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(54) **SYSTEMS AND METHODS FOR REMOTE DEPOSIT OF CHECKS**

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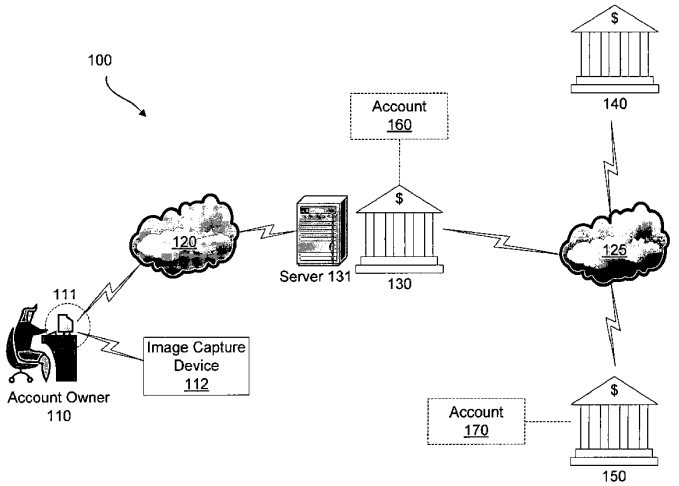
(57) **ABSTRACT**

Remote deposit of checks can be facilitated by a financial institution. A customer's general purpose computer and image capture device may be leveraged to capture an image of a check and deliver the image to financial institution electronics. Additional data for the transaction may be collected as necessary. The transaction can be automatically accomplished utilizing the images and data thus acquired.

12 Claims, 6 Drawing Sheets



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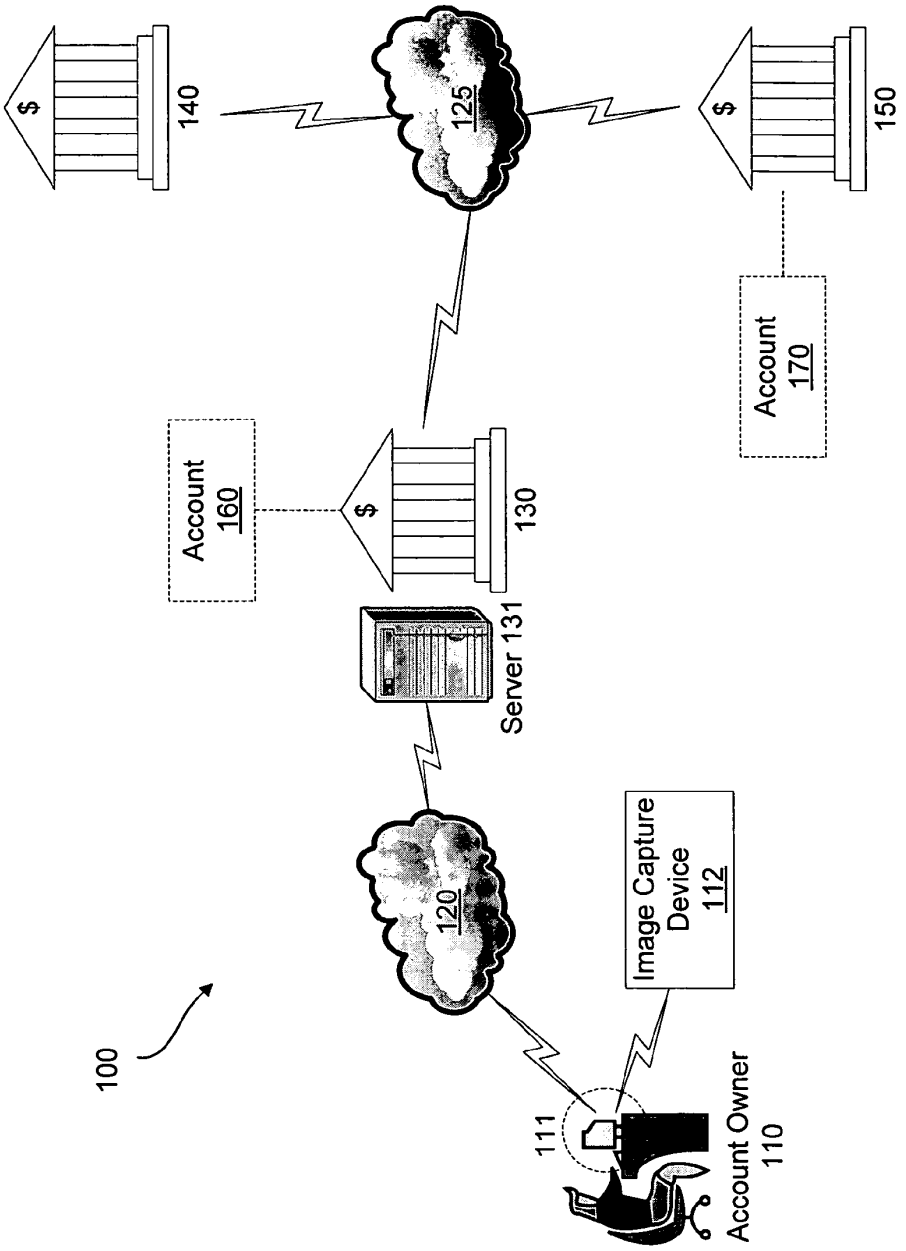
100
Account Owner
110
111
Image Capture
Device
112
120
Server 131
Account
160
130
125
140
Account
170
150

FIGURE 1

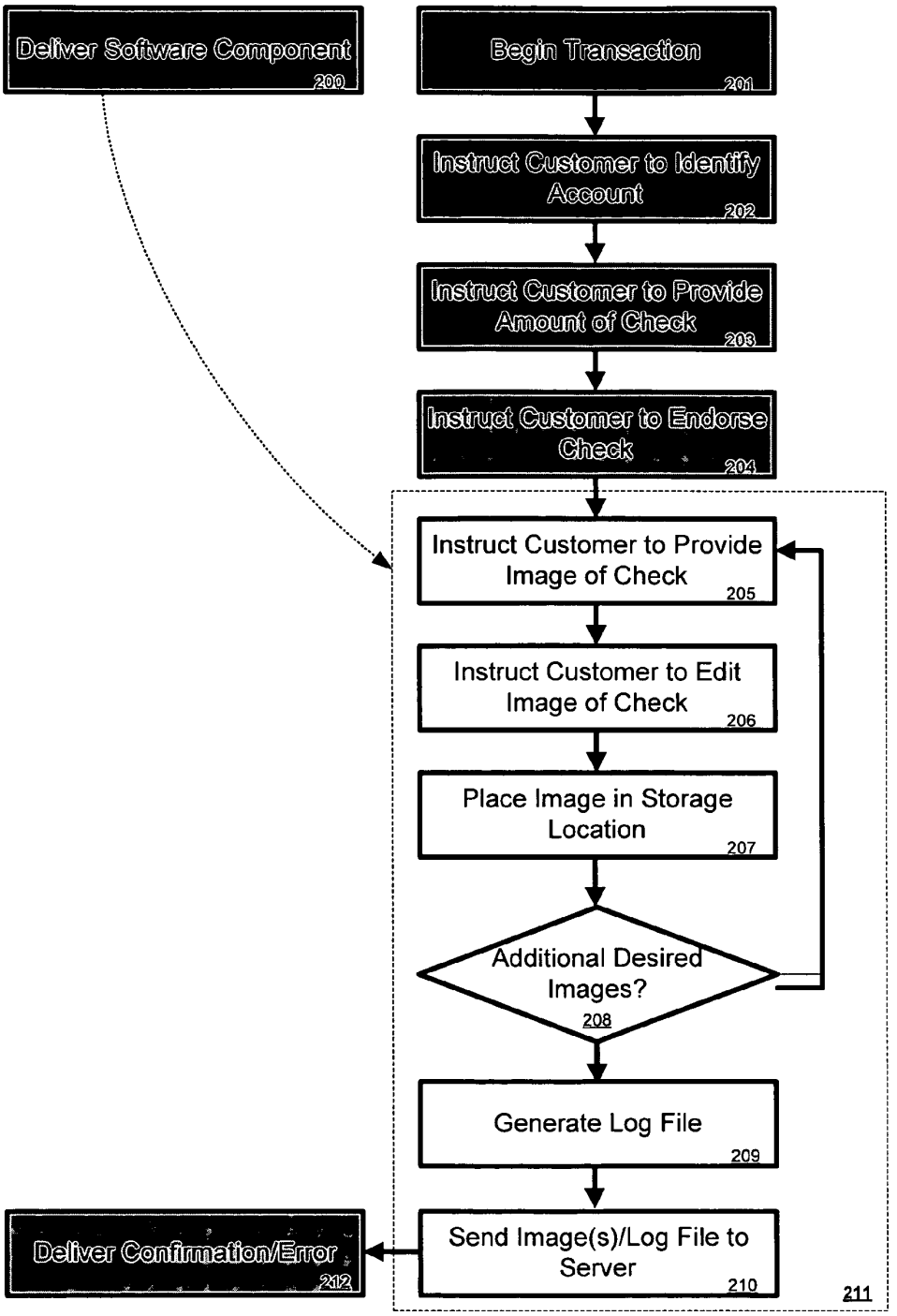
Deliver Software Component
200
Begin Transaction
201
Instruct Customer to Identify Account
202
Instruct Customer to Provide Amount of Check
203
Instruct Customer to Endorse Check
204
Instruct Customer to Provide Image of Check
205
Instruct Customer to Edit Image of Check
206
Place Image in Storage Location
207
Additional Desired Images?
208
Generate Log File
209
Send Image(s)/Log File to Server
210
211
Deliver Confirmation/Error
212

FIGURE 2

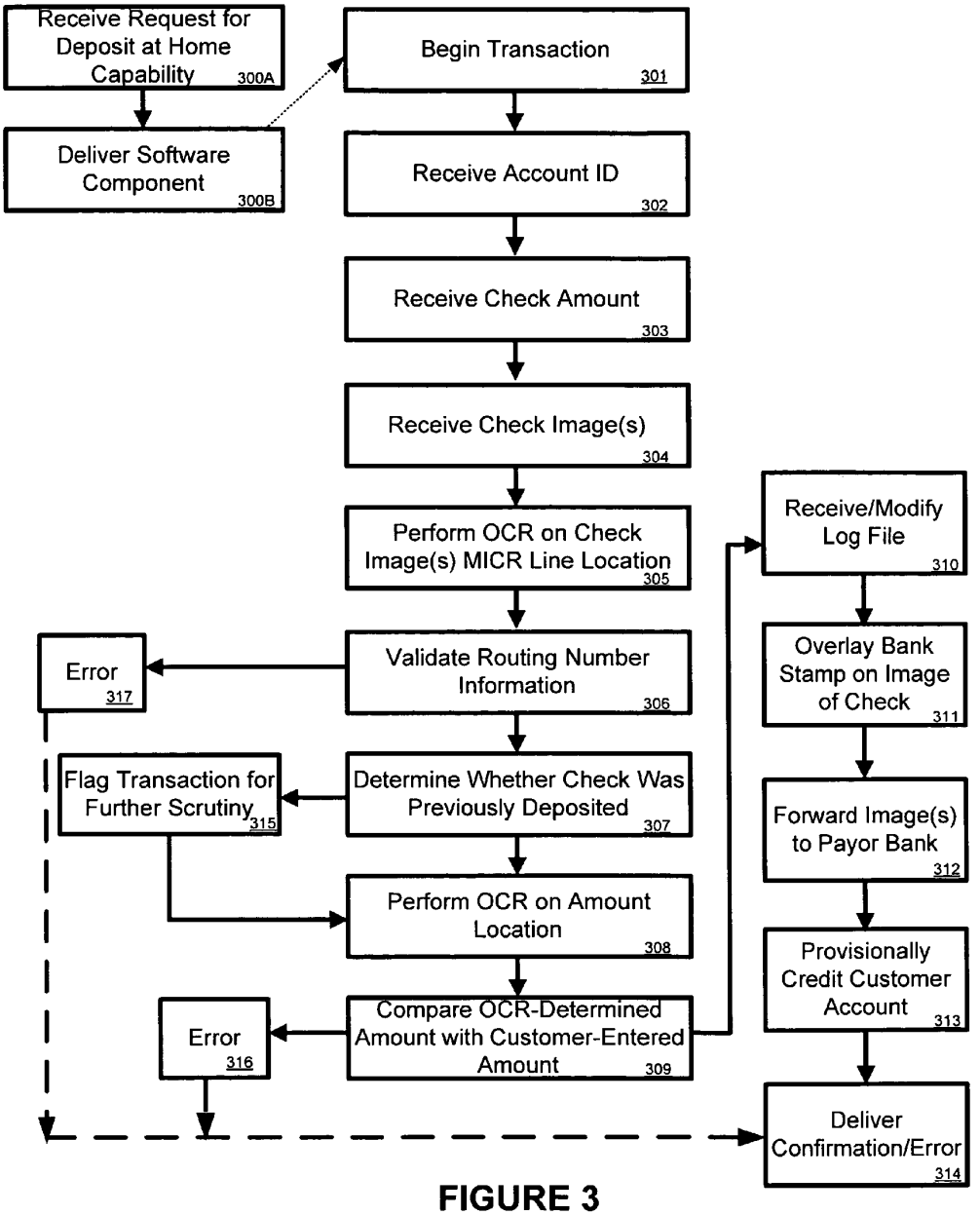
Receive Request for Deposit at Home Capability 300A
Deliver Software Component 300B
Begin Transaction 301
Receive Account ID 302
Receive Check Amount 303
Receive Check Image(s) 304
Perform OCR on Check Image(s) MICR Line Location 305
Validate Routing Number Information 306
Determine Whether Check Was Previously Deposited 307
Perform OCR on Amount Location 308
Compare OCR-Determined Amount with Customer-Entered Amount 309
Error 317
Flag Transaction for Further Scrutiny 315
Error 316
Receive/Modify Log File 310
Overlay Bank Stamp on Image of Check 311
Forward Image(s) to Payor Bank 312
Provisionally Credit Customer Account 313
Deliver Confirmation/Error 314

FIGURE 3

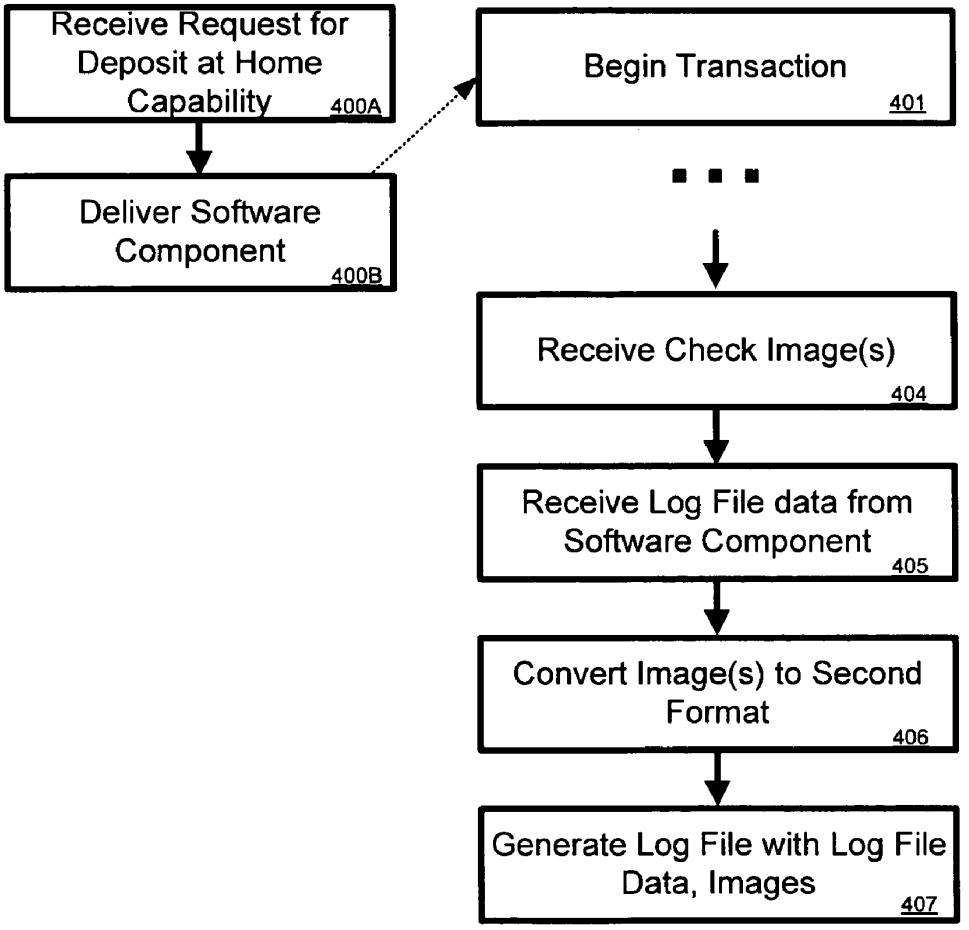
Receive Request for Deposit at Home Capability
400A
Deliver Software Component
400B
Begin Transaction
401
Receive Check Image(s)
404
Receive Log File data from Software Component
405
Convert Image(s) to Second Format
406
Generate Log File with Log File Data, Images
407

FIGURE 4

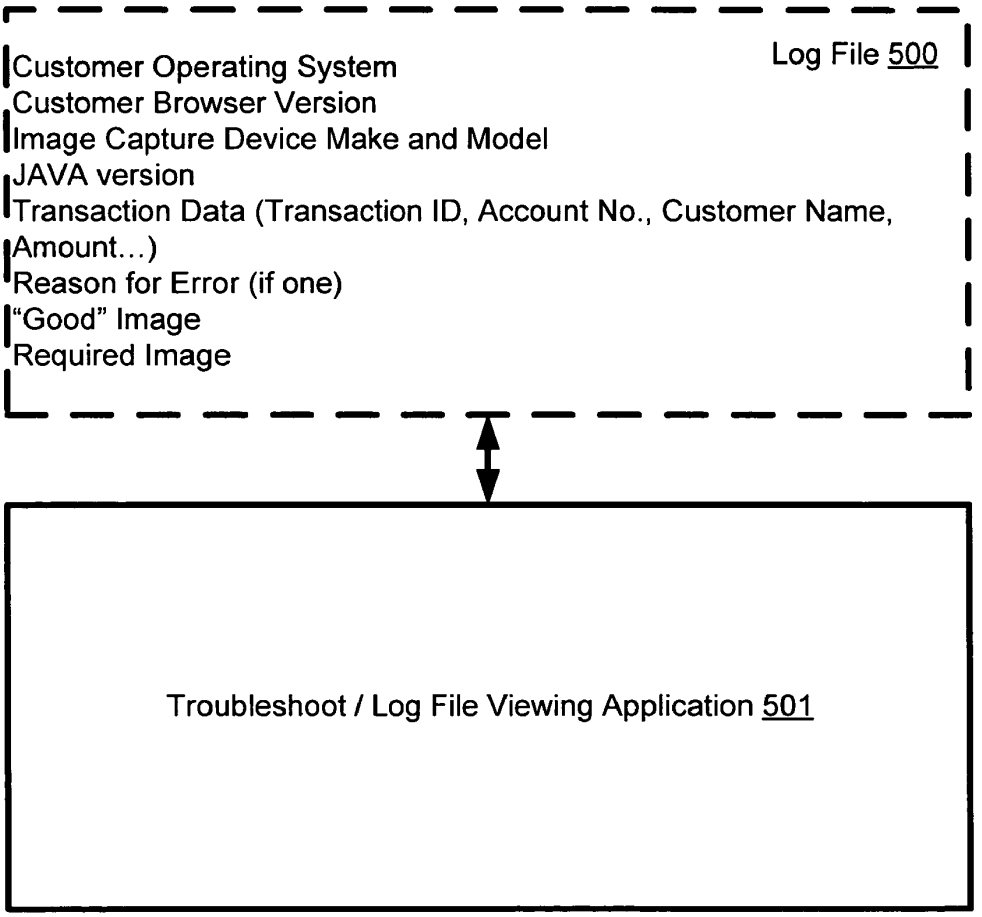
Log File 500
Customer Operating System
Customer Browser Version
Image Capture Device Make and Model
JAVA version
Transaction Data (Transaction ID, Account No., Customer Name, Amount...)
Reason for Error (if one)
"Good" Image
Required Image
Troubleshoot / Log File Viewing Application 501

FIGURE 5

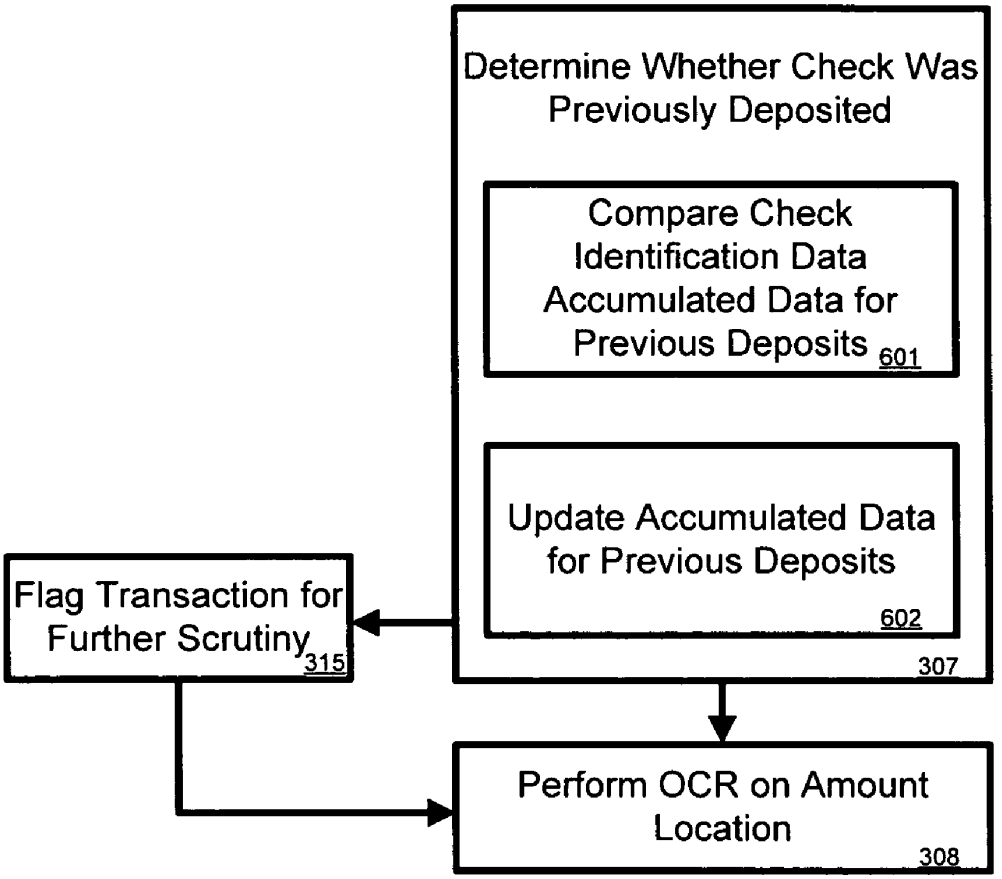
Determine Whether Check Was Previously Deposited
Compare Check Identification Data Accumulated Data for Previous Deposits 601
Update Accumulated Data for Previous Deposits
602
307
Flag Transaction for Further Scrutiny 315
Perform OCR on Amount Location
308

FIGURE 6

SYSTEMS AND METHODS FOR REMOTE DEPOSIT OF CHECKS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is related by subject matter to U.S. patent application Ser. No. 11/591,014, U.S. patent application Ser. No. 11/590,971, U.S. patent application Ser. No. 11/590,963, U.S. patent application Ser. No. 11/591,025, U.S. patent application Ser. No. 11/591,003, and U.S. patent application Ser. No. 11/590,974, all filed on even date herewith and also entitled "Systems and Methods for Remote Deposit of Checks."

This application is also related by subject matter to U.S. patent application Ser. No. 11/321,025, U.S. patent application Ser. No. 11/321,027, U.S. patent application Ser. No. 11/320,998 all filed on Dec. 29, 2005 and entitled "Remote Deposit of Checks," and U.S. patent application Ser. No. 11/591,131 filed Oct. 31, 2006 also entitled "Remote Deposit of Checks."

BACKGROUND

As described in U.S. patent application Ser. No. 11/321,025, checks typically provide a safe and convenient method for an individual to purchase goods and/or services. To use a check, the individual usually must open a checking account, or other similar account, at a financial institution and deposit funds, which are then available for later withdrawal. To pay for goods and/or services with a check, the payor (i.e., the buyer) usually designates a payee (i.e., the seller) 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 in return for the goods and/or services provided by the payee.

Checks have certain advantages over other forms of payment, such as cash. For example, while often considered the most liquid type of asset, cash also may be the least secure. Unlike a check, cash is usually freely transferable and does not have to be endorsed. Thus, the owner and possessor of cash is most often the same individual. Because cash is freely transferable, cash that is lost or stolen typically cannot be recovered. Therefore, the risks associated with cash transactions are often unacceptable, particularly with respect to transactions not conducted in person (e.g., by mail) and/or involving large sums of money. A check, on the other hand, provides a payor with more security because the check usually requires a payor to specify both the person and amount to be paid. Furthermore, as noted above, the check is usually not valid until it is properly signed by the payor. These safeguards help to reduce the risk that money will be lost and/or stolen and ensure that the proper payee receives the proper amount of money.

Cash may have other disadvantages as well. For example, because cash is freely transferable, there may be little or no verifiable transaction history. It is often desirable for a payor and/or payee to have physical proof that a particular transaction took place. This typically requires that the payor receive a receipt. However, receipts may contain errors and can be easily misplaced. In contrast, a bank processing a check will ordinarily create a transaction history, which may include the identity of the payee, the amount to be paid, the date of the payment, and the signature of the payor. This enables both a

payor and payee to independently verify the accuracy of most transactions involving a payment by check.

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. In addition to the time commitment that may be required, visiting a bank branch may be problematic for the payee if the bank's hours of operation coincide with the payee's normal hours of employment. Thus, the payee may be required to leave work early and/or change work schedules.

A check may pose other burdens for the payee. As noted above, a check may not be freely transferable, thereby limiting the payee's ability to use funds from the check. For example, it is usually difficult to for the payee to purchase goods and/or services using a check issued by the payor. While the check may be endorsed and accepted by a third party, such transactions are often disfavored because the third party may not know the payor and, thus, may not be willing to accept the risk that the payor has insufficient funds to cover the check. Therefore, the payee may not have access to the funds from the check until the payee deposits the check at the bank, the check has cleared and the funds have been credited to the payee's account. The payee may have to wait even longer if the payee chooses to deposit the check by mail. Therefore, there is a need for a convenient method of remotely depositing a check while enabling the payee to quickly access the funds from the check.

SUMMARY

The described embodiments contemplate a system, method and computer-readable medium with computer-executable instructions for remotely redeeming a negotiable instrument. In an embodiment, the novel method may include delivering, via a publicly accessible computer network, a software component to a customer-controlled general purpose computer. The customer is instructed to identify an account via said computer, and to provide an image of at least a front side of a check, for example by scanning the check and appropriately rotating and cropping the scanned image as necessary. The image passes from scanner or other image capture apparatus to the software component, which manages delivery to bank servers.

In another embodiment, the novel method may include receiving, at a server computer, a customer request for a customer capability to make at least one check deposit from a customer-controlled general purpose computer. The software component for facilitating a check image capture process is then delivered to the customer. A customer identification of an account for a deposit and an image of a front side of a check is received, and optical character recognition (OCR) is performed on a Magnetic Ink Character Recognition (MICR) line location of the image. The received information and OCR information can be used in completing the deposit.

In another embodiment, the novel method may include receiving a customer identification of an account for a deposit, receiving a first image of a front side of a check, wherein said first image is in a first file format, e.g. JPEG, and wherein said first image is received from a customer-controlled general purpose computer. A second image of said front side of a check may then be created by converting said first image into a second file format, e.g. a bi-tonal TIFF. A log file may be generated comprising one or more of said first image and said second image, in addition to a variety of other

potentially useful information for processing and/or troubleshooting the deposit transaction.

Additional advantages and features of the invention are described below.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing summary, as well as the following detailed description of preferred embodiments, is better understood when read in conjunction with the appended drawings. For the purposes of illustration, there is shown in the drawings exemplary embodiments; however, the invention is not limited to the specific methods and instrumentalities disclosed. In the drawings:

FIG. **1** illustrates a broad view of a system in which the described embodiments may be employed.

FIG. **2** illustrates a method for facilitating deposit of a check from a customer-controlled general purpose computer.

FIG. **3** illustrates a method for processing a check deposit.

FIG. **4** illustrates a method for processing check deposits, with particular applicability to generation and use of an appropriate log file.

FIG. **5** illustrates an exemplary log file and log file viewing application.

FIG. **6** illustrates an exemplary duplicate checking procedure.

DETAILED DESCRIPTION

Certain specific details are set forth in the following description and figures to provide a thorough understanding of various embodiments of the invention. Certain well-known details often associated with computing and software technology are not set forth in the following disclosure, however, to avoid unnecessarily obscuring the various embodiments of the invention. Further, those of ordinary skill in the relevant art will understand that they can practice other embodiments of the invention without one or more of the details described below. Finally, while various methods are described with reference to steps and sequences in the following disclosure, the description as such is for providing a clear implementation of embodiments of the invention, and the steps and sequences of steps should not be taken as required to practice this invention.

FIG. **1** illustrates an example system in which the described embodiments may be employed. System **100** may include account owner **110**, e.g., a bank customer who may be located, for example, at the customer's private residence. The account owner **110** may be utilizing a customer-controlled, general purpose computer **111**. A general purpose computer **111** is generally a Personal Computer (PC) running one of the well-known WINDOWS® brand operating systems made by MICROSOFT® Corp., or a MACINTOSH® (Mac) brand computer, running any of the APPLE® operating systems. General purpose computers are ubiquitous today and the term should be well understood. A general purpose computer **111** may be in a desktop or laptop configuration, and generally has the ability to run any number of applications that are written for and compatible with the computer's operating system. The term "general purpose computer" specifically excludes specialized equipment as may be purchased by a business or other commercial enterprise, for example, for the specialized purpose of high-speed, high-volume check deposits. A particular advantage of embodiments of the invention is its ability to operate in conjunction with electronics that today's consumers actually own or can easily acquire, such as a general purpose computer, a scanner, and a digital camera.

General purpose computer **111** may also be "customer-controlled." A common example of a customer-controlled computer would be a typical computer located in a private residence. The owner of such a computer typically has the power to install programs and configure the computer as they wish, subject to certain security restrictions that may be imposed by the hardware or software manufacturers. A customer-controlled computer need not be located in a private residence, however. For example, computers in college dormitories, in workplace offices, and so forth may also be considered to be "customer-controlled."

An example of a computer that would not be considered customer-controlled would be an Automatic Teller Machine (ATM) that is typically controlled by a bank or other business. Although a customer may access and utilize an ATM machine, the ATM machine is not customer-controlled because the allowed uses of the ATM machine are highly restricted. Relevant factors in determining whether a machine is customer controlled are thus the scope of operations that a customer may perform using the machine, and extent to which the customer can reconfigure the machine in some way by adding software and/or hardware components.

One of the applications that may run on a general purpose computer **111** in connection with the invention is a browser. Common browsers in use today are, for example, the popular INTERNET EXPLORER® line of browsers made by MICROSOFT® Corp., the FIREFOX® browsers distributed via the MOZILLA® open source project, and the NETSCAPE NAVIGATOR® browsers also distributed via the MOZILLA® open source project. Browsers generally allow users to point to a Uniform Resource Locator (URL), and thereby retrieve information such as a web page. For example, a browser application on computer **111** could retrieve a web page that is kept at server **131**, and display the web page to the account owner **110**, as is generally known and appreciated in the industry and by the general public.

Another application, or set of applications, that may run on a general purpose computer **111** in connection with the invention comprises "virtual machine" technologies such as the JAVA® virtual machine software distributed by SUN MICROSYSTEMS® Corp, and .NET® Framework distributed by MICROSOFT® Corp. In general, such applications facilitate execution of computer programs in a variety of computing environments. For example, a JAVA® applet is a computer program (which may be alternatively referred to herein as a "software component") that can execute on any computer running the JAVA® virtual machine software. The applet may be provided to virtual machine software in a "source code" format, and may be compiled by a "just in time" compiler, so as to put the applet in a form that can be executed by the hardware associated with the particular computing device. These technologies are known in the art and may be utilized in connection with certain embodiments of the invention as described herein.

An image capture device **112** may be communicatively coupled to the computer **112**. Image capture device may be, for example, a scanner or digital camera. Computer **111** may comprise software that allows the user to control certain operations of the image capture device **112** from the computer **111**. For example, modern scanner users may be familiar with the TWAIN software often used to control image capture from a computer **111**. Similarly, digital cameras often ship along with software that allows users to move images from the camera to a computer **111**, and may also provide additional functions, such as photo editing functions crop and rotate.

Financial institutions **130**, **140** and **150** 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, investment bank, investment company, regional branch of the Federal Reserve, clearinghouse bank and/or correspondent bank. A negotiable instrument is usually a type of contract that obligates one party to pay a specified sum of money to another party. By way of example, and not limitation, negotiable instruments may include a check, draft, bill of exchange, promissory note, and the like.

Financial institution **130** is illustrated as associated with a server **131**. Financial institution **130** may maintain and operate server **131** for the purposes of communicating with customers such as **110**. Alternatively, such server may be maintained and operated by one or more third party vendors who act under the instructions of the financial institution **130**, but possess skills and resources that may be more effective in competent operation of electronics. Such arrangements are well known in the industry and in this case the server **131** is nonetheless considered to be "associated" with the financial institution **130**.

Account owner **110** may be an individual who owns account **160**, which may be held at financial institution **130**. As such, account owner **110** may be described as a customer of financial institution **130**. Account **160** may be any type of account for depositing funds, such as a savings account, checking account, brokerage account, and the like. Account owner **110** may communicate with financial institution **130** by way of communication network **120**, which may include an intranet, the Internet, a local area network (LAN), a wide area network (WAN), a public switched telephone network (PSTN), a cellular network, a voice over internet protocol (VoIP) network, and the like. Account owner **110** may communicate with financial institution **130** by phone, email, instant messaging, facsimile, and the like.

In one contemplated embodiment, network **120** is a publicly accessible network such as the Internet, which can presently be accessed from many private residences and many public places such as college campuses, airports, coffee shops, and restaurants throughout the United States as well as many other countries of the world. A variety of technologies are available to establish secure connections over such a public network, so that data transmitted between computer **111** and a server **131** associated with the institution **130** remains either inaccessible or indecipherable by third parties that may intercept such data. The invention may make use of any such security technologies.

Financial institutions **130**, **140** and **150** may communicate with each other via a network **125**. Network **125** may be a publicly accessed network such as **120**. Alternatively, network **125** may have certain characteristics that differ from network **120**, due to the different requirements of bank-to-bank communications. For example, one might envision certain security features and access restrictions being more important in bank-to-bank communications.

In an embodiment, account owner **110** may wish to deposit a check that is drawn from account **170** at financial institution **150**. Account owner **110** may deposit the check into account **160** by converting the check into electronic data and sending the data to financial institution **130**. Aspects of the invention may thus comprise systems and methods carried out by the account owner **110** and his computer **111**. Aspects of the invention may also comprise systems and methods carried out by the financial institution **130** and their server **131** or other electronics that facilitate and enable such deposit by the account owner **110**.

For example, account owner **110** may convert the check into a digital image by scanning the front and/or back of the check using image capture device **112**. Account owner **110** may then send the image to financial institution **130** using the systems and methods described herein. Please refer to FIG. **2** and corresponding description for a detailed exemplary embodiment of systems and methods for facilitating and processing a check deposit transaction. Upon receipt of the image, financial institution **130** may credit the funds to account **160**. Financial institution **130** may clear the check by presenting 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 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 institution **130** and **150** may have accounts at the regional branch of the Federal Reserve. As will be discussed in greater detail below, financial institution **130** may create a substitute check using the image provided by account owner **110** 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 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 may be cleared internally.

FIG. **2** illustrates a method for facilitating deposit of a check from a customer-controlled general purpose computer. The various steps of FIG. **2** may be viewed as performed by a server computer associated with a financial institution, in conjunction with a software component that operates from a customer-controlled general purpose computer. Various of the steps are contemplated as performed by the server, while various other steps are contemplated as performed by the software component.

In the embodiment illustrated in FIG. **2**, the darker boxes indicate steps that are performed by the server, for example by delivering information to the user through the user's browser application. Making information available on a server to customers with a browser is considered to be effectively "delivering" such information for the purposes of this document. The lighter boxes inside **211** indicate steps that are performed by the software component, as it executes on the customer computer. Those of skill will recognize that alternative configurations are readily achievable by moving functions from server to software component or vice-versa.

The server may first deliver a software component to the customer-controlled general purpose computer **200**. This

may be done in response to a customer request for the capability of making deposits from his computer. In one embodiment, the financial institution may provide such capability only to customers that meet predetermined criteria of trustworthiness. For example, it can be required that the customer's accounts are in good standing, that the customer relationship has lasted a predetermined amount of time, that the customer has a predetermined number of financial service products with the financial institution (e.g. bank accounts, mortgages, insurance policies, etc.), that the customer has a predetermined level of assets with the financial institution, and so forth.

The software component may be configured to facilitate the deposit transaction in a variety of ways as illustrated herein. In one embodiment, the software component may be compatible with the JAVA® or .NET® technologies described above. Such configurations allow for widespread dissemination and successful operation in a wide variety of computing environments as may exist on customer-controlled general purpose computers.

Where the software component is written for JAVA®, .NET®, or any other such technology, it is useful in step **200** to first determine whether the customer-controlled general purpose computer has an appropriate virtual machine application installed, e.g. JAVA® Virtual Machine (JVM) or .NET® framework. If the computer does not have the appropriate application installed, such application may be automatically installed, or the customer may be directed to a location from which such application may be downloaded and installed. The software component may then be delivered **200**, and should work as intended. The various other steps of FIG. **2** may now take place, or may take place at some subsequent time using the software component as previously downloaded.

After downloading or otherwise accepting the software component, and assuming the customer has an appropriate image capture device, the customer now has the capability to make deposits from his general purpose computer. For example, the customer points his browser to a bank website, where a link may be available that causes the bank server to initiate a deposit transaction **201**. The customer may be asked to log in using a user name and password.

The customer may next be instructed to identify an account into which the deposit will be made **202**. This can be done, for example, by providing a webpage that lists the available accounts, along with an instruction to select an account. Alternatively, a box may be provided into which the customer may type an account number, along with an appropriate instruction to type the number of the desired account. The account may be any account, and need not necessarily be the customer's own account, although it is contemplated that a large number of customer deposits may be made into the transacting customer's account, and embodiments may find it useful to restrict the allowed accounts to the customer's own accounts. In such embodiments, if the customer has just one account with the financial institution, step **202** may be eliminated because the only available allowed account would be the customer's single account.

The customer may next be instructed to identify an amount of a check or other negotiable instrument he wishes to deposit into the selected account **203**. In one embodiment, this can be done similarly to step **202** by providing a webpage with a box into which the customer may type an amount, along with an appropriate instruction to type the amount of the check. The customer may also be instructed to endorse the check **204**.

The customer may next be instructed to provide an image of a front side of a check **205**, for example, by using an image capture device. In one embodiment, the customer may be instructed to place the check face down on a flatbed scanner, and may further be instructed as to the location and orientation of the check on the scanner. If the customer is instructed to take a digital photograph of the check using a digital camera, the customer may be instructed as to the position and orientation of the check, lighting, angle of camera, distance and focal length (zoom) of camera, and so forth. The software component may be useful at this point in providing a graphical illustration of just how the customer should provide the image. The customer may further be given instructions as to how to activate the image capture device and/or move the image from the device to the general purpose computer.

In one embodiment, it is contemplated that the software component allows for control of the transaction and transaction data throughout the various aspects thereof. For example, the software component may open a folder in a storage location, such as the hard drive of the general-purpose computer, and may work in conjunction with any software that interfaces with the image capture device to deposit the image in such folder. This may advantageously be conducted in a secure manner to prevent any unwanted image diversion or tampering. The hard drive of the general-purpose computer is considered to be a storage location that is controlled by said customer-controlled general purpose computer, but other storage locations such as disk drives, networked drives, and so forth may also be effectively controlled by the general purpose computer.

The software component may itself perform operations such as opening a folder and placing the images therein, or may effectively achieve such operations by instructing the customer and/or other applications to do so. All software operates to some extent under the control and with the support of an operating system running on the general purpose computer, and such support is of course appropriate in embodiments of the invention.

The software component may next cause the image of the check to be presented to the customer for editing, e.g. by asking the customer to crop and/or rotate the check image to a predetermined orientation **206**. In embodiments using a scanner, an image of the entire scanner bed, or some otherwise too large image may be generated. If the check was placed in the top left corner of the scanner bed, the customer may be asked to indicate the bottom right corner of the check image, and the image may be cropped to contain only the check image, thereby removing a portion of the originally obtained image.

An appropriately edited image of the check may be placed in the storage location **207**. If further images are necessary **208**, steps **205-207** may be repeated as necessary. For example, the customer may be instructed to endorse and provide an image of the back side of a check. To ensure the check is appropriately voided, the customer may be asked to write "void" on the check and re-scan the front of the check.

A log file may be generated 209 to collect data for processing or troubleshooting the deposit transaction. The log file is discussed further in connection with FIGS. **4** and **5**. The log file may be placed in the storage location along with the various images of the check.

Once the desired images are collected and edited, they may be delivered to the server for processing the deposit **210**. The log file may also be delivered at this time. Once such files are delivered, they may be deleted from the customer's general purpose computer. If the server determines that the delivered images and any corresponding data are sufficient to go forward with the deposit, the customer's account may be provisionally credited, and a confirmation page may be delivered to

the customer via the customer's browser application **212**. The customer may be instructed to destroy, e.g. by shredding, the actual physical check or other negotiable instrument. Under the current check handling procedures in the United States, the physical check is not necessary in processing a deposit, nor is it necessary to keep the original check in bank or customer records.

FIG. **3** illustrates a method for processing a check deposit. The method of FIG. **3** is designed to complement that of FIG. **2** and to illustrate exemplary steps that may be carried out by a server or other electronics operated by a financial institution before, during, and after the various steps of FIG. **2** are carried out.

In general, as illustrated in FIG. **3**, such server may receive a request for deposit at home capability **300**A, and in response to such request may deliver a software component to the requesting customer **300**B. As with FIG. **2**, intermediate steps may comprise determining if the customer is in fact eligible for a remote deposit program, and ensuring the customer has an appropriate virtual machine environment installed on their general purpose computer—in embodiments where the software component requires such an environment.

A transaction may be initiated **301** upon receiving a customer indication that a deposit transaction is desired. The customer is instructed to identify an account per FIG. **2**, and as a result the financial institution electronics receive an account identifier (ID) **302**. Similarly, financial institution electronics receive check amount **303**. At this juncture the software component handles image capture processes, which may or may not involve the server until such time as check image(s) are received **304**.

Upon receipt of check images, an Optical Character Recognition (OCR) process may be invoked to determine certain information about the check. For example, OCR may be performed on the check's MICR line location **305** to determine information such as payor bank routing number, account number, and check number. The bank routing number may then be validated **306** against a list of valid routing numbers to ensure that it corresponds to a legitimate bank, and in some embodiments, to ensure it corresponds to a United States bank. In one embodiment, the OCR is conducted in real time, i.e. prior to confirming the deposit transaction for the customer, so as to validate some initial deposit information immediately, and thereby filter transactions that may result in errors were the OCR to be conducted at some later time. In other embodiments, certain efficiencies may be gained by performing "batch" OCR operations at some later time.

In one embodiment, an OCR process can conveniently be applied to an image of a back side of a check in addition to performing OCR on the image of the front side of said check. One problem that may occur involves customer submission of two front images, instead of one front image and one back image. OCR may be performed on a MICR line location of an alleged image of a back side of said check to confirm that said alleged image of a back side of said check does not bear a MICR line. If no MICR line is present in such location then it is more likely that the alleged image of a back side of said check is in fact the back, and not the front, of the check.

Another advantageous use of OCR is on the endorsement location on the back of a check. By performing OCR, it may be possible in some embodiments to determine that the signature matches that of the payor or drafter of the check. However, often signatures are illegible. Thus in one embodiment it is advantageous to determine that some mark or signature is present in the endorsement location on the back of the check, without conducting any further signature identification procedures.

If the routing number determined using OCR cannot be validated, an error may result **317**, and the deposit transaction can be aborted. An error message can be delivered to the customer **314**, explaining a reason that the transaction could not be processed.

A duplicate checking procedure may be carried out to determine whether the check was previously deposited **307**. Determining whether a check is a duplicate can be processor- and memory-intensive, however, so this operation may be initially performed in a manner designed for speed and rough, if not complete, accuracy. More thorough duplicate detection may be performed after the deposit transaction is confirmed **314**. For example, in one embodiment, an initial duplicate detection process may proceed as illustrated in FIG. **6**.

FIG. **6** expands upon step **307** as illustrated in FIG. **3**. To undertake at least an initial, provisional duplicate checking procedure, check identification data may be compared against accumulated data for previous check deposits **601**. This may entail, for example, comparing check MICR line information against MICR lines for all checks deposited into the transacting customer's account for the previous two weeks. Other embodiments are also possible, for example one might ensure a MICR line does NOT comprise a money amount, because a money amount in a MICR line indicates a check was already deposited. On might scan for a return stamp on the front or back of the check. One might also look for a number 4 in position **44** of the MICR line. Placing a **4** in position **44** is only done when images of checks are made by banks. The fact that an image was made in general implies that the check was already presented to a bank, and therefore it may be advantageous to ensure the check was not presented twice.

According to step **602**, if the check deposit proceeds, appropriate check identification data for the deposited check may be added to the accumulated data for previous deposits, so that it too will be available for use in subsequently identifying duplicate deposit attempts.

There are numerous possibilities for false positives in duplicate checking **307**. Because of this, it is advantageous in some embodiments to proceed with a deposit transaction despite the fact that a duplicate may be initially identified. As illustrated in FIG. **3**, if a duplicate is detected, the transaction may be flagged for further scrutiny **315** at a later time, and the transaction may be allowed to proceed. If a duplicate is not detected, the transaction need not be flagged as abnormal and step **315** is unnecessary.

Returning to FIG. **3**, OCR may further be performed on a check amount location **306**, and the amount as determined using OCR may be compared against the customer-entered amount received pursuant to step **303**. If the amounts do not match, an error **316** can result, terminating the transaction and delivering appropriate information concerning the error to the customer **314**. OCR may further be performed on any other aspects of the check image at this time if it is advantageous in specific embodiments to do so.

The server may further receive and modify a deposit transaction log file **310**. Alternative versions of the images received may be generated an placed in the log file. Check **21** regulations require a bi-tonal TIFF formatted image, which is generally a low-quality image format as compared to other available image formats. Therefore, it is desirable in some embodiments to retain both a "good" image in an initial format, e.g., in a JPEG format, as well as the modified bi-tonal

TIFF required by Check **21**. This way, if any troubleshooting is necessary, a good image of the check remains available.

In some embodiments, a bank stamp may be overlaid on the image of the back of the check **311**, just as if the check was physically deposited at a bank. Appropriate images may be forwarded to the payor bank for payment **312**, and meanwhile, the customer's account may be provisionally credited in the amount of the check **313**. A confirmation can be delivered to the customer **314**.

At **312**, in one embodiment, the bank may forward an image or images to a payor bank. Provisionally crediting the customer account **513** and delivering a confirmation to the customer-controlled general purpose computer **514** may be done before, after, or contemporaneously with step **312**. In general, a provisional credit is subject to the check clearing, e.g., by receiving at the payee bank some confirmation that the check will be satisfied from the payor bank. This confirmation from the payor bank can take some time. Provisionally crediting the customers account **513** and sending the confirmation **514** can assure the customer that the transaction will proceed, even though it may not ultimately be successful.

In one embodiment, forwarding an image or images to a payor bank **512** may be performed pursuant to an Automated Clearinghouse (ACH) transaction. ACH transactions typically include payment instructions to debit and/or credit an account. Banks often employ ACH service providers to settle ACH transactions. Examples of ACH service providers include regional branches of the Federal Reserve and the Electronic Payments Network (EPN).

In an ACH transaction, the payee's (customer's) bank may be referred to as the originating depository financial institution (ODFI). Upon receipt of appropriate check information, the payee's bank may credit funds to the payee's account and generate an ACH debit entry to the payor's account, which may be presented to the ACH service provider for processing.

The ACH service provider may process the debit entry by identifying the account and bank from which the check is drawn. The bank from which the check is drawn (i.e., the payor's bank) may be referred to as a receiving depository financial institution (RDFI). If the payor's bank verifies the transaction, the ACH service provider may settle the transaction by debiting the payor's bank and crediting the payee's bank. The payor's bank may then debit the payor's account.

A substitute check is typically a paper reproduction of an original check and may be the legal equivalent of the original check. Substitute checks were authorized under The Check Clearing for the 21st Century Act, commonly known as Check **21**. The Act was enacted to facilitate the check clearing process by allowing banks to transmit electronic images of checks (e.g., substitute checks) to other banks rather than physically sending the original paper checks. Check **21** does not require that banks use substitute checks. In fact, many banks may have voluntary agreements to accept certain electronic images of checks even though the images may not qualify as substitute checks under Check **21**. If a bank does not have a voluntary agreement and/or refuses to accept an electronic image, the financial institution is required under Check **21** to accept a substitute check in lieu of the original check.

The bank may process the ACH debit entry, substitute check, and/or electronic image. As noted above, the bank may present the ACH debit entry to an ACH service provider (e.g., EPN), which may be responsible for settling the transaction between the payee's bank and the payor's bank. The bank also may convert the digital image into a substitute check and present the substitute check to an intermediary bank (e.g., a regional branch of the Federal Reserve) to complete the check clearing process. If the payor's bank and the payee's bank are the same, the transaction can be handled internally at the payor bank by simply debiting the account of one customer and crediting the account of another. Thus, an intermediate step may comprise identifying if the payor bank and the payee bank are one and the same, or otherwise operating in a closely cooperative manner.

FIGS. **4** and **5** are directed to methods for processing check deposits, with particular applicability to generation and use of an appropriate log file. With reference to FIG. **4**, a bank server and/or related electronics can receive a request for "deposit at home" or remote deposit capability **400**A, and deliver a software component to a customer's general purpose computer **400**B as described above. In general, a transaction may begin **401** and proceed as described with regard to FIGS. **2** and **3**. The three dots in FIG. **4** are a general reference to steps of a deposit transaction that may occur. In the course of such transaction, a log file maybe generated, for example by a software component on a customer-controlled general purpose computer. The log file comprises log file data, and may be delivered to the server by the software component. Log file data may comprise, for example the data illustrated in the log file **500** in FIG. **5**.

In one embodiment, a financial institution server may receive one or more check images **404**, and may receive log file data from the software component **405**. Other embodiments are will be readily recognized as possible, such as placing the images in the log file and combining steps **404** and **405**, or streaming raw data absent any sort of file structure, and allowing the server to generate a file upon receipt of such data.

Step **406** comprises converting an image from a first format to a second format. In one embodiment, the first format is, for example, a relatively high-quality Joint Photographic Experts Group (JPEG) format, such as might be initially generated by the image capture device used by a customer in producing the check image. Due to its high quality, such an image provides a good tool for subsequently troubleshooting a deposit transaction. For example, it might be readily determined if the image represents a check that was previously deposited by simple human inspection of both images.

The second format is, in one embodiment, a format that complies with bank-to-bank image transfer requirements. Currently, the image format required by Check **21** is the bi-tonal Tag Image File Format (TIFF). Therefore the second format may be, for example, a bi-tonal Tag Image File Format (TIFF).

In a further embodiment, the images in both formats can be retained, for example, in the log file. Each image is useful for its own purpose—the first for troubleshooting, the second for regulatory compliance and business necessity. Thus, step **407** illustrates generating a log file with log file data and images. The term "generating" may be exchanged for "modifying" in some embodiments, e.g. where the log file was received from the software component, and simply modified to further comprise an additional check image that is in a different format. The generating step **407** may be broken into a plurality of steps, each step for generating an aspect of log file **500** in FIG. **5**.

Referring now to FIG. **5**, an exemplary log file **500** is illustrated and examples of data that may be placed in the log file **500** are listed. In general, a log file can advantageously comprise an identification of an image capture device used to generate an image of a check, for example a scanner make and model, digital camera make and model, or other identification information such as an image capture device Global Unique Identifier (GUID). This identification information may also

include an identification of software associated with the device, for example the familiar TWAIN drivers that can be used with scanners, digital cameras, and other image capture devices.

Furthermore, with regard to log file **500**, a customer operating system can comprise an identification of the operating system used by the customer's general purpose computer. A customer browser version can comprise the browser used by the customer's general purpose computer. Image capture device make and model may comprise the type of image capture device, manufacturer, and model number. "JAVA version" may comprise a version of the JAVA virtual machine software used by the customer's general purpose computer, or, if .NET technologies are used, the version of the .NET Framework. Transaction data may comprise information such as transaction ID, account number, customer name, amount of deposit, check routing number, check number, check account number, and so forth. Reason for error may be provided if an error occurred—for example, due to an invalid check routing number, different amounts identified by the customer and the OCR process, etc. Finally, the "good" image (customer generated image) and the "required" image (required for bank-to-bank image transfer) may also be included.

The log file **500** may be consumed by a troubleshooting or log file viewing application **501**. Such an application may be provided to financial institution employees to view log files and solve problems associated with particular deposits. The application **501** may also collect statistical information and the like regarding all log files.

The various techniques described herein may be implemented with hardware or software or, where appropriate, with a combination of both. Thus, the methods and apparatus of the disclosed embodiments, 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 disclosed embodiments. In the case of program code execution on programmable computers, the computer will generally include 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 are preferably 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 combined with hardware implementations.

The described methods and apparatus may also be embodied in the form of program code that is transmitted over some transmission medium, such as over electrical wiring or cabling, through fiber optics, or via any other form of transmission, wherein, when the program code is received and loaded into and executed by a machine, such as an EPROM, a gate array, a programmable logic device (PLD), a client computer, a video recorder or the like, the machine becomes an apparatus for practicing the invention. When implemented on a general-purpose processor, the program code combines with the processor to provide a unique apparatus that operates to perform the processing of the disclosed embodiments.

In addition to the specific implementations explicitly set forth herein, other aspects and implementations will be apparent to those skilled in the art from consideration of the specification disclosed herein. It is intended that the specification and illustrated implementations be considered as examples only, with a true scope and spirit of the following claims.

What is claimed:

1. A processor-implemented method for processing a check deposit, comprising:

receiving a customer identification of an account for a deposit, an identification of an image capture device communicatively coupled to a depositor-owned device, an identification of a browser application instantiated on the depositor-owned device and an identification of a virtual machine framework instantiated on the depositor owned device;

receiving a first image of a front side of a check, wherein said first image is in a first file format, wherein said first file format is a Joint Photographic Experts Group (JPEG) format and wherein said first image is generated by the image capture device;

creating by a processor a second image of said front side of a check by converting said first image into a second file format, wherein said second file format is a bi-tonal Tag Image File Format (TIFF) format;

accumulating Magnetic Ink Character Recognition (MICR) data associated with said check along with MICR data associated with a plurality of other checks, and analyzing said MICR data for duplicate checks; and

generating one or more log files, said one or more log files comprising one or more of said first image and said second image, the received customer identification of an account, the received identification of an image capture device, the received identification of the browser application instantiated on the depositor-owned device and the received identification of the virtual machine framework instantiated on the depositor owned device.

2. The method of claim **1**, wherein said log file further comprises an identification of an operating system associated with said depositor-owned device.

3. The method of claim **1**, wherein said log file further comprises a version of a browser application associated with said depositor-owned device.

4. The method of claim **1**, wherein said log file further comprises an identification of an image capture device type for an image capture device that was used to capture said first image.

5. A system for processing a check deposit, comprising:

a subsystem for receiving a customer identification of an account for a deposit, an identification of an image capture device communicatively coupled to a depositor-owned device, an identification of a browser application instantiated on the depositor-owned device and an identification of a virtual machine framework instantiated on the depositor owned device;

a subsystem for receiving a first image of a front side of a check, wherein said first image is in a first file format, wherein said first file format is a Joint Photographic Experts Group (JPEG) format and wherein said first image is generated by the image capture device;

a subsystem for creating a second image of said front side of a check by converting said first image into a second file format, wherein said second file format is a bi-tonal Tag Image File Format (TIFF) format;

a subsystem for accumulating Magnetic Ink Character Recognition (MICR) data associated with said check along with MICR data associated with a plurality of other checks, and a subsystem for analyzing said MICR data for duplicate checks; and

a subsystem for generating one or more log files, said one or more log files comprising one or more of said first image and said second image, the received customer identification of an account, the received identification of an image capture device, the received identification of the browser application instantiated on the depositor-owned device and the received identification of the virtual machine framework instantiated on the depositor owned device.

6. The system of claim **5**, wherein said log file further comprises an identification of an operating system associated with said depositor-owned device.

7. The system of claim **5**, wherein said log file further comprises a version of a browser application associated with said depositor-owned device.

8. The system of claim **5**, wherein said log file further comprises an identification of an image capture device type for an image capture device that was used to capture said first image.

9. A computer readable medium storing computer-executable instructions for processing a check deposit, said computer-executable instructions comprising:

instructions for receiving a customer identification of an account for a deposit, an identification of an image capture device communicatively coupled to a depositor-owned device, an identification of a browser application instantiated on the depositor-owned device and an identification of a virtual machine framework instantiated on the depositor owned device;

instructions for receiving a first image of a front side of a check, wherein said first image is in a first file format, wherein said first file format is a Joint Photographic Experts Group (JPEG) format and wherein said first image is generated by the image capture device;

instructions for creating by a processor a second image of said front side of a check by converting said first image into a second file format, wherein said second file format is a bi-tonal Tag Image File Format (TIFF) format;

instructions for accumulating Magnetic Ink Character Recognition (MICR) data associated with said check along with MICR data associated with a plurality of other checks, and analyzing said MICR data for duplicate checks; and

instructions for generating one or more log files, said one or more log files comprising one or more of said first image and said second image, the received customer identification of an account, the received identification of an image capture device, the received identification of the browser application instantiated on the depositor-owned device and the received identification of the virtual machine framework instantiated on the depositor owned device.

10. The computer readable medium of claim **9**, wherein said log file further comprises an identification of an operating system associated with said depositor-owned device.

11. The computer readable medium of claim **9**, wherein said log file further comprises a version of a browser application associated with said depositor-owned device.

12. The computer readable medium of claim **9**, wherein said log file further comprises an identification of an image capture device type for an image capture device that was used to capture said first image.

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