim; "Digital Federal Credit Union and Four Others Offer Consumer Remote Deposit Capture Through EasCorp", NetBanker—Tracking Online Finance, www.netbanker.com 2008/04/digital_federal_credit_union_a.html, Apr. 13, 2008 (3 pgs).
Bruno, M., "Instant Messaging," Bank Technology News, Dec. 2002 (3 pgs).
Carrubba, P. et al., "Remote Deposit Capture: A White Paper Addressing Regulatory, Operational and Risk Issues," NetDeposit Inc., 2006 (11 pgs).
Century Remote Deposit High-Speed Scanner Users Manual Release 2006, (Century Manual), Century Bank, 2006, (32 pgs).
CNN.com/technology, "Scan, deposit checks from home", www.cnn.com/2008ITECH/biztech/02/07/check.scanning.ap/index.html, Feb. 7, 2008 (3 pgs).
Creativepaymentsolutions.com, "Creative Payment Solutions—Websolution," www.creativepaymentsolution.com cps/financialservices/websolution/default.html, Copyright 2008, Creative Payment Solutions, Inc. (1 pg).
Credit Union Journal, "The Ramifications of Remote Deposit Capture Success", www.cuiournal.com orintthis.html?id=20080411EODZT57G, Apr. 14, 2008 (1 pg).
DCU Member's Monthly—Jan. 2008, "PC Deposit—Deposit Checks from Home!", http://www.mycreditunionnewsletter.com/dcu/01 08/page1. html, Copyright 2008 Digital Federal Credit Union (2 pgs).
De Jesus, A. et al., "Distributed Check Processing in a Check 21 Environment: An educational overview of the opportunities and challenges associated with implementing distributed check imaging and processing solutions," Panini, 2004, pp. 1-22.

(56) **References Cited**

OTHER PUBLICATIONS

Debello, James et al., "RDM and Mitek Systems to Provide Mobile Check Deposit," Mitek Systems, Inc., San Diego, California and Waterloo, Ontario, (Feb. 24, 2009), 2 pgs.
eCU Technologies, "Upost Remote Deposit Solution," Retrieved from the internet https://www.eutechnologies.com products/upost.html, downloaded 2009 (1 pg).
EFT Network Unveils FAXTellerPlus, EFT Network, Inc., www.eftnetwork.com, Jan. 13, 2009 (2 pgs).
ElectronicPaymentProviders, Inc., "FAQs: ACH/ARC, CheckVerification/Conversion/Guarantee, RCK Check Re-Presentment," http://www.useapp.com faq.htm, downloaded Oct. 18, 2006 (3 pgs).
Federal Reserve System, "12 CFR, Part 229 [Regulation CC; Docket No. R-0926]: Availability of Funds and Collection of Checks," Federal Registrar, Apr. 28, 1997, pp. 1-50.
Federal Reserve System, "Part IV, 12 CFR Part 229 [Regulation CC; Docket No. R-1176]: Availability of Funds and Collection of Checks; Final Rule," Federal Registrar, vol. 69, No. 149, Aug. 4, 2004, pp. 47290-47328.
Fidelity Information Services, "Strategic Vision Embraces Major Changes in Financial Services Solutions: Fidelity's long-term product strategy ushers in new era of application design and processing," Insight, 2004, pp. 1-14.
Garry, M., "Checking Options: Retailers face an evolving landscape for electronic check processing that will require them to choose among several scenarios," Supermarket News, vol. 53, No. 49, 2005 (3 pgs).
Gupta, Maya R. et al., "MCR binarization and image pre-processing for searching historical documents," Pattern Recognition, vol. 40, No. 2, Feb. 2007, pp. 389-397.
Hale, J., "Picture this: Check 21 uses digital technology to speed check processing and shorten lag time," Columbus Business First, http://columbus.bizjournals.com columbus/stories/2005/03/14focus1.html, downloaded 2007 (3 pgs).
Hildebrand, C. et al., "Electronic Money," Oracle, http://www.oracle.com oramag/profit/05-feb/p15financial.html, 2005, downloaded Oct. 18, 2006 (5 pgs).
Hillebrand, G., "Questions and Answers About the Check Clearing for the 21st Century Act, 'Check 21," ConsumersUnion.org, http://www.consumersunion.org/finance/ckclear1002.htm, Jul. 27, 2004, downloaded Oct. 18, 2006 (6 pgs).
Investment Systems Company, "Portfolio Accounting System," 2000, pp. 1-32.
JBC, "What is a MICR Line?," eHow.com, retrieved from http://www.ehow.com about_4684793_what-micr-line.html on May 4, 2009 (2 pgs).
Kendrick, Kevin B., "Check Kiting, Float for Purposes of Profit," Bank Security & Fraud Prevention, vol. 1, No. 2, 1994 (3 pgs).
Levitin, Adam J., Remote Deposit Capture: A Legal and Transactional Overview, Banking Law Journal, p. 115, 2009 (RDC).
Matthews, Deborah, "Advanced Technology Makes Remote Deposit Capture Less Risky," Indiana Bankers Association, Apr. 2008 (2 pgs).
Metro 1 Credit Union, "Remote Banking Services," hltp://ww\\i.metro1cu.org/metro1cu/remote.html, downloaded Apr. 17, 2007 (4 pgs).
Moreau, T., "Payment by Authenticated Facsimile Transmission: a Check Replacement Technology for Small and Medium Enterprises," CONNOTECH Experts-conseils, Inc., Apr. 1995 (31 pgs).
Nelson, B. et al., "Remote deposit capture changes the retail landscape," Northwestern Financial Review, http://findarticles.com p/articles/mi qa3799/is200607/ai_n16537250, 2006 (3 pgs).
NetBank, Inc., "Branch Out: Annual Report 2004," 2004 (150 pgs).
NetBank, Inc., "Quick Post: Deposit and Payment Forwarding Service," 2005 (1 pg).
NetDeposit Awarded Two Patents for Electronic Check Process, NetDeposit, Jun. 18, 2007, (1 pg).
Nixon, Julie et al., "Fisery Research Finds Banks are Interested in Offering Mobile Deposit Capture as an," Fiserv, Inc. Brookfield, Wis., (Business Wire), (Feb. 20, 2009), 2 pgs.
Online Deposit: Frequently Asked Questions, http://www.depositnow.com faq.html, Copyright 2008 (1 pg).
Richey, J. C. et al., "EE 4530 Check Imaging," Nov. 18, 2008 (10 pgs).
SoyBank Anywhere, "Consumer Internet Banking Service Agreement," Dec. 6, 2004 (6 pgs).
Teixeira, D., "Comment: Time to Overhaul Deposit Processing Systems," American Banker, Dec. 10, 1998, vol. 163, No. 235, p. 15 (3 pgs).
The Green Sheet 2.0: Newswire, "CO-OP adds home deposit capabilities to suite of check imaging products", www.greensheet.com newswire.php?newswire_id=8799, Mar. 5, 2008 (2 pgs).
Valentine, Lisa, "Remote Deposit Capture Hot Just Got Hotter," ABA Banking Journal, Mar. 2006, p. 1-9.
Wells Fargo Commercial, "Remote Deposit", www.wellsfargo.com com treasury mgmtlreceivables/electronic/remote deposit, Copyright 2008 (1 pg).
Whitney et al., "Reserve Banks to Adopt DSTU X9.37-2003 Format for Check 21 Image Services", American Bankers Association, May 18, 2004, http://www.aba/com NR/rdonlyres/CBDC1 A5C-43E3-43CC-B733-BE417C638618/35930/DSTUFormat.pdf (2 pages).
Wikipedia ®, "Remote Deposit," http://en.wikipedia.org/wiki/Remote_deposit, 2007 (3 pgs).
Windowsfordevices.com, "Software lets camera phone users deposit checks, pay bills", www.windowsfordevices.com news/NS3934956670.html, Jan. 29, 2008 (3 pgs).
Wolfe, Daniel, "Check Image Group Outlines Agenda," American Banker, New York, N.Y.: Feb. 13, 2009, vol. 174, Iss. 30, p. 12. (2 pgs).
Woody Baird Associated Press, "Pastor's Wife got Scammed—She Apparently Fell for Overseas Money Scheme," The Commercial Appeal, Jul. 1, 2006, p. A. 1.
Zions Bancorporation, "Moneytech, the technology of money in our world: Remote Deposit," http://www.bankjunior.com pground/moneytech/remote_deposit.jsp, 2007 (2 pgs).
U.S. Appl. No. 12/062,143, filed Apr. 3, 2008 (27 pgs).
U.S. Appl. No. 12/859,741, filed Aug. 19, 2010 (235 pgs).
U.S. Appl. No. 12/195,723, filed Aug. 21, 2008 (38 pgs).
U.S. Appl. No. 12/545,127, filed Aug. 21, 2009 (45 pgs).
U.S. Appl. No. 12/549,443, filed Aug. 28, 2009 (41 pgs).
U.S. Appl. No. 11/613,656, filed Dec. 20, 2006 (21 pgs).
U.S. Appl. No. 12/982,494, filed Dec. 30, 2010 (280 pgs).
U.S. Appl. No. 12/982,561, filed Dec. 30, 2010 (275 pgs).
U.S. Appl. No. 12/982,578, filed Dec. 30, 2010 (274 pgs).
U.S. Appl. No. 12/982,594, filed Dec. 30, 2010 (275 pgs).
U.S. Appl. No. 13/397,405, filed Feb. 15, 2012 (19 pgs).
U.S. Appl. No. 12/388,005, filed Feb. 18, 2009 (37 pgs).
U.S. Appl. No. 13/735,678, filed Jan. 7, 2013 (30 pgs).
U.S. Appl. No. 11/487,537, filed Jul. 13, 2006 (23 pgs).
U.S. Appl. No. 12/509,613, filed Jul. 27, 2009 (48 pgs).
U.S. Appl. No. 12/509,680, filed Jul. 27, 2009 (41 pgs).
U.S. Appl. No. 12/137,051, filed Jun. 11, 2008 (29 pgs).
U.S. Appl. No. 13/155,976, filed Jun. 8, 2011 (352 pgs).
U.S. Appl. No. 13/156,007, filed Jun. 8, 2011 (356 pgs).
U.S. Appl. No. 13/156,018, filed Jun. 8, 2011 (353 pgs).
U.S. Appl. No. 11/686,924, filed Mar. 15, 2007 (34 pgs).
U.S. Appl. No. 11/686,928, filed Mar. 15, 2007 (36 pgs).
U.S. Appl. No. 13/842,112, filed Mar. 15, 2013 (62 pgs).
U.S. Appl. No. 12/397,671, filed Mar. 4, 2009 (40 pgs).
U.S. Appl. No. 12/397,930, filed Mar. 4, 2009 (37 pgs).
U.S. Appl. No. 11/747,222, filed May 10, 2007 (35 pgs).
U.S. Appl. No. 12/253,278, filed Oct. 17, 2008 (42 pgs).
U.S. Appl. No. 11/876,925, filed Oct. 23, 2007 (36 pgs).
U.S. Appl. No. 11/877,335, filed Oct. 23, 2007 (29 pgs).
U.S. Appl. No. 11/923,839, filed Oct. 25, 2007 (22 pgs).
U.S. Appl. No. 11/926,388, filed Oct. 29, 2007 (23 pgs).
U.S. Appl. No. 11/928,297, filed Oct. 30, 2007 (26 pgs).
U.S. Appl. No. 11/590,974, filed Oct. 31, 2006 (31 pgs).
U.S. Appl. No. 11/591,008, filed Oct. 31, 2006 (27 pgs).
U.S. Appl. No. 11/591,227, filed Oct. 31, 2006 (58 pgs).
U.S. Appl. No. 11/591,273, filed Oct. 31, 2006 (56 pgs).
U.S. Appl. No. 11/930,537, filed Oct. 31, 2007 (27 pgs).
U.S. Appl. No. 11/931,670, filed Oct. 31, 2007 (47 pgs).

(56) **References Cited**

OTHER PUBLICATIONS

U.S. Appl. No. 11/868,884, filed Oct. 8, 2007 (30 pgs).
U.S. Appl. No. 11/864,569, filed Sep. 28, 2007 (35 pgs).
U.S. Appl. No. 12/205,996, filed Sep. 8, 2008 (30 pgs).
Claims as filed on Apr. 3, 2008 for U.S. Appl. No. 12/062,163 (3 pgs).
Claims as filed on Apr. 3, 2008 for U.S. Appl. No. 12/062,175 (3 pgs).
Claims as filed on Aug. 19, 2010 for U.S. Appl. No. 12/859,752 (5 pgs).
Claimes as filed on Dec. 15, 2011 for U.S. Appl. No. 13/327,478 (4 pgs).
Claims as filed on Dec. 20, 2006 for U.S. Appl. No. 11/613,671, (3 pgs).
Claims as filed on Dec. 20, 2012 for U.S. Appl. No. 13/722,576 (4 pgs).
Claims as filed on Dec. 29, 2005 for U.S. Appl. No. 11/320,998 (3 pgs).
Claims as filed on Dec. 29, 2005 for U.S. Appl. No. 11/321,027 (3 pgs).
Claims as filed on Dec. 8, 2010 for U.S. Appl. No. 12/963,513 (7 pgs).
Claims as filed on Feb. 12, 2013 for U.S. Appl. No. 13/765,412 (1 pg).
Claims as filed on Feb. 15, 2012 for U.S. Appl. No. 13/397,437 (6 pgs).
Claims as filed on Feb. 16, 2011 for U.S. Appl. No. 13/028,477 (3 pgs).
Claims as filed on Feb. 19, 2013 for U.S. Appl. No. 13/770,048 (4 pgs).
Claims as filed on Jan. 20, 2011 for U.S. Appl. No. 13/010,644 (9 pgs).
Claims as filed on Jan. 31, 2011 for U.S. Appl. No. 13/017,865 (11 pgs).
Claims as filed on Mar. 15, 2007 for U.S. Appl. No. 11/686,925 (5 pgs).
Claims as filed on May 10, 2007 for U.S. Appl. No. 11/747,223 (4 pgs).
Claims as filed on May 18, 2011 for U.S. Appl. No. 13/110,077 (9 pgs).
Claims as filed on May 2, 2011 for U.S. Appl. No. 13/098,566 (10 pgs).
Claims as filed on Nov. 20, 2012 for U.S. Appl. No. 13/682,268 (4 pgs).
Claims as filed on Oct. 23, 2007 for U.S. Appl. No. 11/877,382 (6 pgs).
Claims as filed on Oct. 24, 2008 for U.S. Appl. No. 12/257,471 (4 pgs).
Claims as filed on Oct. 31, 2006 for U.S. Appl. No. 11/590,963 (3 pgs).
Claims as filed on Oct. 31, 2006 for U.S. Appl. No. 11/590,995 (3 pgs).
Claims as filed on Oct. 31, 2006 for U.S. Appl. No. 11/590,998 (4 pgs).
Claims as filed on Oct. 31, 2007 for U.S. Appl. No. 11/931,804 (4 pgs).
Claims as filed on Oct. 8, 2007 for U.S. Appl. No. 11/868,878 (4 pgs).
Claims as filed on Sep. 14, 2012 for U.S. Appl. No. 13/619,026 (3 pgs).
Claims as filed on Sep. 2, 2008 for U.S. Appl. No. 12/202,781 (4 pgs).
Claims as filed on Sep. 8, 2008 for U.S. Appl. No. 12/206,001 (3 pgs).
Claims as filed on Sep. 8, 2008 for U.S. Appl. No. 12/206,007 (3 pgs).

* cited by examiner

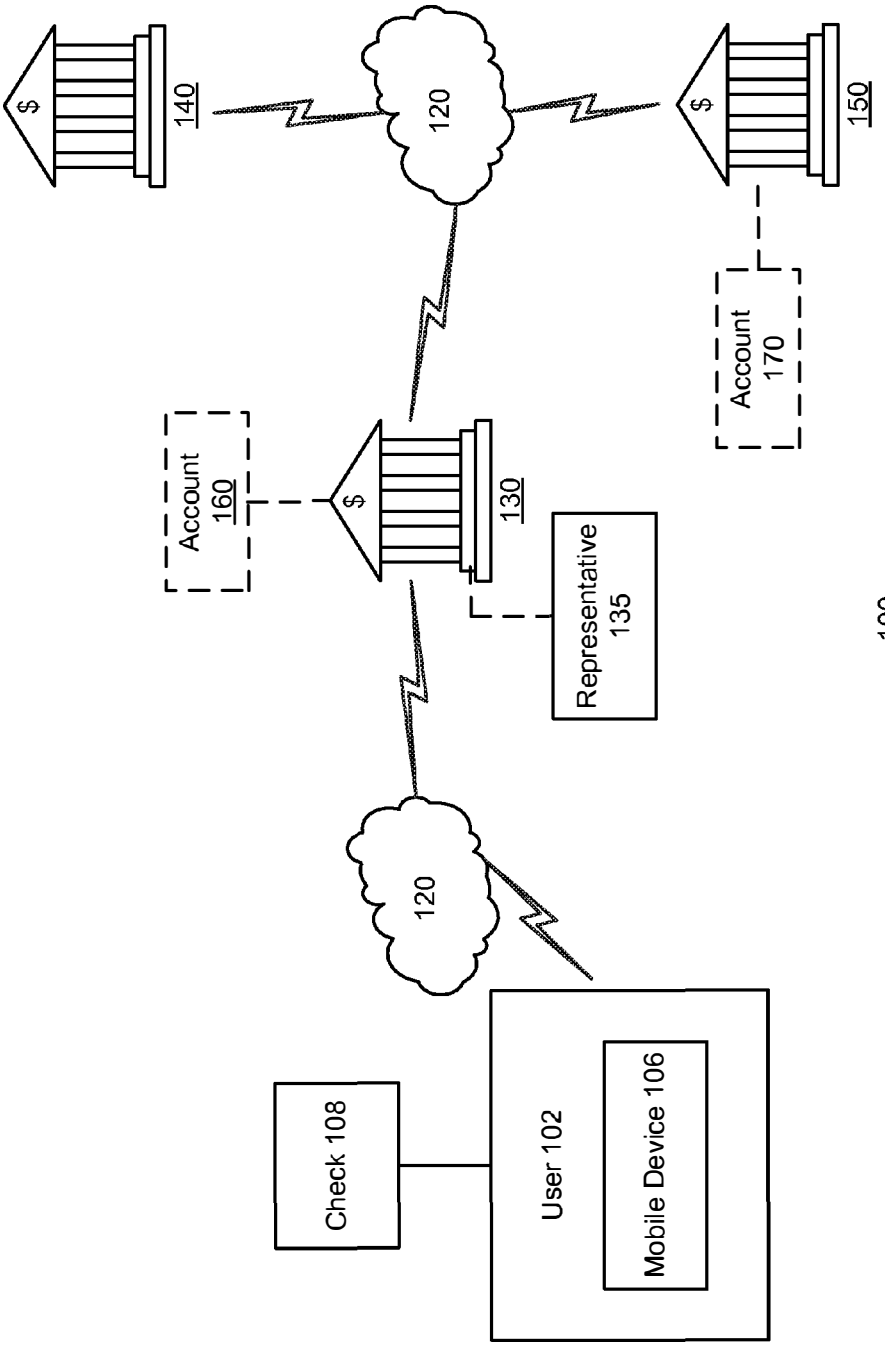

$
140
120
$
150
Account
170
Account
160
$
130
Representative
135
100
120
Check 108
User 102
Mobile Device 106

FIG. 1

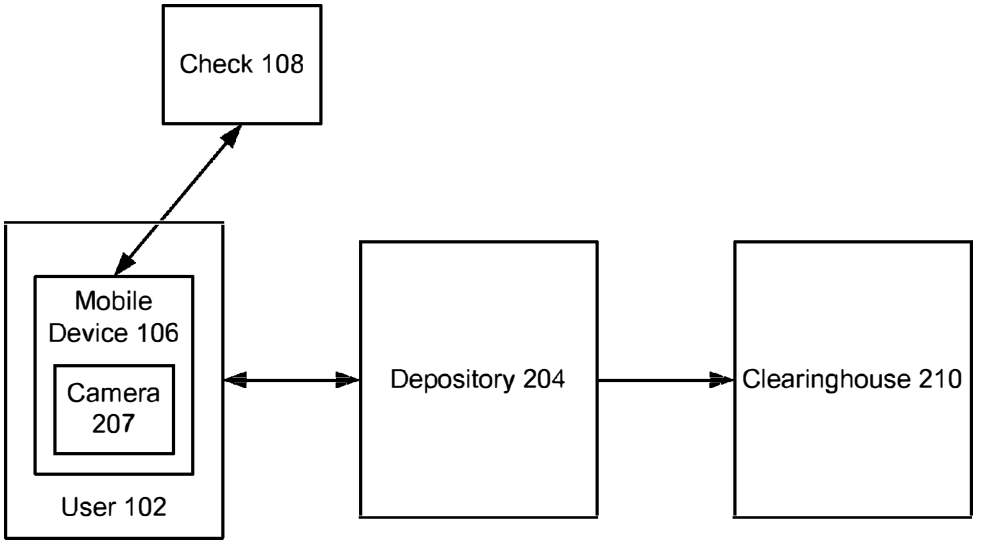

Check 108
Mobile Device 106
Camera 207
User 102
Depository 204
Clearinghouse 210
200

FIG. 2

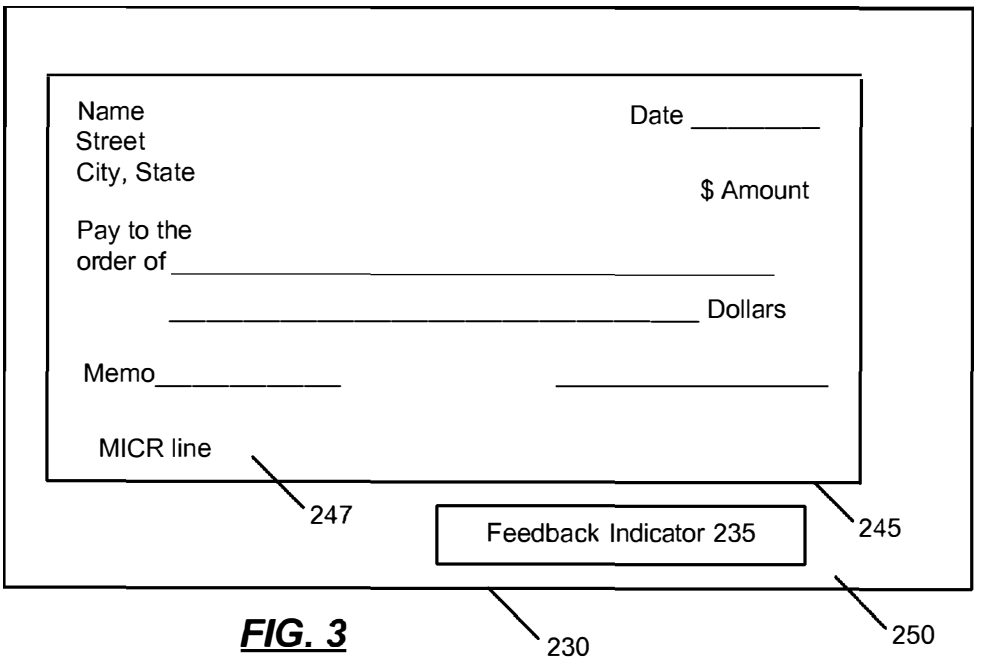

Name
Street
City, State
Date _____
$ Amount
Pay to the
order of _____
_____ Dollars
Memo_____
_____
MICR line
247
Feedback Indicator 235
245
230
250

FIG. 3

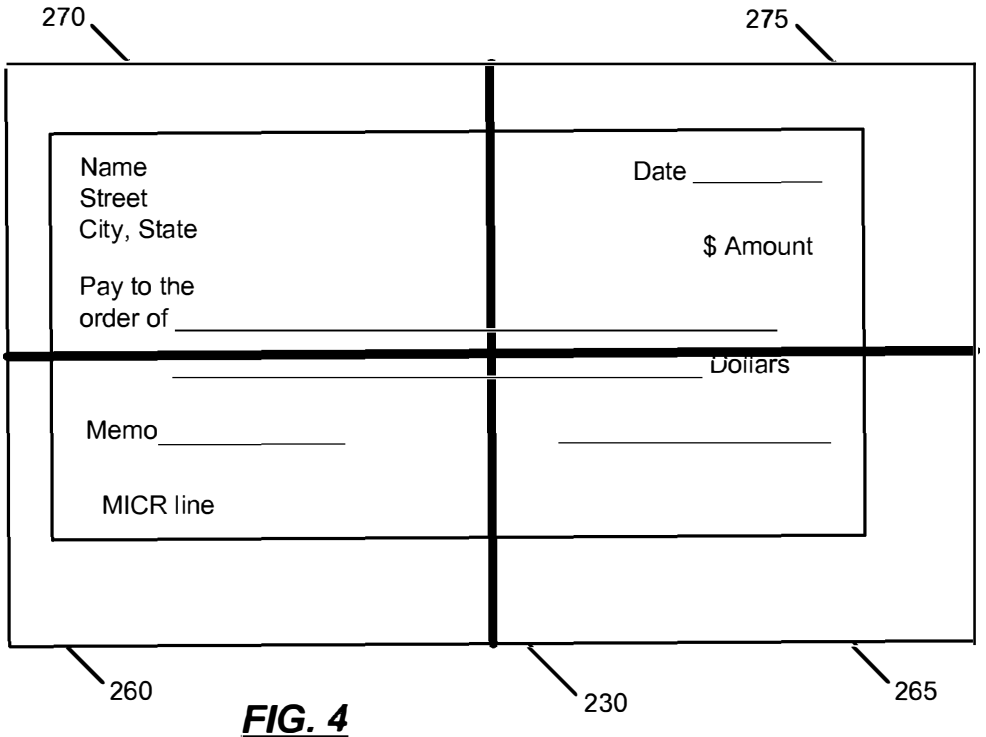
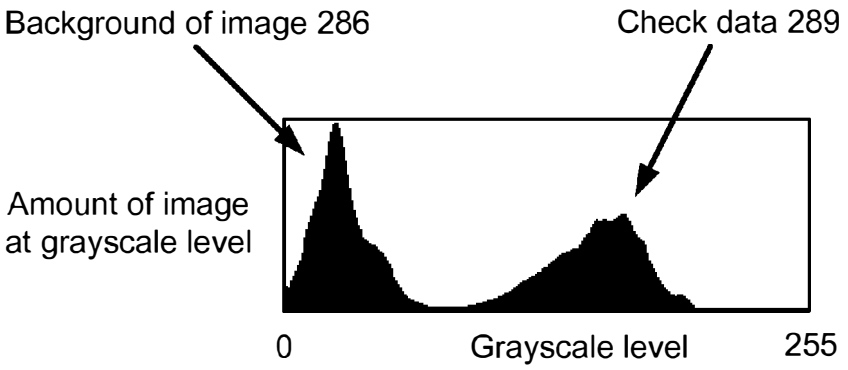
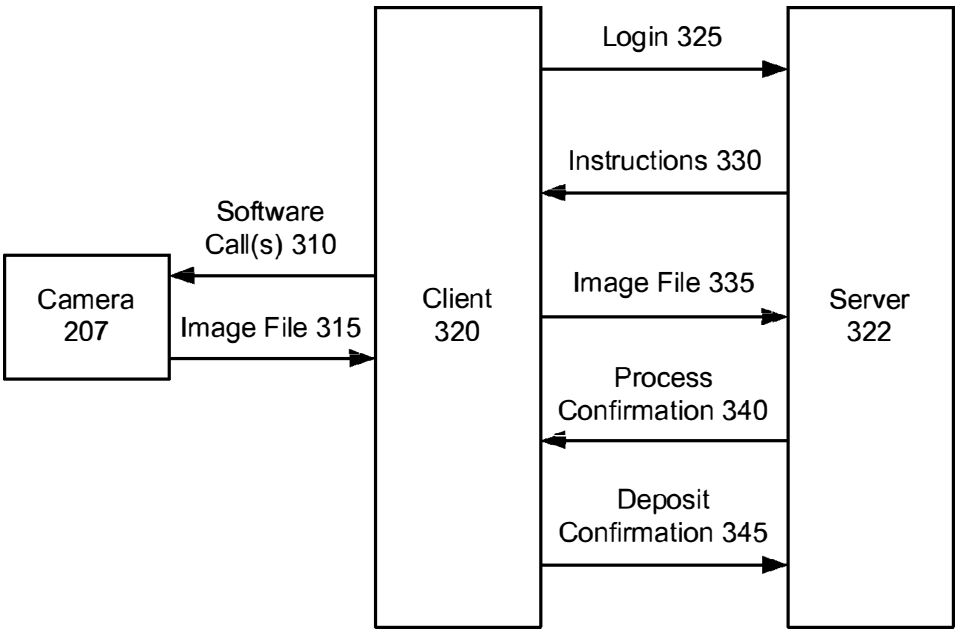

270
275
Name
Street
City, State
Date _____
$ Amount
Pay to the
order of _____
_____ Dollars
Memo_____
_____
MICR line
260
230
265

FIG. 4



280

FIG. 5



300

FIG. 6

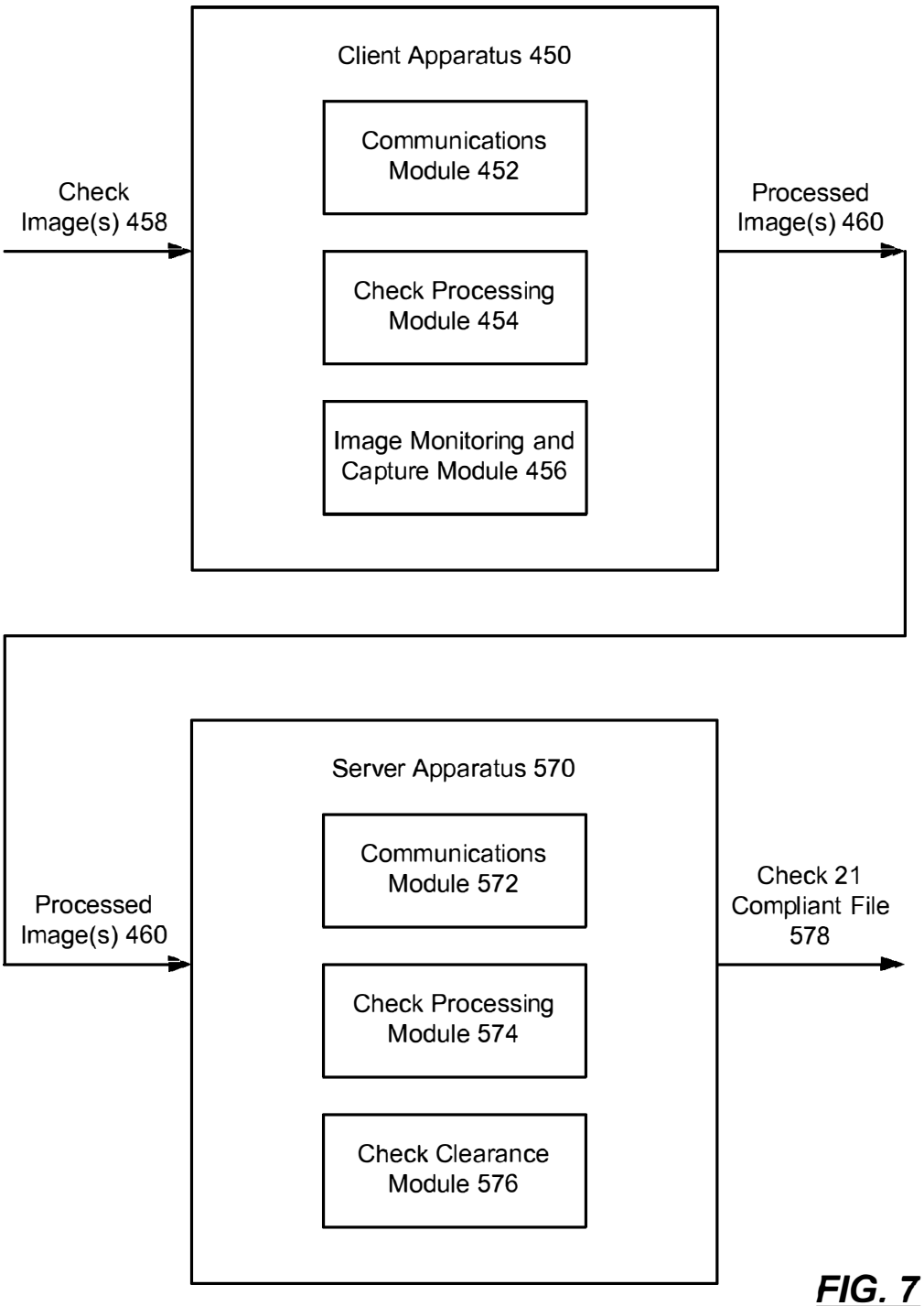

Client Apparatus 450
Communications Module 452
Check Processing Module 454
Image Monitoring and Capture Module 456
Check Image(s) 458
Processed Image(s) 460
Server Apparatus 570
Communications Module 572
Check Processing Module 574
Check Clearance Module 576
Processed Image(s) 460
Check 21 Compliant File 578

FIG. 7

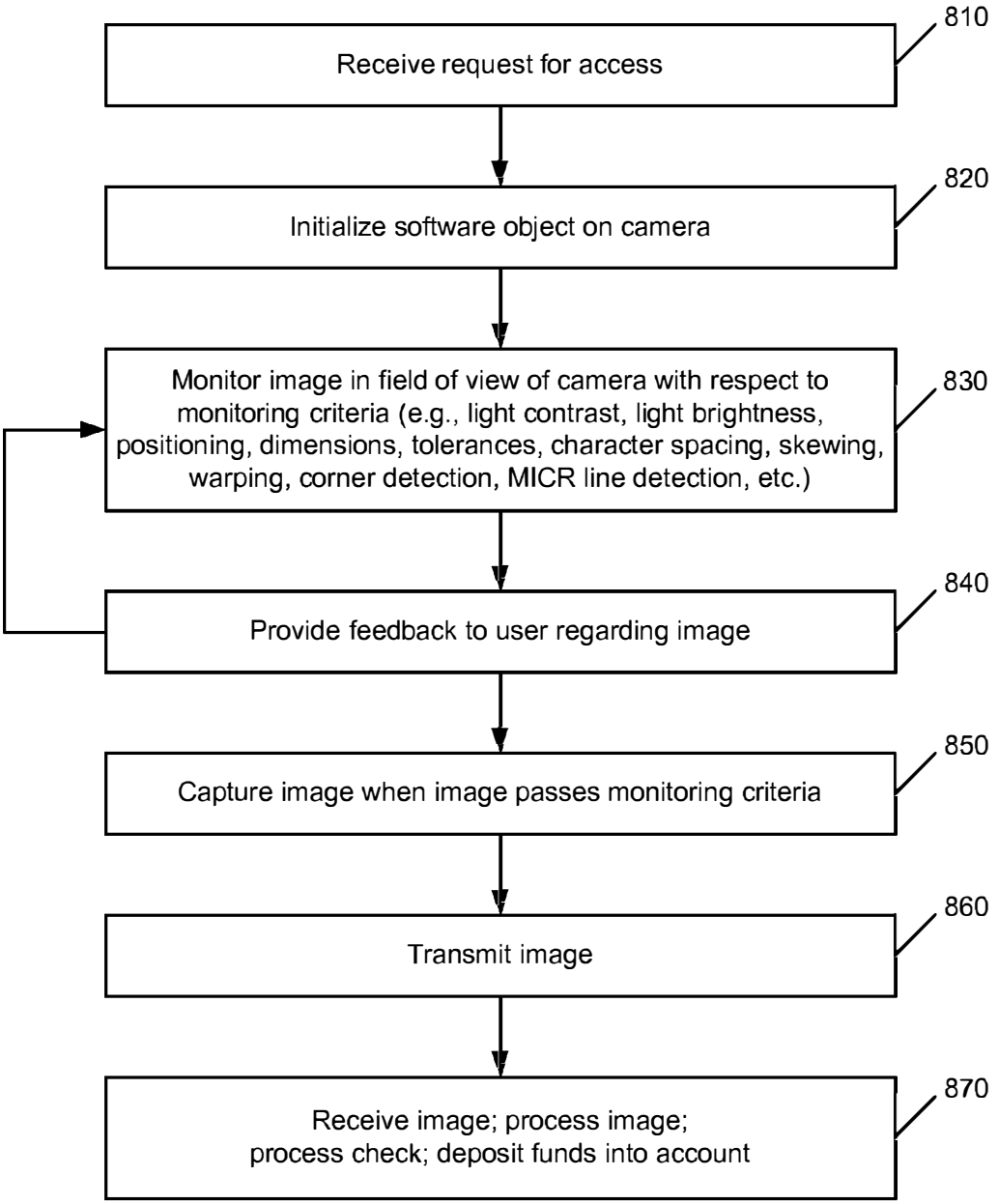

Receive request for access
810
Initialize software object on camera
820
Monitor image in field of view of camera with respect to monitoring criteria (e.g., light contrast, light brightness, positioning, dimensions, tolerances, character spacing, skewing, warping, corner detection, MICR line detection, etc.)
830
Provide feedback to user regarding image
840
Capture image when image passes monitoring criteria
850
Transmit image
860
Receive image; process image; process check; deposit funds into account
870
800

FIG. 8

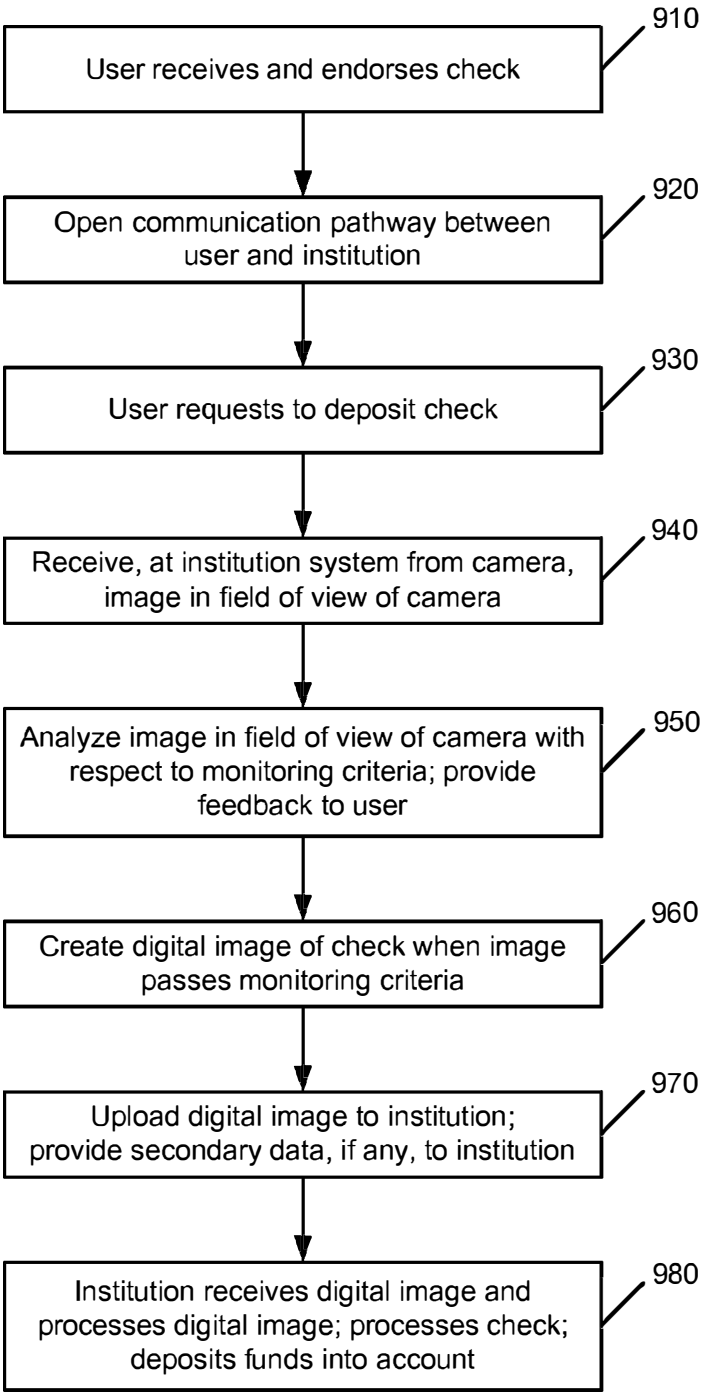

910
User receives and endorses check
920
Open communication pathway between user and institution
930
User requests to deposit check
940
Receive, at institution system from camera, image in field of view of camera
950
Analyze image in field of view of camera with respect to monitoring criteria; provide feedback to user
960
Create digital image of check when image passes monitoring criteria
970
Upload digital image to institution; provide secondary data, if any, to institution
980
Institution receives digital image and processes digital image; processes check; deposits funds into account
900

FIG. 9

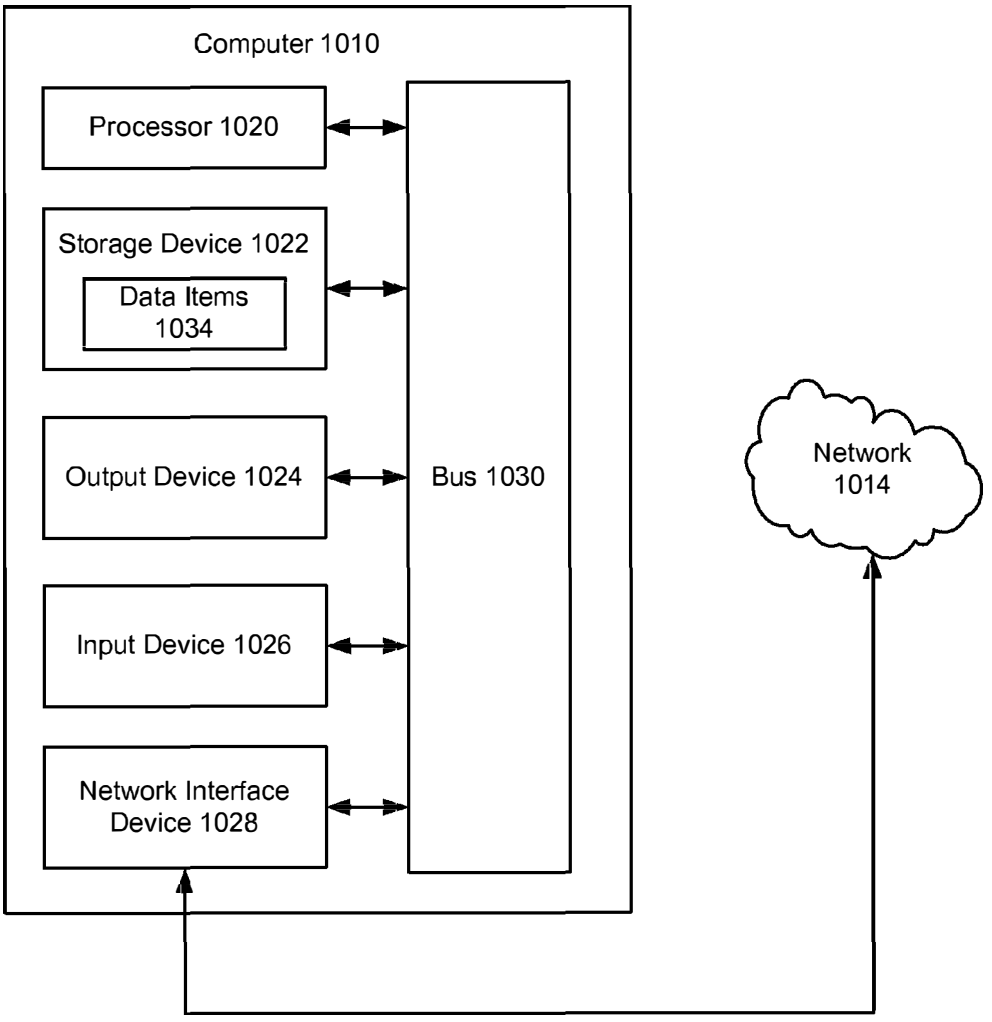

Computer 1010
Processor 1020
Storage Device 1022
Data Items 1034
Output Device 1024
Input Device 1026
Network Interface Device 1028
Bus 1030
Network 1014
1000

FIG. 10

SYSTEMS AND METHODS FOR IMAGE MONITORING OF CHECK DURING MOBILE DEPOSIT

BACKGROUND

Checks typically provide a safe and convenient method for an individual such as a payor to transfer funds to a payee. To use a check, the individual usually opens a checking account, or other similar account, at a financial institution and deposits funds, which are then available for later withdrawal. To transfer funds with a check, the payor usually designates a payee and an amount payable on the check. In addition, the payor often signs the check. Once the check has been signed, it is usually deemed negotiable, meaning the check may be validly transferred to the payee upon delivery. By signing and transferring the check to the payee, the payor authorizes funds to be withdrawn from the payor's account on behalf of the payee.

While a check may provide a payor with a convenient and secure form of payment, receiving a check may put certain burdens on the payee, such as the time and effort required to deposit the check. For example, depositing a check typically involves going to a local bank branch and physically presenting the check to a bank teller. To reduce such burdens for the payee, systems and methods have been developed to enable the remote deposit of checks. For example, the payee may capture a digital image of a check using a mobile device. The financial institution may then receive from the payee the digital image of the check. The financial institution may then use the digital image to credit funds to the payee. However, such a technique requires the efficient and accurate detection and extraction of the information pertaining to a check in the digital image. Capturing a digital image at a mobile device that allows for subsequent detection and extraction of the information from the digital image is difficult.

SUMMARY

An image of a check that is in the field of view of a camera is monitored prior to the image of the check being captured. The camera is associated with a mobile device. The monitoring may be performed by the camera, the mobile device, and/or a financial institution that is in communication with the mobile device. When the image of the check in the field of view passes monitoring criteria, an image may be taken by the camera and provided from the mobile device to a financial institution. The check may be deposited in a user's bank account based on the image. Any technique for sending the image to the financial institution may be used.

In an implementation, the image capture may be performed automatically by the camera, the mobile device, and/or the financial institution as soon as the image of the check is determined to pass the monitoring criteria. In an implementation, feedback may be provided to the user of the camera regarding the image of the check in the field of view. The user may reposition the check and/or the camera, for example, responsive to the feedback. Alternatively, the user may capture an image of the check responsive to the feedback.

This summary is provided to introduce a selection of concepts in a simplified form that are further described below in the detailed description. This summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing summary, as well as the following detailed description of illustrative embodiments, is better understood when read in conjunction with the appended drawings. For the purpose of illustrating the embodiments, there are shown in the drawings example constructions of the embodiments; however, the embodiments are not limited to the specific methods and instrumentalities disclosed. In the drawings:

FIG. **1** is a block diagram of an implementation of a system in which example embodiments and aspects may be implemented;

FIG. **2** shows a high-level block diagram of an implementation of a system that may be used for the deposit of a check;

FIG. **3** is a diagram of an example image comprising a check image, a background image, and feedback;

FIG. **4** is a diagram of an example image divided into segments that may be used for monitoring the image;

FIG. **5** is a diagram of an example histogram for a segment of an image comprising check data and background data;

FIG. **6** shows a data flow diagram of a system for the deposit of a check, in accordance with an example embodiment;

FIG. **7** shows a block diagram of a client apparatus and a server apparatus for the deposit of a check, in accordance with an example embodiment;

FIG. **8** is an operational flow of an implementation of a method that may be used for deposit of a check using image monitoring of the check;

FIG. **9** is an operational flow of another implementation of a method that may be used for deposit of a check using image monitoring of the check; and

FIG. **10** is a block diagram of an example computing environment in which example embodiments and aspects may be implemented.

DETAILED DESCRIPTION

In the following detailed description of example embodiments, reference is made to the accompanying drawings, which form a part hereof and in which is shown, by way of illustration, specific embodiments in which the example methods, apparatuses, and systems may be practiced. It is to be understood that other embodiments may be used and structural changes may be made without departing from the scope of this description.

FIG. **1** is a block diagram of an implementation of a system **100** in which example embodiments and aspects may be implemented. System **100** may include an account owner, referred to herein as a user **102**, and financial institutions **130**, **140**, and **150**, which may be any type of entity capable of processing a transaction involving a negotiable instrument. For example, financial institutions **130**, **140**, and **150** may be a retail bank, an investment bank, an investment company, a regional branch of the Federal Reserve, a clearinghouse bank, and/or a correspondent bank.

A negotiable instrument typically includes a type of contract that obligates one party to pay a specified sum of money to another party. Negotiable instrument as used herein is an unconditioned writing that promises or orders payment of a fixed amount of money. One example of a negotiable instrument is a check. The check may be taken by the receiving party and deposited into an account at a financial institution of the receiving party. The receiving party may endorse the check and then present it for deposit at a bank branch, via an automated teller machine (ATM), or by using remote deposit. Other examples of negotiable instruments include money orders, cashier's checks, drafts, bills of exchange, promissory notes, and the like. A money order is a trusted financial instrument that is a payment order for a pre-specified amount of money. A cashier's check (also known as a bank check,

official check, teller's check, bank draft or treasurer's check) is a check guaranteed by a bank and may be purchased from a bank.

The user **102** may be an individual or entity who owns account **160** that may be held at financial institution **130**. Account **160** may be any type of deposit account for depositing funds, such as a savings account, a checking account, a brokerage account, and the like. The user **102** may deposit a check **108** or other negotiable instrument in the account **160** either electronically or physically. The financial institution **130** may process and/or clear the check **108** or other negotiable instrument. The user **102** may communicate with financial institution **130** by way of communications network **120** such as an intranet, the Internet, a local area network (LAN), a wide area network (WAN), a wireless fidelity (WiFi) network, a public switched telephone network (PSTN), a cellular network, a voice over Internet protocol (VoIP) network, and the like. The user **102** may communicate with financial institution **130** by phone, email, instant messaging, text messaging, web chat, facsimile, mail, and the like. Financial institutions **130**, **140**, and **150** also may communicate with each other by way of communications network **120**.

In an implementation, the user **102** may receive payment from another individual such as a payor in the form of a check **108** or other negotiable instrument that is drawn from account **170** at financial institution **150**. The user **102** may endorse the check **108** (e.g., sign the back of the check **108**) and indicate an account number on the check **108** for depositing the funds. It is noted that although examples described herein may refer to a check, the techniques and systems described herein are contemplated for, and may be used for, deposit of any negotiable instrument. Similarly, the techniques and systems described herein are contemplated for and may be used with any form or document whose image may be captured with a camera or other imaging device of a mobile device for subsequent storage and/or processing.

As described further herein, a digital image of a check or other negotiable instrument may be provided from a user to a financial institution, and the digital image may be processed and funds associated with the check or negotiable instrument in the digital image may be deposited in a user's bank account. The user **102** may deposit the check **108** into account **160** by making a digital image of the check **108** and sending the image file containing the digital image to financial institution **130**. For example, after endorsing the check **108**, the user **102** may use a mobile device **106** that comprises a camera to convert the check **108** into a digital image by taking a picture of the front and/or back of the check **108**. The mobile device **106** may be a mobile phone (also known as a wireless phone or a cellular phone), a personal digital assistant (PDA), or any handheld computing device, for example. Aspects of an example mobile device are described with respect to FIG. **10**.

To increase the likelihood of capturing a digital image of the check **108** that may be readable and processed such that the check **108** can be cleared, the image is monitored for compliance with one or more monitoring criteria, prior to the image of the check **108** being captured. The monitoring criteria may be directed to proper lighting and/or framing of the check **108** in an image of the check **108** that will be captured and presented for clearing of the check **108**. An application may monitor whether the check **108** is sufficiently within the frame of the camera and has a high enough quality for subsequent processing. The monitoring is performed with respect to the image as it appears in the field of view of the camera of the mobile device **106**. The field of view is that part of the world that is visible through the camera at a particular position and orientation in space; objects outside the field of view when the image is captured are not recorded in the image. The monitoring criteria may be based on one or more of light contrast on the image, light brightness of the image, positioning of the image, dimensions, tolerances, character spacing, skewing, warping, corner detection, and MICR (magnetic ink character recognition) line detection, as described further herein. In an implementation, one or more histograms may be determined using the image being monitored. The histograms may be used in conjunction with monitoring criteria, as described further herein.

The monitoring may be performed by the camera, the mobile device **106**, and/or a financial institution that is in communication with the mobile device **106**. When the image of the check **108** in the field of view passes the monitoring criteria, an image may be taken by the camera and provided from the mobile device **106** to a financial institution. By ensuring that the image of the check passes monitoring criteria during pre-image capture monitoring, the number of non-conforming images of checks is reduced during presentment of the images to a financial institution for processing and clearing. In an implementation, feedback may be provided to the user **102** regarding the image of the check in the field of view. Based on the feedback, the user **102** may reposition the check **108** and/or the camera, for example, or may capture an image of the check **108**.

In an implementation, the image capture may be performed automatically by the camera, the mobile device **106**, and/or the financial institution as soon as the image of the check **108** is determined to pass the monitoring criteria. Alternatively, the user **102** may manually instruct the camera to perform the image capture (e.g., by pressing a button the camera or the mobile device **106**) after the user **102** receives an indication or other feedback that the image passes the monitoring criteria.

In an implementation, the user **102** may send the digital image(s) to financial institution **130** using the mobile device **106**. Any technique for sending a digital image to financial institution **130** may be used, such as providing a digital image to a website associated with financial institution **130** from storage, emailing a digital image to financial institution **130**, or sending a digital image in a text message or instant message, for example.

Financial institution **130** may receive a digital image representing the check **108** and may use any known image processing software or other application(s) to obtain the relevant data of the check **108** from the digital image. Financial institution **130** may determine whether the financial information associated therewith may be valid. For example, financial institution **130** may include any combination of systems and subsystems such as electronic devices including, but not limited to, computers, servers, databases, or the like. The electronic devices may include any combination of hardware components such as processors, databases, storage drives, registers, cache, random access memory (RAM) chips, data buses, or the like and/or software components such as operating systems, database management applications, or the like. According to an embodiment, the electronic devices may include a network-based server that may process the financial information and may receive the digital image from the user **102**.

The electronic devices may receive the digital image and may perform an analysis on the quality of the digital image, the readability of the data contained therein, or the like. For example, the electronic devices may determine whether the account number, amount payable, and the like may be readable such that it may be parsed or otherwise obtained and processed by the financial institution to credit an account **160**

associated with the user **102** and debit an account associated with the payor. In an implementation, a representative **135** of financial institution **130** may provide assistance to the user **102** and may provide assistance in determining whether the financial information may be readable and/or of a good enough quality to be processed.

Upon receipt and approval of the digital image, financial institution **130** may credit the funds to account **160**. Financial institution **130** may clear the check **108** by presenting a digital image of the check **108** captured from the digital image to an intermediary bank, such as a regional branch of the Federal Reserve, a correspondent bank, and/or a clearinghouse bank. For example, the check **108** may be cleared by presenting the digital image to financial institution **140**, which may be a regional branch of the Federal Reserve, along with a request for payment. Financial institutions **130** and **150** may have accounts at the regional branch of the Federal Reserve. Financial institution **130** may create a substitute check using the image provided by the user **102** and present the substitute check to financial institution **140** for further processing. Upon receiving the substitute check, financial institution **140** may identify financial institution **150** as the paying bank (e.g., the bank from which the check **108** is drawn). This may be accomplished using a nine digit routing number located on the bottom left hand corner of the check. A unique routing number is typically assigned to every financial institution in the United States. Financial institution **140** may present the substitute check to financial institution **150** and request that the check be paid. If financial institution **150** verifies the check (i.e., agrees to honor the check), financial institution **140** may then settle the check by debiting funds from financial institution **150** and crediting funds to financial institution **130**. Financial institution **150** may then debit funds from account **170**.

It will be appreciated that the preceding examples are for purposes of illustration and explanation only, and that an embodiment is not limited to such examples. For example, financial institution **150** may be a correspondent bank (i.e., engaged in a partnership with financial institution **130**). Thus, financial institution **130** may bypass the regional branch of the Federal Reserve and clear the check directly with financial institution **150**. In addition, account **160** and account **170** may both be held at financial institution **130**, in which case the check **108** may be cleared internally.

In an implementation, the mobile device **106** may comprise a video source such as a video camera, a web camera, or a video-enabled phone, for example, to obtain a video of the check **108**. A frame of the video may be obtained and monitored with respect to monitoring criteria, as described further herein. The mobile device **106** and/or the institution may obtain the frame and monitor the frame, depending on an implementation. Generation of a live video of a check **108** is not limited to a video camera, a web camera, and a video-enabled phone, and it is contemplated that any device that is capable of generating a live video may be used to make a video of the check **108** which may be monitored in real-time with respect to monitoring criteria. Additional devices that may be used in the generation and/or transmission of a live video include a web-enabled video computing device, a mobile phone, a camcorder, and a computer camera, for example.

FIG. **2** shows a high-level block diagram of an implementation of a system **200** that may be used for the deposit of a check, such as the check **108**. As described further herein, the user **102** may deposit the funds of the check **108** using the camera functionality in the mobile device **106**. In the example of one person giving a check to another person, this would enable the receiving party to deposit the funds at that time, without physically visiting an ATM or a bank branch.

In an implementation, the mobile device **106** may comprise a camera **207**, such as a digital camera. Such a mobile device may be called a camera phone. The mobile device **106**, through the camera **207**, has the ability to take or capture a picture or digital image of the check **108** or other negotiable instrument. The camera **207** may take an image of the front of the check **108**. Alternatively, the camera **207** may take an image of both the front and the back of the check **108**. The back of the check may provide endorsement verification, such as the signature of the person or party the check is made out to.

In an implementation, prior to an image in the field of view of the camera **207** being captured by the camera **207**, the image may be monitored with respect to monitoring criteria, e.g., using a software application running on the mobile device **106**. Feedback based on the monitoring of the image may be provided to the user **102** to assist the user **102** in positioning the check **108** so that the image of the check **108** may be captured in such a manner that it may be more easily processed and cleared during subsequent operations, such as those involving one or more financial institutions.

A depository **204** may include a bank in which the user **102** has a deposit account; however, the present disclosure is not limited to just banks. Alternatively, a third party may act as the depository **204** providing functionality to a plurality of users without regard to the bank at which they have deposit accounts, or whether their individual bank allows for the methods and systems described herein. The depository **204**, in an implementation, after receiving the image(s) of the check **108** from the user **102**, may use a clearinghouse **210** to perform the check clearing operations. As described with respect to the system **100** of FIG. **1**, check clearing operations are used by banks to do the final settlement of the check **108**, such as removing funds from the account of the payor and transferring those funds to the user's bank. The user's bank may choose to make the funds available to the user **102** immediately and take on the risk that the check **108** does not clear. However, for various reasons, the bank may only make those funds available to the user **102** after the check **108** finally clears.

In an implementation, the user **102** may place the check **108** on a background and generate a digital image comprising an image of the check (e.g., a check image) and a portion of the background (e.g., a background image) using the camera **207**. Any background may be used, although a dark background or a consistently colored background may provide more optimal results. It is noted that although examples and implementations described herein may refer to a check image and check data, the term "check image" may refer to any foreground image in a digital image (as opposed to the background image) and the term "check data" may refer to any foreground data in a digital image (as opposed to background data). Thus, the "check image" and the "check data" may refer to the foreground image and foreground data in implementations involving any negotiable instrument, form, or document.

In an implementation, the image being monitored in the field of view of the camera **207** comprises check data and background data. The check data pertains to the check image and the background data pertains to the background image (e.g., the background on which the check image is disposed).

FIG. **3** is a diagram of an example image **230** comprising a check image **247**, a background image **250**, and a feedback indicator **235** providing feedback to the user **102**. The image **230** may be generated by an imaging device associated with the mobile device **106**, such as the camera **207**. An edge **245**

separates the check image **247** from the background image **250**. The edge **257** may be detected using any known technique(s). The image **230** may be provided in the field of view of the camera **207** prior to and during image capture of the check **108**. The user **102** may adjust the camera **207**, the check **108**, and/or any light source so that the image **230** passes one or more monitoring criteria. For example, a light source from a specific angle can lead to poor light contrast. Light contrast may be a monitoring criterion, and poor light contrast may be corrected easily by moving the lens of the camera **207** to a different perspective, thereby allowing the image to pass the monitoring criterion.

Feedback regarding the image **230** in the field of view with respect to the monitoring criteria may be generated and provided to the user **102**. In an implementation, the feedback may be provided visually, such as by text (e.g., "go closer", "go farther", "move the check to the right", "put the check on a darker background", "tilt the camera down", "take the picture now", etc.), arrows, or other visual indicators or cues (e.g., green lights, red lights, etc.) overlaid on the image **230**, shown as feedback indicator **235**. Alternatively or additionally, feedback may be provided to the user **102** aurally, such as through a speaker associated with the mobile device **106**. The feedback may advise the user **102** to move the camera **207** or the check **108** or adjust the lighting or the background, for example. The feedback may also advise the user **102** when the image **230** passes the one or more monitoring criteria and to capture the image of the check **108**.

One of the monitoring criteria may be based on the positioning of the check **180** in the image **230**. The positioning of the check **108** may be determined from the image **230** and compared with predetermined dimensions (e.g., of a typical personal check, of a typical business check) and tolerances. If the dimensions are within a certain acceptable tolerance, then it may be determined that the check **108** is properly positioned. Such feedback may be generated and provided to the user **102**.

In an implementation, the positioning of the check **108** in the image **230** may be compared with an alignment guide (which may or may not be visible to the user **102** in the field of view of the camera **207**). For example, measurements may be made by a processor in the camera **207**, the mobile device **106**, or a computing device at the financial institution to determine the check's position with respect to the alignment guide. The measurements may be compared to predetermined measurements or values to determine whether the check's positioning in the image **230** is proper or sufficient for further processing of the image. Edge detection and/or corner detection may be used in such measurements (e.g., in measuring the distance from the check **108** in the image **230** to the alignment guide). Any known technique(s) for edge detection and/or corner detection may be used. In an implementation, corner detection itself may be a monitoring criterion, such that if corner detection of the check **108** in the image **230** is achieved, then it may be concluded that the image **230** may be properly processed and cleared by a depository (i.e., the image **230** passes the monitoring criteria).

The alignment guide may be overlaid on the camera feed of the mobile device **106**, in an implementation. The alignment guide may take any shape such as a bounding rectangle or other bounding box or shape, horizontal and/or vertical bars, parallel lines, etc., for example. With a bounding rectangle, for example, used as the alignment guide, aligning the check **108**, thereby passing this monitoring criterion, means enclosing the check **108** within the bounding rectangle. If the check **108** is outside of the alignment guide in the image **230**, feedback may be generated and provided to the user **102** regarding this monitoring criterion with instructions for moving the check **108** or the camera **207** in order to properly align the check **108** in the field of view.

The operator of the camera **207** may introduce distortions in the image due to a perspective problem, specifically an angling of the camera vertically over the check, and the top of the check is smaller than the bottom, or the reverse. Monitoring criteria may also be directed to determining whether the image is skewed or warped. Skewing occurs when the check **208** is rotated from the horizontal in the image **230**. By measuring the distance from the edge(s) of the check **208** in the image to an alignment guide or the edge of the field of view, it may be determined whether the check **208** is skewed (e.g., by comparing the distances to one another, by comparing the distances to predetermined values, etc.). If skewing is present in the image **230**, feedback may be generated and provided to the user **102** with instructions for moving the check **108** or the camera **207** in order to properly align the check **108** in the field of view with respect to the horizontal.

Warping, as used herein, is meant to denote that the check **108** is tilted forward or back with respect to a plane that is perpendicular to a line drawn from the camera lens to the center of the check **108**. Warping, or tilting, of the image may lead to incorrect optical detection of the check **108**. In an implementation, a processor in the camera **207**, the mobile device **106**, or a computing device at the financial institution may determine whether warping is present in the image, and if so, may generate and provide feedback to the user **102**. Such feedback may comprise instructions to the user **102** for moving the check **108** or the camera **207** such that the check **108** would appear to be perpendicular to an imaginary line drawn from the center of the camera lens to the center of the check **108** itself (e.g., dewarping instructions).

If user involvement is tolerated, the user may be queried to supply or identify one or more corners of the check **108** in the image **230**. The perimeter of the check **108** may be determined using this information. Additionally, this information may be used for monitoring the image **230** for distortions.

In an implementation, a monitoring criterion may be whether the MICR line can be detected and/or read. Any known MICR line detection technique(s) may be used by the camera **207**, the mobile device **106**, and/or the financial institution (e.g., using an image processor, for example) to detect the MICR line on the check **108** in the image **230**. If the MICR line can be detected, it may be determined that the image **230** may be captured and sent to the financial institution for processing and clearing of the check **108** (i.e., the image passes the monitoring criterion directed to MICR line detection). If the MICR line cannot be detected, feedback may be provided to the user **102**, such as to reposition the check **108** and/or the camera **207** (i.e., the image fails to pass the monitoring criterion, perhaps because the image is out focus or the lighting is inadequate, for example).

In an implementation, spacing between certain characters, points, or features (e.g., MICR number, "$" sign, signature line, courtesy amount line, legal amount line, etc.) may be determined and used as a monitoring criterion. For example, if the MICR line can be detected, then the spacing between the numbers in the MICR line may be determined using any known measuring and/or image processing technique(s). If the spacing is outside of a certain range corresponding to valid spacing between number in a MICR line, then it may be determined that the image **230** may be not properly processed if captured by the camera **207**. In such a case, feedback may be generated and provided to the user **102**, such as to reposition the check **108** and/or the camera **207**.

Another monitoring criterion may be based on the light in the image **230**, such as the light contrast and/or light brightness found on the image **230**, such as in various regions of the image **230**. For example, if the light contrast between the check image **247** and the background image **250** is less than a predetermined amount, then it may be determined that the image **230** may be not properly processed if captured by the camera **207**. In such a case, instead of capturing the image **230**, feedback may be generated and provided to the user **102** to adjust the camera **207**, the check **108**, and/or the lighting in order to bring the image **230** into compliance with the monitoring criteria.

As another example, the light brightness on various regions of the image may be determined and compared to each other and/or may be compared to a predetermined threshold. If the difference between the light brightness of the various regions is less than a predetermined amount (e.g., the light brightness does not vary significantly among the regions) or if the light brightness is less than a predetermined threshold, then it may be determined that the image **230** may be properly processed if captured by the camera **207**. Otherwise, feedback may be generated and provided to the user **102** to adjust the camera **207**, the check **108**, and/or the lighting in order to change the light brightness on the image **230**.

In an implementation, one or more histograms may be generated based on the image **230** and used in the determination of light contrast and/or light brightness monitoring criteria. A histogram is a well known graph and may be used to display where all of the brightness levels contained in an image are found, from the darkest to the brightest. These values may be provided across the bottom of the graph from left (darkest) to right (brightest). The vertical axis (the height of points on the graph) shows how much of the image is found at any particular brightness level.

Histograms may be used to monitor whether the light on the image **230** is uniform, not too bright, etc. For example, the mobile device **106** can monitor the histogram of the image **230** to ensure that there is a large contrast between the background image **250** and the check image **247**. Feedback may be provided to the user **102** as to how to move or adjust the camera, lighting, etc. in order to get a good image for subsequent processing (i.e., how to get an image that passes the monitoring criteria).

In an implementation, the image **230** may be divided into segments, such as those shown in FIG. **4**. FIG. **4** is a diagram of the example image **230** of FIG. **3** divided into segments **260**, **265**, **270**, **275** that may be used for monitoring the image **230**. Although four segments are shown in FIG. **4**, any number of segments may be used with techniques described herein. Although the segments **260**, **265**, **270**, **275** are formed by dividing the image **250** into quadrants, the segments may be formed by any techniques, take any shape, and have any area, subject to a constraint that each segment comprises a portion of the check data **247** and a portion of the background data **250** separated by a portion of the edge **245**. In this manner, distinct areas of density corresponding to the background of the image and the check data of the image may be provided in a histogram.

FIG. **5** is a diagram of an example histogram **280** for a segment of an image comprising check data and background data. The horizontal axis of the histogram **280** represents the grayscale level between 0 and 255, where 0 represents true black and 255 represents true white. The vertical axis represents the amount of the image at a particular grayscale level of the horizontal axis. Any known technique for generating a histogram for an image (such as a grayscale image of the image **230**) may be used. The histogram **280** shows two distinct areas of density (i.e., two distinct density distributions). The density area **286** closer to the grayscale level of zero corresponds to the background of the image, and the density area **289** closer to the grayscale level of 255 corresponds to the check data.

The density distribution for each segment (or for the entire image **230**) may be analyzed to determine whether the light contrast and/or light brightness is appropriate for processing and clearing of the check **108** in the image **230** (and thus passes that monitoring criterion) or whether the light contrast and/or light brightness does not pass the monitoring criterion and the camera **207**, the check **108**, and/or the light source should be adjusted or repositioned. For example, the density distributions for the segments may be compared with each other and/or may be compared to predetermined values or levels. If the differences are less than a predetermined difference amount, such as less than 1 percent different, less than 5 percent different, etc., then the image **230** may be captured and sent to the financial institution for processing. Otherwise, feedback may be generated and provided to the user **102** to reposition the camera **207**, the check **108**, and/or the light source.

When the image **230** passes the monitoring criteria (e.g., is positioned properly with respect to an alignment guide, is not warped, is not skewed, has adequate light brightness and/or light contrast, etc.), the image **230** may be captured either automatically (e.g., by the camera or the mobile device under direction of an application running on the camera **207** or the mobile device **106** or the financial institution) or manually (e.g., by the user **102** pressing a button or making a selection on the camera **207** or the mobile device **106**). The digital image thus captured may be provided from the mobile device **106** to a financial institution. The check **108** may be deposited in a user's bank account based on the digital image. Any technique for sending the digital image to the financial institution may be used.

FIG. **6** shows a data flow diagram **300** of a system for the deposit of a check, in accordance with an example embodiment. In the data flow diagram **300**, a client **320** is one example of the mobile device **106** of the user **102** described with respect to the systems **100** and **200** of FIGS. **1** and **2**, respectively. In an implementation, a server **322** may be a software component operable by the depository **204** of FIG. **2**. The client **320** may log in to a remote deposit system executed on the server **322**. The login **325** may serve to authenticate the user **102** as an authorized consumer of the depository **204**.

The server **322**, in one example, may send instructions **330** to the client **320** that execute an application on the client **320**. This may include instructions that cause a software object, which may have been previously downloaded and installed (e.g., pre-installed) on the client **320**, to be executed on the client **320**. The software object may analyze the image in the field of view of a digital camera (e.g., the image **230** shown in the field of view of the camera **207** associated with the mobile device **106**) with respect to one or more monitoring criteria and may generate and provide feedback to the user regarding the monitoring criteria and/or instructions for capturing an image of the check **108**.

In another example, the instructions **330** may include a wholly self-contained application that when delivered to the client **320** will execute and perform one or more operations described herein, such as those directed to analyzing the image in the field of view of the camera **207** with respect to monitoring criteria and providing feedback to the user **102**. In either example, the software object may be configured to make one or more software calls **310** to the camera **207**. This

may be through specific software instructions to the camera **207**. In other words, the camera's functionality may not be abstracted through any software library. In such an example, software code may be written and delivered to every different camera-equipped mobile phone.

In an alternate example, the software object may operate through a software abstraction layer, such as an application programming interface (API). The software object developer may only insert code into the software object to call one or more APIs exposed by the software operating the mobile device **106**. One example of such software is Windows Mobile by Microsoft Corporation. In the context of a Windows Mobile device, the Windows Mobile operating system (OS) has one or more APIs exposed to application developers that will translate instructions from applications into instructions operable by the camera **207** on the mobile device **106**. A mobile operating system, also known as a mobile platform or a handheld operating system, is the operating system that controls a mobile device. Other mobiles OSs include Symbian OS, iPhone OS, Palm OS, BlackBerry OS, and Android.

The software object may cause the camera **207** to analyze an image in the field of view with respect to monitoring criteria, provide feedback, and/or take a picture or capture one or more images of the check **108** being deposited. These images may be captured sequentially, e.g., pursuant to the user **102** flipping the check **108** over after an image of the front of the check **108** has been captured after passing the monitoring criteria. However, each side of the check **108** may be captured by the camera **207** using similar API calls. The images may be stored in an image file **315**.

Once the images of one or both sides of the check **108** pass the monitoring criteria and are captured by the camera **207**, the image file **315** may be operated on by the software object of the client **320**. These operations may include any of the following: deskewing, dewarping, magnetic ink character recognition, cropping (either automatically, or having the user **102** manually identify the corners and/or edges of the check **108** for example), reducing the resolution of the image, number detection, character recognition, and the like.

With respect to number and character recognition, commercial check scanners have used characteristics of the MICR encoding to detect information about the check, such as the bank's routing number and the account number. However, the characteristics that these scanners have used are the magnetic characteristic of the ink itself and these scanners have used methods similar to those of magnetic audio tape readers. In an implementation, a software object of the client **320** may optically recognize the characters on the MICR line, as a consumer mobile device such as the mobile device **106** will lack the magnetic reading ability of a commercial check scanner.

The image may be also down converted into a grayscale or black and white image, such as either in Joint Photographic Experts Group (JPEG) compliant format or in tabbed image file format (TIFF) for example. In an alternate example, the image may be formatted as a Scalable Vector Graphics (SVG) image. One of the benefits of an SVG file is a large size advantage over JPEG. In the former example, the image at some point before entry into the clearing system may be converted to TIFF format. This may be performed at the mobile device **106**, wherein the camera **207** captures the image in TIFF format. However, the camera **207** of the mobile device **106** may capture the image in JPEG format, which may then be converted into TIFF either at the mobile device **106** or at the server **322**. In the latter example, this may use the transmission of the TIFF image across a communications network which may be more advantageous as TIFF images are typically smaller in file size for the same size of picture as a JPEG formatted image.

The software object on the client **320** may operate by performing one or more of the operations described herein and then transmitting an image file **335** (e.g., based on image file **315** that has been processed) to the server **322** after the user **102** confirms that they do wish to deposit the check **108**. Alternately, the software object may capture the image of the check **108** and transmit that image to the server **322** that in turn may perform those operations, verifies that the image quality is within acceptable thresholds, and communicates that verification back to the client **320**, which can then instruct the user **102** to take a picture of the other side of the check **108**. In this example, the image transmitted to the server **322** may be in any format, such as JPEG or TIFF, insofar as the server software has the ability to convert that image into a Check 21 compliant format. Alternately, the bank may output an X9.37 file to the clearing system. The Check Clearing for the 21st Century Act (or Check 21 Act) is a United States federal law that allows the recipient of a paper check to create a digital version, thereby eliminating the need for further handling of the physical document. The Check 21 standard for electronic exchange is defined in the standard DSTU X9.37-2003 ("X9.37"). It is a binary interchange format.

The server **322** may confirm (e.g., using a process confirmation **340**) with the user **102** the transmission, reception, and processing of each side of the check **108** separately, or may confirm both sides at the same time. On the server side, more operations may be performed, such as signature verification. Where to perform these operations may be determined by the processing power of the mobile device **106** itself, which is typically limited in computational power. However, the present discussion is not limited in any way by discussion of where certain operations are described as operating. The operations of detecting and verifying information may be performed by the client **320** before the information is transmitted along with the image in the image file **335** to the server **322**. Alternately, the software object(s) operating on the mobile device **106** may perform no operation other then capturing images of the front and back of the check **108** after passing the monitoring criteria, receiving confirmation that the user **102** wishes to proceed, and transmitting those images to the server **322**, wherein the server **322** performs those operations.

In an implementation, after the image file **335** has been received by the server **322**, the server **322** may send a process confirmation **340** to the client **320**. The process confirmation **340** may request instructions from the client **320** to continue proceeding with the deposit now that the server **322** has received the image file **335**. In response, the client **320** may send a deposit confirmation **345** to the server **322**, instructing the server **322** to process the deposit of the check based on the image file **335** that had been received by the server **322**.

FIG. **7** shows a block diagram of a client apparatus **450** and a server apparatus **570** for the deposit of a check, in accordance with an example embodiment. The client apparatus **450** may include one or more software objects operating on a mobile device **106**, such as described above. The client apparatus **450** may include a communications module **452**, a check processing module **454**, and an image monitoring and capture module **456**. The client apparatus **450** may receive, in one example, one or more check images **458** as an input and output one or more processed images **460**.

In an implementation, the check images **458** may be received following a software call from the check processing module **454** to the image monitoring and capture module **456**.

In such an implementation, the image monitoring and capture module **456** may include the camera **207** contained within the mobile device **106**. Alternately, the camera **207** may be detachably coupled to the mobile device **106** such as through a secure digital (SD) slot or over any suitable communications bus, such as USB (universal serial bus).

In an implementation, the image monitoring and capture module **456** may obtain an image and send the image to a financial institution (e.g., financial institution **130**, the server **322**, the server apparatus **570**, etc.) for processing. In an implementation, the client apparatus **450** may comprise a browser such as a web browser, for accessing a website on the Internet or other network associated with a financial institution. The user may access the website and select a "monitor and capture image" link or similar icon, button or link, for example, displayed on the browser. Such a selection may call the image monitoring and capture module **456** on the client apparatus **450**.

The communications module **452** may be configured, in one example, to receive and send data signals over a suitable communications network. This may include, without limitation, GSM/GPR3, HSDPA, CDMA, TDMA, 802.11, 802.16 and the like. While the bandwidth available to the mobile device **106** may be an implementation concern such discussion is outside the scope of the present discussion and any suitable wireless communications network is considered to be within the scope of the present discussion. With respect to the present discussion, the communications module **452** may receive one or more processed check images **460** from the check processing module **454** and may transmit them over the suitable communications network to the depository **204**, as described herein.

The check processing module **454** may be configured, in one example, to cause the image monitoring and capture module **456** to monitor an image of at least one side of a check provided in a field of view of the camera **207** and then capture the image after it passes monitoring criteria. Compliance with the monitoring criteria is intended to ensure that the image of the check is suitable for one or more processing tasks. For instance, if the check is rotated 45 degrees clockwise when captured, the check processing module **454** or a software object operated on the server **322** described above may be unable to optically detect information on the check.

The check processing module **454** may perform one or more cleaning or processing operations on the captured image of the check. Such cleaning or processing may include dewarping and/or deskewing (if not part of the monitoring criteria, in an implementation), for example. Cleaning or processing may include down-converting the image received from the image capture module to a suitable size, such as 200 dots per inch (DPI) resolution or in a resolution range such as 200 DPI to 400 DPI, 300 DPI to 500 DPI, etc., and/or converting the image to grayscale or black and white. Such operation(s) may reduce the file size of the check image. Alternatively, the check processing module **454** may send instructions to the image monitoring and capture module **456** to cause the image monitoring and capture module **456** to capture an image of the check at a suitable resolution. The check processing module **454** may additionally perform any of the following operations, in further examples: convert from JPEG to TIFF, detect check information, perform signature detection on the image of the check, and the like. The check processing module **454** may, alternatively, send the captured check image to the server described herein for such processing, and receive confirmation that the operations were completed before further operations can proceed.

The size of the file sent between the mobile device and the server may be small. This runs counter with respect to automatic check detection against a background. If captured in color, the contrast between check and background becomes easier. However, the processed image sent over the communications network may need to be smaller, and if the detection operation is performed by the server, it may be advantageous to convert the captured image to grayscale, or even black and white, before transmission to the server. Grayscale images are compliant with the Check 21 Act.

While "flat" is a fairly well known term to users, each user's appreciation of flat with respect to the camera lens of the camera **207** associated with the mobile device **106** may result in a problem with needing to align the check image programmatically or risk rejecting a large number of check images. As the image captured is a set of pixels, a tilted image will result in a jagged polygon rather than a perfect rectangle. Using convex hull algorithms, the check processing modules may create a smooth polygon around the boundary and remove the concavity of the check image. Alternatively, a rotating calipers algorithm may be used to determine the tightest fitting rectangle around the check boundary, which can then be used to determine the angle of it, with that angle being used to align the check properly.

The server apparatus **570** may include one or more software objects operating on a server operated by the depository **204**. Aspects of an example server apparatus are described with respect to FIG. **10**. The server apparatus **570** may include a communications module **572**, a check processing module **574**, and a check clearance module **576**. The server apparatus **570** may receive one or more processed images **460** from a mobile device **106** or a client apparatus **450** as an input and may output a file such as a Check 21 compliant file **578**. The Check 21 compliant file **578** may be a file or entry in a record set that is compliant with the clearinghouse rules set forth in the Check 21 Act and may include outputting an X9.37 file, in one example.

The communications module **572** may be configured to receive a wireless communication from the mobile device **106** over any suitable communications network, such as those described above. The communications module **572** may additionally receive a communication over a different communications network than the mobile device **106** communicated on, such as receiving the communication over a TCP/IP (Transmission Control Protocol/Internet Protocol) connection from the user's communication provider.

The check processing module **574** may be configured, in one example, to perform one or more check processing operations on the processed image(s) **460** that are received. In an implementation, these operations may include any of the operations described herein with respect to the check processing module **454**. The operation of signature verification may be performed by the check processing module **574** of the server apparatus **570** as the server apparatus **570** may interface with other systems of the depository **204** that may maintain previously verified signature samples of the user **102**. Performing signature verification at the client apparatus **450** may be computationally unfeasible; additionally, there may be a security risk if the signature sample is stored on the user's own device.

A cropped grayscale image may be sent to the server apparatus **570**. The server apparatus **570** may extract information via a TIFF conversion and determine the DPI and re-scale to the proper DPI (e.g., convert to TIFF and detect the DPI that was used in the grayscale image). In an implementation, DPI detection may run on the client apparatus **450**.

The check clearance module **576** may be configured, in one example, to receive a file from the check processing module **574** and may communicate with a check clearinghouse such that a Check 21 compliant file may be delivered to the check clearinghouse and funds may be received by the depository **204**. The availability of the funds to the user **102** may be delayed by this operation such that the user **102** only has access to those funds when the depository **204** receives confirmation that the check has cleared.

FIG. **8** is an operational flow of an implementation of a method **800** that may be used for deposit of a check using image monitoring of the check. At **810**, a request for access may be received from a user (e.g., the user **102**). The user may request access to a deposit system operated by a depository (e.g., the depository **204**) by way of a mobile device (e.g., the mobile device **106**) such as a cellular phone, a PDA, a hand-held computing device, etc. operated by the user. The access may be through some sort of user login, in some examples. The deposit system may be configured to receive a deposit of a negotiable instrument, such as a check, money order, cashier's check, etc. from the user and clear the negotiable instrument in a suitable clearinghouse system.

At **820**, the system may initialize a software object on the mobile device. This may include sending instructions to the mobile device intended to execute a previously installed (i.e., pre-installed) software object. Alternatively, the system may send a software object to the mobile device that may execute the software object, carry out operations described herein by use of the software object, and terminate the software object. In an implementation, the system may instruct a camera associated with the mobile device to monitor and capture an image of the negotiable instrument in conjunction with monitoring criteria.

The user may use the camera to obtain an image in the field of view of the camera, and at **830**, the image in the field of view of the camera may be monitored with respect to one or more monitoring criteria, such as those described above. The monitoring may be performed by the camera, the mobile device, and/or a computing device associated with the depository, for example. The monitoring may be performed pursuant to instructions received at the camera or mobile device from the deposit system operated by a depository, the server **322**, or the server apparatus **570**, for example. In an implementation, the results of the monitoring may indicate that the camera and/or the check should be repositioned and/or the light source should be adjusted prior to an image capture in order to capture an image of the check that may be processed properly, e.g., to have the data from the check obtained without error from the image, so that that check can be cleared.

At **840**, feedback based on the results may be generated and provided visually and/or aurally to the user via the camera and/or the mobile device. In an implementation, the feedback may be provided if the image fails to pass the monitoring criteria. The feedback may comprise instructions or guidance for the user to follow to obtain an image of the check in the field of view of the camera that will pass the monitoring criteria. Processing may continue at **830** with the image that is currently in the field of view of the camera (after the user has received and acted on the feedback) being monitored with respect to the monitoring criteria.

When the image in the field of view passes the monitoring criteria as determined at **830**, the image in the field of view may be captured by the camera at **850**. This may be accomplished through the software object accessing a camera associated with the mobile device (e.g., either comprised within the mobile device or separate from the mobile device). This may be done through an API exposed by the OS of the mobile device, or may be through software code customized for a specific phone and specific camera. With respect to the former, a developer of the software object may write code to the camera API(s), which may be specific to the OS and without regard to the camera on the device. The user may initiate the capture of the image (e.g., by pressing a button on the camera or the mobile device) or the image may be captured automatically, without user intervention, as soon as the image in the field of view is determined to have passed the monitoring criteria. In this manner, the occurrence of non-conforming images downstream (e.g., at a depository or financial institution) is reduced, and there is a high confidence that the image will be properly processed downstream.

In an implementation, when the image in the field of view is determined to pass the monitoring criteria, feedback may be generated and provided to the user indicating so. The feedback may instruct the user to capture the image now (e.g., by pressing a button on the camera or mobile device) or may advise the user that the image has been captured, for example.

At **860**, the captured image may be transmitted to the depository, e.g. as a digital image file. At **870**, the depository may receive the image of the check (along with financial information pertaining to the account for depositing funds, for example) and may process the image. Processing of the digital image file may include retrieving financial information regarding the check. The financial information may comprise the MICR number, the routing number, an amount, etc. Any known image processing technology may be used, such as edge detection, filtering to remove imagery except the check image or check data in the received digital image file, image sharpening, and technologies to distinguish between the front and the back sides of the check. The depository may identify and/or remove at least a portion of data that is extraneous to the check, such as background data.

After retrieving the financial information from the check in an electronic data representation form, the depository may determine whether the financial information such as the amount payable to the user, the account associated with the user to deposit funds, an account associated with a payor to debit funds, and an institution associated with the payor, etc., may be valid. For example, the depository may include electronic devices such as computers, servers, databases, or the like that may be in communication with each other. The electronic devices may receive an electronic data representation and may perform an analysis on the quality of the data representation, the readability of the data representation, or the like. For example, the electronic devices may determine whether the account number, amount payable, or the like may be readable such that they may be parsed and processed by the depository to credit an account associated with the user.

If the financial information is determined to be valid, the electronic data representation may be processed by the depository, thereby depositing the money in the user's account. If the financial information is determined to be invalid, then the user may be advised. For example, the depository may transmit an email, a web message, an instant message, or the like to the user indicating that the financial information associated with the electronic data representation may be invalid. The user may determine how to proceed by selecting an option on the web message, replying to the email, or the like.

Thus, in an implementation, instructions on how the user would like to proceed may be requested from the user, such as whether the user would like to try the deposit again (e.g., make another image of the check that pass the monitoring criteria and send it to the depository) or whether the user would like assistance from a representative, for example. The

user may indicate how they would like to proceed. If the user would like assistance, the financial information may be transferred to a representative for further review. The representative may review the financial information associated with the electronic data representation to determine whether to allow the electronic data representation to be processed by the depository. If so, the electronic data representation of the financial information may be processed by the depository, thereby depositing the check in the user's account. The depository may send a notice to the user via email, facsimile, instant message, or mail, for example, that the check has been deposited into the selected account.

FIG. **9** is an operational flow of another implementation of a method **900** that may be used for deposit of a check using image monitoring of the check. A user (e.g., the user **102**) may receive and endorse a check (e.g., the check **108**) at **910**, and open a communication pathway with an institution (e.g., the financial institution **130**) at **920**. In an implementation, the user may open a communication pathway with the institution by logging into a website of the institution, for example. There may be several ways in which a communication pathway may be established, including, but not limited to, an Internet connection via a website of the institution. The user may access the website and log into the website using credentials, such as, but not limited to, a username and a password.

At **930**, the user may send a request to deposit the check and may select an account in which to deposit the check. In an implementation, the user may select a "deposit check" option provided on the website, and may enter details such as check amount, date, the account the check funds should be deposited in, comments, etc.

At **940**, an image in the field of view of the camera may be obtained and provided, via the communication pathway, to the institution. A still image may be provided or a video may be provided, such as a video stream generated by the camera.

At **950**, the institution may receive the image or video stream and may analyze the image or a frame of the video stream with respect to one or more monitoring criteria, such as those described above. Feedback pertaining to the image with respect to the monitoring criteria may be generated and provided to the user over the communication pathway. Based on the feedback, the user may adjust the position the camera and/or the check and/or may adjust the light source until the image in the field of view of the camera is determined by the institution to pass the monitoring criteria.

When the image in the field of view passes the monitoring criteria, the image in the field of view may be captured (e.g., automatically without user intervention or pursuant to the user pressing a button) by the camera at **960**, thereby creating a digital image of the check. In an implementation, the user may instruct the camera (e.g., by pressing a button on the camera or the mobile device) to create the digital image. In another implementation, the camera may automatically create the digital image as soon as the image of the check passes the monitoring criteria. In this manner, the user may point the camera at the check such that the image of the check appears in the field of view, and after image has been determined to pass the monitoring criteria, a digital image of the check may be created without further user intervention. Depending on the implementation, one or more digital images of the check (e.g., corresponding to the front and back of the check) may be created using such techniques.

At **970**, the digital image(s) may be uploaded to the institution using any known image upload process. In an implementation, the upload may be augmented by secondary data which may be information relating to the deposit of the check, such as an account number and a deposit amount, for example. At **980**, when the institution has received the digital images (e.g., of the front and back sides of the check), the institution may process the digital images to obtain an image of the check and to deposit the funds of the check in the user's account, as described herein. It is contemplated that processing such as grayscale conversion, image cropping, image compression, edge and/or corner detection, etc. may be implemented in the method **900**. Such operations may be performed on one or more digital images created by the camera and may be performed on the image(s) by the mobile device and/or by the institution, as described further above.

Although the examples described herein may refer to uploading of images of checks to an institution, it is contemplated that any negotiable instrument or image (e.g., vehicle accident pictures provided to an insurance company) may be processed and/or transmitted using the techniques described herein. Additionally, one or more of the techniques described herein may be performed by the institution instead of the mobile device of the user.

FIG. **10** is a block diagram of an example computing environment in which example embodiments and aspects may be implemented. The computing system environment is only one example of a suitable computing environment and is not intended to suggest any limitation as to the scope of use or functionality. Numerous other general purpose or special purpose computing system environments or configurations may be used. Examples of well known computing systems, environments, and/or configurations that may be suitable for use include, but are not limited to, personal computers (PCs), server computers, handheld or laptop devices, multiprocessor systems, microprocessor-based systems, network PCs, minicomputers, mainframe computers, embedded systems, distributed computing environments that include any of the above systems or devices, and the like.

Computer-executable instructions, such as program modules, being executed by a computer may be used. Generally, program modules include routines, programs, objects, components, data structures, etc. that perform particular tasks or implement particular abstract data types. Distributed computing environments may be used where tasks are performed by remote processing devices that are linked through a communications network or other data transmission medium. In a distributed computing environment, program modules and other data may be located in both local and remote computer storage media including memory storage devices.

With reference to FIG. **10**, a system **1000** includes a computer **1010** connected to a network **1014**. The computer **1010** includes a processor **1020**, a storage device **1022**, an output device **1024**, an input device **1026**, and a network interface device **1028**, all connected via a bus **1030**. The processor **1020** represents a central processing unit of any type of architecture, such as a CISC (Complex Instruction Set Computing), RISC (Reduced Instruction Set Computing), VLIW (Very Long Instruction Word), or a hybrid architecture, although any appropriate processor may be used. The processor **1020** executes instructions and includes that portion of the computer **1010** that controls the operation of the entire computer. Although not depicted in FIG. **10**, the processor **1020** typically includes a control unit that organizes data and program storage in memory and transfers data and other information between the various parts of the computer **1010**. The processor **1020** receives input data from the input device **1026** and the network **1014** reads and stores code and data in the storage device **1022** and presents data to the output device **1024**. Although the computer **1010** is shown to contain only a single processor **1020** and a single bus **1030**, the disclosed

embodiment applies equally to computers that may have multiple processors and to computers that may have multiple busses with some or all performing different functions in different ways.

The storage device **1022** represents one or more mechanisms for storing data. For example, the storage device **1022** may include read-only memory (ROM), RAM, magnetic disk storage media, optical storage media, flash memory devices, and/or other machine-readable media. In other embodiments, any appropriate type of storage device may be used. Although only one storage device **1022** is shown, multiple storage devices and multiple types of storage devices may be present. Further, although the computer **1010** is drawn to contain the storage device **1022**, it may be distributed across other computers, for example on a server.

The storage device **1022** includes a controller (not shown in FIG. **10**) and data items **1034**. The controller includes instructions capable of being executed on the processor **1020** to carry out functions previously described herein with reference to FIGS. **1-9**. In another embodiment, some or all of the functions are carried out via hardware in lieu of a processor-based system. In one embodiment, the controller is a web browser, but in other embodiments the controller may be a database system, a file system, an electronic mail system, a media manager, an image manager, or may include any other functions capable of accessing data items. The storage device **1022** may also contain additional software and data (not shown), which is not necessary to understand the invention. Although the controller and the data items **1034** are shown to be within the storage device **1022** in the computer **1010**, some or all of them may be distributed across other systems, for example on a server and accessed via the network **1014**.

The output device **1024** is that part of the computer **1010** that displays output to the user. The output device **1024** may be a liquid crystal display (LCD) well-known in the art of computer hardware. In other embodiments, the output device **1024** may be replaced with a gas or plasma-based flat-panel display or a traditional cathode-ray tube (CRT) display. In still other embodiments, any appropriate display device may be used. Although only one output device **1024** is shown, in other embodiments any number of output devices of different types, or of the same type, may be present. In an embodiment, the output device **1024** displays a user interface. The input device **1026** may be a keyboard, mouse or other pointing device, trackball, touchpad, touch screen, keypad, microphone, voice recognition device, or any other appropriate mechanism for the user to input data to the computer **1010** and manipulate the user interface previously discussed. Although only one input device **1026** is shown, in another embodiment any number and type of input devices may be present.

The network interface device **1028** provides connectivity from the computer **1010** to the network **1014** through any suitable communications protocol. The network interface device **1028** sends and receives data items from the network **1014**. The bus **1030** may represent one or more busses, e.g., USB, PCI, ISA (Industry Standard Architecture), X-Bus, EISA (Extended Industry Standard Architecture), or any other appropriate bus and/or bridge (also called a bus controller).

The computer **1010** may be implemented using any suitable hardware and/or software, such as a personal computer or other electronic computing device. Portable computers, laptop or notebook computers, PDAs, pocket computers, appliances, telephones, and mainframe computers are examples of other possible configurations of the computer **1010**. For example, other peripheral devices such as audio adapters or chip programming devices, such as EPROM (Erasable Programmable Read-Only Memory) programming devices may be used in addition to, or in place of, the hardware already depicted.

The network **1014** may be any suitable network and may support any appropriate protocol suitable for communication to the computer **1010**. In an embodiment, the network **1014** may support wireless communications. In another embodiment, the network **1014** may support hard-wired communications, such as a telephone line or cable. In another embodiment, the network **1014** may support the Ethernet IEEE (Institute of Electrical and Electronics Engineers) 802.3x specification. In another embodiment, the network **1014** may be the Internet and may support IP (Internet Protocol). In another embodiment, the network **1014** may be a LAN or a WAN. In another embodiment, the network **1014** may be a hotspot service provider network. In another embodiment, the network **1014** may be an intranet. In another embodiment, the network **1014** may be a GPRS (General Packet Radio Service) network. In another embodiment, the network **1014** may be any appropriate cellular data network or cell-based radio network technology. In another embodiment, the network **1014** may be an IEEE 802.11 wireless network. In still another embodiment, the network **1014** may be any suitable network or combination of networks. Although one network **1014** is shown, in other embodiments any number of networks (of the same or different types) may be present.

It should be understood that the various techniques described herein may be implemented in connection with hardware or software or, where appropriate, with a combination of both. Thus, the methods and apparatus of the presently disclosed subject matter, or certain aspects or portions thereof, may take the form of program code (i.e., instructions) embodied in tangible media, such as floppy diskettes, CD-ROMs, hard drives, or any other machine-readable storage medium wherein, when the program code is loaded into and executed by a machine, such as a computer, the machine becomes an apparatus for practicing the presently disclosed subject matter. In the case of program code execution on programmable computers, the computing device generally includes a processor, a storage medium readable by the processor (including volatile and non-volatile memory and/or storage elements), at least one input device, and at least one output device. One or more programs may implement or use the processes described in connection with the presently disclosed subject matter, e.g., through the use of an API, reusable controls, or the like. Such programs may be implemented in a high level procedural or object-oriented programming language to communicate with a computer system. However, the program(s) can be implemented in assembly or machine language, if desired. In any case, the language may be a compiled or interpreted language and it may be combined with hardware implementations.

Although exemplary embodiments may refer to using aspects of the presently disclosed subject matter in the context of one or more stand-alone computer systems, the subject matter is not so limited, but rather may be implemented in connection with any computing environment, such as a network or distributed computing environment. Still further, aspects of the presently disclosed subject matter may be implemented in or across a plurality of processing chips or devices, and storage may similarly be effected across a plurality of devices. Such devices might include personal computers, network servers, and handheld devices, for example. Although the subject matter has been described in language specific to structural features and/or methodological acts, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to the specific

features or acts described above. Rather, the specific features and acts described above are disclosed as example forms of implementing the claims.

What is claimed:

1. A non-transitory computer-readable medium comprising computer-readable instructions for depositing a check that, when executed by a processor, cause the processor to:

monitor an image of the check in a field of view of a camera of a mobile device with respect to a monitoring criterion using an image monitoring and capture module of the mobile device;

capture the image of the check with the camera when the image of the check passes the monitoring criterion; and

provide the image of the check from the camera to a depository via a communication pathway between the mobile device and the depository.

2. The non-transitory computer-readable medium of claim **1**, further comprising instructions that provide feedback, via the mobile device to a user of the mobile device, regarding the image of the check with respect to the monitoring criterion prior to capturing the image of the check.

3. The non-transitory computer-readable medium of claim **2**, wherein the feedback is provided if the image fails to pass the monitoring criterion.

4. The non-transitory computer-readable medium of claim **3**, wherein the feedback comprises instructions for the user to follow to obtain a second image of the check in the field of view of the camera that passes the monitoring criterion.

5. The non-transitory computer-readable medium of claim **4**, wherein the feedback is provided visually in the field of view of the camera.

6. The non-transitory computer-readable medium of claim **1**, wherein capturing the image of the check is performed automatically without user intervention when the image of the check passes the monitoring criterion.

7. The non-transitory computer-readable medium of claim **1**, where the computer-readable instructions cause the processor to monitor the image of the check in the field of view of the camera with respect to a monitoring criterion without providing feedback, via the mobile device, regarding the monitoring of the image of the check in the field of view of the camera.

8. The non-transitory computer-readable medium of claim **1**, where the computer-readable instructions cause the processor to monitor the image of the check in the field of view of the camera with respect to a monitoring criterion without providing feedback, via the mobile device, regarding the monitoring of the image of the check in the field of view of the camera.

9. A non-transitory computer-readable medium comprising computer-readable instructions for depositing a check that, when executed by a processor, cause the processor to:

initialize a software object on a mobile device operated by a user, the software object configured to communicate with a camera;

monitor an image of the check in a field of view of the camera with respect to a monitoring criterion using an image monitoring and capture module associated with the camera;

capture the image of the check using the camera when the image of the check in the field of view passes the monitoring criterion; and

transmit the image of the check from the mobile device to a deposit system configured to clear the check and deposit funds of the check into a deposit account of the user.

10. The non-transitory computer-readable medium of claim **9**, further comprising instructions that provide feedback, via the mobile device to the user, when the image of the check in the field of view passes the monitoring criterion, prior to capturing the image of the check.

11. The non-transitory computer-readable medium of claim **10**, wherein the feedback comprises instructions to the user to capture the image of the check.

12. The non-transitory computer-readable medium of claim **9**, wherein the monitoring criterion comprises light contrast or light brightness of the image.

13. The non-transitory computer-readable medium of claim **9**, wherein the monitoring criterion comprises skewing of the image or warping of the image.

14. A system for depositing a check, comprising:

a subsystem that receives at a server a request for access to a deposit system from a mobile device;

a subsystem that receives, at the server from the mobile device, an image of the check in a field of view of a camera associated with the mobile device;

a subsystem that monitors, at a computing device of the server, the image with respect to a monitoring criterion;

a subsystem that provides instructions from the server to the mobile device to create a digital image of the check when the image passes the monitoring criterion;

a subsystem that receives the digital image at the server from the mobile device;

a subsystem that processes the digital image at a check processing module of the server; and

a subsystem that deposits funds of the check into an account associated with the deposit system using the processed digital image and a check clearance module of the server.

15. The system of claim **14**, wherein the monitoring criterion is based on light in the image.

16. The system of claim **15**, wherein the subsystem that monitors the image with respect to the monitoring criterion comprises a subsystem that generates a histogram using the image and uses the histogram in determining when the image passes the monitoring criterion.

17. The system of claim **14**, further comprising a subsystem that provides feedback from the server to the mobile device regarding the image with respect to the monitoring criterion prior to the image passing the monitoring criterion.

18. The system of claim **14**, wherein creating the digital image of the check when the image passes the monitoring criterion is performed without user intervention.

19. The system of claim **14**, wherein the mobile device comprises a video source and the image of the check is provided in a video received from the mobile device.

20. The system of claim **14**, wherein the image of the check is a frame of a live video of the check.

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