

1 **FINANCIAL TRANSACTION PROCESSING SYSTEMS AND METHODS**

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3 The present invention relates generally to financial transaction processing
4 systems and methods, and more specifically, to such systems and methods wherein at
5 least one document containing financial transaction-related information is optically
6 scanned to generate at least one computer-readable image from which the information
7 may be extracted for use in processing the transaction. Particular utility for the
8 present invention is found in the area of processing electronic financial transactions
9 (e.g., electronic funds transfer (EFT) and Automatic Clearing House (ACH)
10 transactions), although other utilities are also contemplated for the present invention,
11 including other financial transaction processing and accounting applications.
12 Additionally, although the present invention will be described in connection with
13 processing financial transactions based at least partially upon information contained
14 on specific types of financial documents (e.g., drafts, checks, and billing documents),
15 it should be understood that processing of financial transactions based upon other
16 types of documents, including other types of financial documents, may also be
17 accomplished, without departing from the present invention.

18 Many systems and methods exist in the prior art for electronically processing
19 and/or executing financial transactions. For example, debit card systems exist
20 wherein EFT and/or ACH transactions may be authorized to pay for goods or services
21 at the point of sale (e.g., at the merchant or retailers place of business, and/or at the
22 location of third party transaction agent for the merchant or retailer). Such systems
23 typically include a mechanism for reading customer bank account information
24 encoded on a magnetic strip on the customer's debit card, which information is then
25 utilized by the system to generate an EFT or ACH request from the customer bank
26 account to the payee's bank account (e.g., the retailer's or merchant's bank account).
27 Typically, prior to executing the EFT or ACH request, the system requires the
28 customer to input a pre-selected Personal Identification Number (PIN) or other type of
29 authorization information associated with the debit card being used in the transaction,

1 and unless the pre-selected PIN or authorization information is input correctly, the
2 system will not execute the request.

3 However, despite growing use of debit card transactions for point of sale
4 payment of goods or services, tendering of paper negotiable instruments (e.g., checks
5 and drafts), remains the most widely used method of effectuating such payment.
6 Many customers appear to favor effectuating point of sale payments using such
7 negotiable instruments, and conversely, appear to disfavor effectuating such payments
8 via debit cards. This is unfortunate, since processing by merchants of negotiable
9 instruments tendered at point of sale for payment of the merchants' goods or services
10 creates substantial problems.

11 For example, processing by merchants of such negotiable instruments
12 significantly increases transaction costs associated with sale of the merchants' good
13 and services. Typically, a merchant accepting payment in the form of a negotiable
14 instrument must wait a "float" period of one or more days following deposit of the
15 instrument in the merchant's bank account for the instrument to clear the bank on
16 which it is drawn, and for the funds transferred via the instrument to be actually made
17 available in the merchant's bank account. The loss of use of the payment funds during
18 this float period deleteriously affects merchant cash flow.

19 Additionally, the merchant accepting payment via a negotiable instrument
20 usually does not know whether the presenter of the instrument has sufficient funds, or
21 whether the presentee of the instrument intends to honor the instrument. The risks
22 and merchant bank charges associated with potential and/or actual non-payment of the
23 instrument drives up merchant costs associated with acceptance of the instrument as
24 payment for the merchant's goods and/or services.

25 Furthermore, under present banking regulations, although there is no limit to
26 the number of times EFT or ACH transactions refused due to insufficient funds can be
27 resubmitted for payment, a check returned to the merchant for insufficient funds can
28 only be once re-submitted to the banking system for payment. This means that once
29 a check has twice been returned to a merchant for insufficient funds, the merchant

1 must seek to obtain payment for the goods and/or services provided in exchange for
2 the check via means outside the banking system (e.g., by contacting the customer or
3 payor of the check, turning the check over to a collection agency, and/or turning to
4 litigation). Each of these options involves expenditures of time, money, and other
5 resources by the merchant.

6 As a solution to the aforesaid problems associated with acceptance of
7 negotiable instruments as point of sale payment for goods and services, it has been
8 proposed to permit merchants to "convert" such negotiable instruments into EFT or
9 ACH transactions. That is, it has been proposed to permit merchants to accept tender
10 of negotiable instruments at point of sale as payment for their goods and services, but
11 to allow the merchants to submit, at the point of sale, without prior consent of the
12 payor of the negotiable instrument, EFT or ACH requests equivalent to the
13 transactions specified in the negotiable instruments, in place of actually submitting the
14 negotiable instruments themselves to the banking system for collection.

15 Unfortunately, the United States Federal Reserve System has been unwilling
16 to allow merchants to "convert" such negotiable instruments into EFT or ACH
17 transactions, without prior approval or authorization of the payor of the negotiable
18 instrument, and some payors have instituted litigation challenging the legality of such
19 unauthorized "conversions" by merchants. To the best of the knowledge and belief of
20 the Applicant, all such litigation has been settled in favor of the payors.

21 Systems and methods also exist in the prior art for effectuating payment of
22 bills or accounts payable via EFT and/or ACH transactions. For example, various
23 commercially available computer software programs exist for electronically paying
24 bills based upon information (e.g., bill payee, amount due, etc.) manually input to the
25 program by a human user, or provided to the program from a previously generated file
26 containing such information. Disadvantageously, such programs require a significant
27 amount of human operator interaction which can slow the process of paying bills
28 using such programs. Further disadvantageously, such programs are subject, to a

1 significant degree, to human operator errors (e.g., input of erroneous payment
2 information), which can result in generation of erroneous electronic bill payments.

3 Other conventional bill and accounts payable payment systems and methods
4 optically scan billing or accounts payable documents to generate computer-readable
5 scanned images of the documents, and determine from the scanned images the
6 amounts due and billing account information (e.g., customer billing account numbers)
7 respectively specified on the documents being scanned. With previously granted
8 authorization for same, EFT and/or ACH transaction requests may then be generated
9 based upon the amounts due and billing account information, whereby to effectuate
10 payment of the bills or accounts payable. Unfortunately, such conventional payment
11 techniques typically are only capable of accurately recognizing and processing a
12 single, "pre-selected" type of billing or accounts payable document format, and if
13 billing or accounts payable documents having different formats from the "pre-
14 selected" format are processed using these techniques, it can be expected that
15 erroneous amounts due and billing account information may be generated, and
16 therefore, erroneous EFT and/or ACH transaction requests may also be generated.
17 Furthermore, since many different types of billing and accounts payable document
18 formats exist, and in many instances the particular document format utilized is unique
19 to the party generating the document (e.g., the vendor or service provider issuing the
20 document), the fact that these prior art techniques are able to properly recognize and
21 process only a single document format type means that only those documents
22 generated by a single party (or, at most, a small number of parties) may be properly
23 recognized and processed by these prior art techniques.

24 Examples of prior art financial transaction processing systems and methods are
25 disclosed in e.g., Owens et al., U.S. Patent No. 4,264,808; Moreau, U.S. Patent No.
26 5,590,196; Josephson et al., U.S. Patent No. 5,412,190; Stephens et al., U.S. Patent
27 No. 5,237,159; Josephson et al., U.S. Patent No. 5,532,464; Foreman et al., U.S.
28 Patent No. 5,369,709; Inoyama et al., U.S. Patent No. 4,166,945; Azcua et al., U.S.
29 Patent No. 4,310,885; Hilt et al., U.S. Patent No. 5,465,206; Pickering, U.S. Patent

1 No. 5,483,445; and Carlson et al., U.S. Patent No. 5,053,607. Unfortunately, all of
2 the prior art disclosed in these patents suffers from the aforesaid and/or other
3 disadvantages and drawbacks.

4 Accordingly, in a first aspect of the present invention, a system and method
5 are provided for processing an electronic financial transaction based upon visual
6 information related to the transaction contained on a document tendered by a party to
7 the transaction. One preferred embodiment of the system of this aspect of the present
8 invention includes an optical scanner for generating a computer-readable scanned
9 image of the document, and an optical character recognizer for generating, from the
10 scanned image, transaction data indicative of at least a portion of the visual
11 information. This embodiment of the system of this aspect of the present invention
12 also includes an authorization record generator for generating, based upon the
13 transaction data, a record of the transaction for being assented to by the party
14 tendering the document prior to completion of the transaction, and for generating from
15 the record once it is assented to by the party, a computer-readable record of assent of
16 the party to the transaction. A collection system is also included in this embodiment
17 of the system of this aspect of the present invention for generating in response to the
18 transaction data and the computer-readable record, an electronic financial transaction
19 request for being used by an electronic transaction system to execute the electronic
20 financial transaction.

21 One embodiment of the method of the first aspect of the present invention
22 includes generating a computer-readable scanned image of the document, and
23 generating, from the scanned image, transaction data indicative of at least a portion of
24 the visual information contained on the document. A record is generated, from the
25 transaction data, of the electronic financial transaction being processed, which record
26 is for being assented to by the party tendering the document, prior to completion of
27 said transaction. Once the record has been assented to by the party tendering the
28 document, a computer-readable record of the party's assent to the transaction is
29 generated from the assented-to record. An electronic financial transaction request is

1 then generated in response to the transaction data and the computer-readable assented-
2 to record, which request is for being used by an electronic financial transaction system
3 to execute the electronic financial transaction.

4 Also, in a second aspect of the present invention, a system and method are
5 provided for use in processing a financial transaction based at least in part upon visual
6 data formed on a document. The visual data represents information related to the
7 transaction and is in a particular format.

8 One preferred embodiment of the system of the second aspect of the present
9 invention includes an optical scanner for generating a scanned image of at least a
10 portion of the document containing the visual representation. An image
11 characterization generator is provided for generating recognition characteristics from
12 the scanned image, and a recognition characteristic comparator is provided for
13 comparing the recognition characteristics to respective sets of reference recognition
14 characteristics generated from respective other transaction documents having different
15 respective formats and for determining therefrom whether the particular format of the
16 visual data on the scanned document matches one of the respective formats of the
17 other documents. A field location generator is also provided for determining, based
18 upon the one respective format when the particular format is determined to match the
19 one respective format, location of a field in the scanned image to which optical
20 character recognition (OCR) may be applied to generate therefrom the transaction-
21 related information represented by the visual data. OCR is then applied by an image
22 processor to this location to generate the visual data for use in processing the
23 transaction.

24 One preferred embodiment of the method according to the second aspect of the
25 present invention includes generating an optically scanned image of at least a portion
26 of document containing visual data, in a particular format, representing information
27 related to the financial transaction. Recognition characteristics are generated from
28 the scanned image and are compared to respective sets of reference recognition
29 characteristics generated from respective other transaction documents having different

1 respective formats to determine therefrom whether the particular format of the visual
2 data matches one of the respective formats of the other documents. When such a
3 match is found to exist, location is determined of a field in the scanned image to
4 which optical character recognition may be applied to generate therefrom the
5 information, based upon the respective format found to match the particular format of
6 the visual data. Optical character recognition is then utilized to generate said visual
7 data from said location.

8 Advantageously, the system and method of the first aspect of the present
9 invention permit negotiable instruments payments tendered at a point of sale to be
10 "converted" into legally binding equivalent EFT and/or ACH transactions, thereby
11 overcoming the aforesaid and other disadvantages and drawbacks associated with
12 tender of negotiable instruments payments at point of sale and unauthorized
13 conversion of same into equivalent EFT and/or ACH transactions.

14 Also advantageously, the system and method of the second aspect of the
15 present invention require less human interaction, are less prone to human operator
16 errors, and are faster in operation than the aforesaid conventional computer programs
17 for electronically paying bills, and are able to properly recognize and process
18 transaction documents having different respective format types.

19 These and other features and advantages of the present invention will become
20 apparent as the following Detailed Description proceeds and upon reference to the
21 Drawings, wherein like numerals depict like parts and in which:

22 Figure 1 is an architectural-level, block diagram of the functional components
23 of one preferred embodiment of the system of a first aspect of the present invention.

24 Figure 2 is block diagram of the functional components of one preferred
25 construction of a point of sale payment terminal of the preferred embodiment of
26 Figure 1, all of the point of sale payment terminals shown in Figure 1 preferably being
27 of identical construction to that shown in Figure 2.

28 Figure 3 is a block diagram of one preferred construction of the collection
29 system of the preferred embodiment of Figure 1.

1 Figure 4 is a preferred form of an authorization slip for use in the preferred
2 embodiment of Figure 1.

3 Figure 5 is a preferred form of a reprinted negotiable instrument document
4 generated by the preferred embodiment of Figure 1.

5 Figure 6 is one type of negotiable instrument that can be processed by the
6 preferred embodiment of Figure 1.

7 Figure 7 is an architectural-level, block diagram of the functional components
8 of one preferred embodiment of the system of the second aspect of the present
9 invention.

10 Figures 8A - 8F are billing documents that can be processed by the preferred
11 embodiments of Figures 7.

12 Figure 9 is an architectural-level, block diagram of the functional components
13 of a modification of the system of Figure 7.

14 Figure 10 is a functional block diagram of one preferred construction of a
15 payment terminal of the system of Figure 9.

16 Figure 11 is a functional block diagram of one preferred construction of the
17 collection system of the system of Figure 9.

18 Although the following Detailed Description will proceed with reference being
19 made to specific embodiments of the present invention, it should be understood that
20 the present invention is not intended to be limited to these embodiments. Rather,
21 many alternatives, modifications, and variations thereof will be apparent to those
22 skilled in the art. Accordingly, the present invention should be viewed broadly, as
23 being limited only as set forth in the hereinafter appended Claims.

24 Turning now to Figures 1-6, one preferred embodiment of the system of the
25 first aspect of the present invention will be described. As shown in Figure 1, system
26 10 comprises at least one 18, and preferably a plurality 18, 20, 22 of point of sale
27 payment terminals. Each terminal 18, 20, 22 preferably is located in its own
28 respective point of sale location 12, 14, 16 (e.g., at a merchant's or retailer's place of
29 business, and/or at the location of third party transaction agent acting on behalf of the

1 merchant or retailer). It should be understood that although three terminals 18, 20, 22
2 are shown as being comprised in system 10, system 10 could be modified to include
3 any number of such terminals without departing from this aspect of the present
4 invention.

5 Each of the terminals 18, 20, 22 includes an optical scanner 34 for scanning
6 negotiable instrument documents, (exemplified by check 110 shown in Figure 6)
7 tendered at point of sale in payment for goods or services provided by the merchant or
8 retailer associated with that point of sale, to generate respective computer-readable
9 scanned images of the documents. Preferably, scanner 34 comprises a conventional
10 monotonal image scanner having a resolution of at least 300 dots-per-inch and being
11 adapted for being controlled by local controller/processor 40 to scan one or both sides
12 of a document 110 placed in the scanner 34, such as a NestorReader scanner available
13 from NCS Recognition Products Group, Lincoln, Rhode Island.

14 When it is desired to begin processing of a point of sale electronic transaction
15 using system 10, a negotiable instrument document tendered in payment at the point
16 of sale is placed in the scanner 34 by a human operator (not shown) of the terminal at
17 the point of sale or by the party (also not shown) tendering the document 110 in such
18 a way as to permit the scanner 34 to scan at least one entire side 112 of the document
19 110 when the scanner 34 is activated. The scanner 34 then signals to the controller 40
20 the presence of the document in the scanner 34, which controller 40 then causes the
21 user input/display device 30 to indicate same to the human operator. Preferably,
22 device 30 comprises a conventional alphanumeric keypad and/or keyboard for
23 permitting input to the processor 40, by the human operator, of data and commands
24 (which will be described more fully below) related to the transaction being processed,
25 and an LCD/LED or computer monitor for displaying information transmitted thereto
26 from the processor 40 and for echoing information data and commands input via the
27 device 30.

28 Preferably, if the point of sale 12 is the premises of a third party payment
29 agent for the merchant or retailer that is actually providing the goods or services for

1 which payment is being effected by tender of the negotiable instrument 110, prior to
2 placing the document 110 in the scanner 34, the human operator of the payment
3 terminal 18 inputs (e.g., as a result of or after tallying the purchases being paid for by
4 the check 110) to the processor 40 via the device 30 data indicative of both the
5 amount of the payment and the payee to which the payment is being made (i.e., the
6 payment amount indicated on the negotiable instrument being tendered in payment).
7 Preferably, there is permitted to be only one payee per transaction. Alternatively, if
8 the point of sale is the merchant's or retailer's premises, negotiable instruments
9 processed via the terminal at that point of sale will presumably only be made out to a
10 single payee (i.e., the merchant or retailer at the point of sale); in such instances, the
11 human operator may simply input data indicative of the amount of the payment being
12 made, and the processor 40 may be adapted to automatically associate appropriate
13 payee identification data with the inputted payment amount data. In either case, this
14 data is stored by the processor 40 in local storage system 42 for later processing in the
15 manner described below. Processor 40 also includes timing means for permitting
16 processor 40 to determine the current date and time, and when processing of the
17 transaction is initiated by the human operator, the date of time of initiation of the
18 transaction is also recorded in the storage system 42 in association with the aforesaid
19 other data stored therein. Preferably, system 42 comprises a combination of
20 conventional volatile and non-volatile electronic memory means (e.g., RAM, ROM,
21 EEPROM, etc.) and secondary storage means (e.g., fixed disk storage, optical disk
22 storage, etc.) to and from which data may be written and read, respectively, by the
23 processor 40 and by the collection system/terminal interface 44 (as will be will be
24 described more fully below). Of course, it should be appreciated that inputting of the
25 aforesaid data could be accomplished prior to placing the negotiable instrument in the
26 scanner 34, without departing from this embodiment of the present invention.

27 Once the aforesaid data (i.e., payment amount being tendered and payee) has
28 been input via the device 30, document 110 has been placed in the scanner 34, and
29 presence of the document 110 in the scanner 34 has been signalled to the terminal

1 operator, the terminal operator continues processing the document 110 by
2 commanding the processor 40 via the device 30 to initiate scanning of the document
3 110. In response, the processor 40 issues commands to the scanner 34 to scan the
4 document 110 placed therein, whereupon, the scanner 34 scans at least one entire side
5 112 of the draft 110 so as to generate a computer-readable scanned image of at least
6 that entire side 112 of the draft document 110 (i.e., computer-readable data from
7 which an appropriately provisioned computer may generate a display image of the at
8 least one scanned side 112 of the document 110). The computer-readable scanned
9 image data is then transmitted by the scanner 34 to the processor 40; the processor 40
10 then transmits to the optical character recognizer 32 a copy of the scanned image data
11 generated by the scanner 34 in order to permit the recognizer 32 to process same in
12 the manner described below. A separate copy of the scanned image data is also
13 transmitted to the storage system 42 where it is stored in association with the
14 previously stored payment amount and payee data of the negotiable instrument being
15 processed.

16 The American Banking Association, U.S. Federal Reserve and other
17 government agencies have promulgated fairly extensive and detailed regulations
18 mandating standardization in the format of checks and other draft documents drawn
19 on U.S. financial institutions. As a result, the position, style, sizing, etc. of certain key
20 portions or elements in such documents are substantially standardized. One such
21 standardized portion in check 110 is Magnetic Ink Character Recognizable (MICR)
22 line 94, which is positioned at the bottom of the check 110 and in check 110, includes
23 three fields 114, 116, 118 of printed digits separated by special control characters.
24 Fields 114, 116 contain the financial institution transaction routing number and
25 account number on which the check 110 is drawn, and field 118 contains the check
26 number of the check 110. It should be noted, however, that other than the left most
27 nine digits (and associated separator characters) of the MICR line 94, the contents of
28 said line may vary, depending upon the financial institution upon which the negotiable

1 instrument is drawn. System 10 may be adapted to recognize and parse information
2 contained in different types of negotiable instrument MICR lines (not shown).

3 Based upon the standardized location, size, style, etc. of the MICR line 94 in
4 document 110 and the fields 114, 116, 118 contained therein, recognizer 32 utilizes
5 optical character recognition and image processing techniques to extract from the
6 scanned image data the data generated by the scanner 34 from scanning the MICR line
7 portion 94 of the document 110, and once thus extracted, to generate numeric
8 transaction data indicative of the visual information (i.e., the numbers printed in fields
9 114, 116, 118) in MICR line 94. This numeric data is then transmitted to the
10 processor 40, which transmits a copy of the numeric data to the storage system 42
11 where it is stored in association with the scanned image data and the payee and
12 payment amount data previously stored therein.

13 A second copy of the numeric data is also transmitted from the processor 40 to
14 the authorization record generator 38, which also retrieves from the storage system 42
15 the payee and payment amount data associated with this transaction and transmits
16 same to the generator 38. Processor 40 also supplies to the generator 38 from the
17 storage system 42 data indicative of the initiation of the current transaction.
18 Preferably, each of the terminals 18, 20, 22 of the system 10 is associated with a
19 unique station/terminal identification code or number which is stored in the terminal's
20 respective storage system 42. This terminal identification number is also supplied to
21 the generator 38 from the system 42.

22 Generator 38 utilizes the numeric transaction data, payee and payment amount
23 data, transaction date and time data, and terminal identification number to generate,
24 for each point of sale financial transaction processed by the terminal, a unique
25 respective record of the transaction for being assented to by the party tendering the
26 negotiable instrument document being processed by the terminal. For each such
27 transaction, the generator 38 causes the unique respective record generated by the
28 generator 38 to be printed out by printer 36 (which comprises, e.g., a conventional

1 laser printer) as a respective hard copy transaction record. An example of one such
2 hard copy transaction record 70 is shown in Figure 4.

3 As shown in Figure 4, each transaction record 70 generated by the generator
4 38 includes an authorization contract portion 80 which contains language approved by
5 the National Automated Clearing House Association for the party tendering the
6 negotiable instrument being processed in the transaction to give approval to
7 conversion of the payment being made by the negotiable instrument to an equivalent
8 EFT transaction. The language contained in portion 80 also authorizes the party
9 processing the transaction (e.g., the merchant, retailer, or third party transaction agent
10 at the point of the sale) to convert the EFT transaction to an equivalent paper draft
11 transaction in the event that the EFT transaction cannot be completed (e.g., due to
12 insufficient funds for carrying out the EFT transaction or because the financial
13 institution upon which the negotiable instrument 110 is drawn cannot process EFT
14 requests), and to charge the tendering party's account in the event of such insufficient
15 funds.

16 Each transaction record 70 also includes a portion 78 which specifies the date
17 and time of processing of the transaction, a portion 76 specifying the terminal
18 identification number of the terminal processing the transaction, and a transaction data
19 section 82 specifying the numerical transaction data generated from the scanned
20 image. Each transaction record 70 also contains a unique transaction identification
21 number generated by the generator 38 by concatenating a 5-digit form of the terminal
22 identification number to the time and date of the transaction in numerically expressed
23 in the form YYYYMMDDHHMM (wherein YYYY represents the year, the left most
24 MM represents the month, DD represents the day of the month, HH represents the
25 hour in said day, and the right most MM represents the minutes in said hour of the
26 transaction) and to a system-wide, unique 5-digit daily transaction sequence number
27 (which is reset system-wide, periodically, e.g., once per day), and a tendering party
28 assent portion 84 for receiving a signature 72 from the tendering party or other
29 authorized representative thereof for signifying assent by the tendering party to the

1 terms and conditions specified in the record 70. Optionally, the record 70 may also
2 contain a signatory identification line 71 for permitting the operator of the terminal to
3 write thereon identification information provided by the individual signing the record
4 70 to ensure that the individual signing the record 70 is in fact authorized to assent to
5 the terms and conditions specified on the record.

6 Once the record is signed by the party tendering the negotiable instrument
7 being processed, or by that party's authorized representative, the operator of the
8 terminal places the assented-to record (preferably, side-ways) in the scanner 34 in a
9 such a way as to permit the scanner 34 to be able to scan at least the signed side of the
10 record. Once the presence of the record in the scanner 34 is indicated on the device
11 30, the operator then commands the processor 40 via the device 30 to command the
12 scanner 34 to scan the signed record. Scanning of the signed record by the scanner
13 34 generates a computer-readable scan file of the signed record, which scan file is
14 rotated appropriately (i.e., to rotate the image represented by the data in the scan file)
15 and transmitted to the recognizer 32 via the processor 40. Recognizer 32 generates a
16 truncated scan file from the scan file of the signed record, using optical character
17 recognition and image processing techniques, which truncated scan file contains only
18 the portions of the scan file of the signed record generated from the transaction
19 identification portion 74, an indication as to which type of form language has been
20 assented to ("Direct Express Form #ACH1.0, above" in Figure 4), and signed
21 authorization portion 84 of the record 70. The truncated scan file is then transmitted
22 to the storage system 42, via the processor 40, where it is stored in association with
23 the other data previously stored therein that is associated with the transaction. Also,
24 the generator 38 transmits to the storage system 42 via the processor 40 the unique
25 transaction identification number for this transaction, which number is also stored in
26 the storage system 42 in association with the other previously stored therein that is
27 associated with the transaction. The generator 38 then commands the printer 36 to
28 print out a transaction receipt reciting the amount of the negotiable instrument

1 tendered in payment in the transaction, the payee of the instrument, and the
2 information contained in the MICR line of the negotiable instrument.

3 In accordance with this aspect of the present invention, no paper records of the
4 transaction need be maintained by the merchant, retailer, or third party transaction
5 agent at the point of sale, since all of the records necessary to reconstruct any financial
6 transaction processed by the system 10 are stored electronically within the system 10.
7 Advantageously, this greatly reduces the time, effort, and storage space required by
8 merchants, retailers, and third party transaction agents to maintain records of
9 transactions processed using system 10, and permits all of the documents processed
10 and generated by the terminals 18, 20, 22 to be given to and retained by the customers
11 tendering the negotiable instruments processed by the terminals 18, 20, 22, thereby
12 permitting the merchants, retailers, or third party's processing said documents to be
13 able to comply with U.S. Federal Reserve regulations which require that processed
14 checks be truncated when they are not submitted in paper form to the financial
15 institutions on which they are drawn.

16 Each of the terminals 18, 20, 22 includes a respective collection system/point
17 of sale terminal interface 44; these interfaces connect the terminals 18, 20, 22 to point
18 of sale terminals/collection system interface 48 of the collection system 24 via a
19 conventional computer and/or telecommunications network system (e.g., a
20 conventional wide area network, public/private telecommunications network,
21 Transmission Control Protocol/Internet Protocol-based network, and/or ISDN-based
22 network, not expressly referenced in the Figures). The interfaces 44 in the terminals
23 18, 20, 22 convert data and commands received from the collection system 24 via the
24 not shown network system into data and command formats suitable for use by the
25 respective processors 40 and storage systems comprised within the terminals 18, 20,
26 22 receiving such command and data from the collection system 24, and convert data
27 transmitted from the respective terminals to the collection system 24 into a format
28 suitable for transmission over the not shown network system connecting the terminals
29 and the collection system. Similarly, interface 48 converts data received from the

1 terminals 18, 20, 22 via the not shown network system into a format suitable for use
2 by the controller 50 and other components of the collection system 24.

3 In this embodiment 10, processor 40 may be adapted to transmit to the
4 collection system 24, once a given transaction's processing data (i.e., the processed
5 negotiable instrument payment amount, payee, MICR line transaction data, date and
6 time of transaction processing, processing terminal identification number, unique
7 transaction identification number, negotiable instrument scanned image, and truncated
8 scan file of the tendering party's signed assent record) has been acquired and stored in
9 the processing terminal's storage system, the given transaction's processing data from
10 the storage system 42 via the interface 44 and the not shown network system, for
11 further processing by the collection system (as will be described in greater detail
12 below). Alternatively, processor 40 may be adapted to store processing data of
13 transactions until processing data from a predetermined number of such transactions
14 have been stored, to store processing data from transactions until a predetermined
15 time interval has elapsed, or to store processing data from transactions until a
16 command is received from the collection system 24 to initiate transmission of stored
17 processing data to the collection system for further processing by the collection
18 system, whereupon the processor 40 may be programmed to transmit the stored
19 transaction processing data to the collection system 24 for further processing thereat.

20 After being converted by the interface 48, transaction processing data received
21 by the collection system 24 from the terminals 18, 20, 22 is first transmitted to the
22 controller 50, whereupon the controller 50 immediately transmits the received
23 transaction processing data to the storage archive system 28 via the interface 58.
24 Archive system 28 comprises a non-volatile optical and/or magnetic media mass
25 storage system for storing and retrieving data therein and therefrom, respectively,
26 based upon commands and data received from the controller 50 via interface 58.
27 Interface 58 converts commands and/or data transmitted to the archive system 28 from
28 the controller 50, Automatic Clearing House Transaction Generator 52, and interfaces
29 56, 60 into formats suitable for processing by the archive system 28, and converts data

1 transmitted from the archive system 28 into formats suitable for processing by these
2 components.

3 After storing the received transaction processing data in the archive system 28,
4 the processor 50 transmits a copy of the data to the generator 52. Generator 52
5 comprises an ACH EFT request generator which generates from the transaction
6 processing data supplied thereto respective ACH EFT requests for effectuating an
7 equivalent ACH EFT transactions for each of the respective negotiable instruments
8 processed by the terminals to generate the transaction processing data. A copy of
9 each of these ACH EFT requests is then transmitted to the storage archive 28 via the
10 interface 58, and is stored in the archive 28 in association with the respective portion
11 of transaction processing data from which it was generated by the generator 52.

12 In this embodiment 10, another copy of each of these ACH EFT requests is
13 also transmitted by the generator 52 via the interface(s) 56 to the respective computer
14 system or systems 46 of the payee or payees designed in the ACH EFT requests for
15 submission to the ACH EFT system 26 for processing by the system 26 to effectuate
16 the ACH EFT transactions requested by these requests. Alternatively, generator 52
17 may transmit one or more of the ACH EFT requests directly to the ACH system 26
18 via the interface 60.

19 The ACH system 26 and the computer system(s) 46 may be connected to the
20 collection system 24 via wide area network means (not shown) of the type or types
21 described previously as connecting the collection system 24 and the terminals 18, 20,
22 22. Interface 56 converts data and commands transmitted to the collection system 24
23 from the payee system(s) 46 via the not shown network means into a form processable
24 by the various components of the collection system 24 desired to receive same, and
25 converts data transmitted to the payee system(s) from the various components of the
26 system 24 transmitting same into form(s) for being transmitted via such network
27 means and so to be processable by such system(s) 46. Similarly, interface 60 converts
28 data and commands transmitted to the ACH system 26 from the various components
29 of the collection system 24 desired to transmit same into a form for being transmitted

1 through such network means and processable by the ACH system 26, and converts
2 data transmitted from the ACH system 26 to the various components of the collection
3 system 24 desired to receive same into form for being transmitted through the network
4 means and processable by such components.

5 In the event that any of the ACH EFT requests transmitted to the system 26
6 cannot be executed by the system 26 (e.g., because of insufficient funds from which to
7 make ACH request effecuation), system 26 notifies the request transmitter (i.e., either
8 the computer system(s) 46 or the collection system 24) of same. In response to such
9 notification, the collection system 24 or the payee system(s) 46 receiving such
10 notification may periodically resubmit the transaction request(s) for which execution
11 by the ACH EFT system 26 has not been accomplished, until such execution is
12 accomplished by the system 26. Alternatively, the payee system(s) receiving such
13 notification may command the controller 50 of the collection system 24 to effectuate
14 such ACH EFT request resubmission. Further alternatively, or after the system(s) 46
15 and/or system 24 have been notified by the system 26 a predetermined number times
16 that ACH EFT request resubmissions made to the system 26 could not be executed by
17 the system 26, the controller 50 may reconvert the failed EFT request(s) into
18 negotiable instrument draft form, by retrieving from the archive 28 the transaction
19 processing data from which the ACH EFT request(s) was generated, and commanding
20 the document generator 54 (which e.g., comprises a conventional magnetic ink laser
21 printer) to print out, based upon such transaction data, on appropriate negotiable
22 instrument paper stock (e.g., check paper stock) negotiable instrument(s) equivalent to
23 the failed ACH EFT request(s). Preferably, each of the negotiable instrument
24 document(s) printed out by the generator 54 has the form shown in Figure 5. As
25 shown in Figure 5, each such negotiable instrument document 100 printed out by the
26 generator 54 includes one portion 104 comprising a print out of the scanned image of
27 the original negotiable instrument 110 from which the failed ACH EFT request was
28 generated, another portion 102 containing a print out of transaction processing data
29 associated with negotiable instrument 110, and a third portion 96 containing a clearer

1 print out of the MICR line 94 of the negotiable instrument 110 compliant with the
2 American Banking Association and U.S. Federal Reserve standards regarding same.
3 The positioning and dimensions of the three portions 104, 102, 96 are chosen so as to
4 permit the document 100 to constitute a valid negotiable instrument processable by
5 U.S. financial institutions to result in an equivalent financial transaction to that
6 requested by the failed ACH EFT request associated with the document 100. In
7 particular, it should be noted that the size of portion 104 is reduced (i.e., smaller)
8 compared to the size of document 110.

9 It should also be noted that generator 54 also may be used to print out
10 documents other than reprinted negotiable instruments of the type shown in Figure 5.
11 For example, based upon commands received from a user input device (not shown) in
12 the system 24, controller 50 may be caused to retrieve from the storage system 28 and
13 print out via generator 54 any other portion of the transaction processing data stored in
14 the archive 28, and/or may be adapted to periodically generate via generator 54 paper
15 records of the transaction processing data contained in system 28.

16 Turning now to Figure 7, a preferred embodiment 200 of a system according
17 to the second aspect of the present invention will be described. System 200
18 comprises at least one bill payment terminal 202. It should be understood that
19 although only one such bill payment terminal 202 is shown in Figure 7, system 200
20 may comprise a plurality of such terminals without departing from this aspect of the
21 present invention. Terminal 202 comprises a user interface/display device 206 and an
22 optical scanner 208. Device 206 preferably comprises a conventional graphical user
23 interface and system control means or other type of human input/output, control and
24 display means for permitting a human operator (not shown) to monitor and control
25 operation of various of the functional components of the system 200 in the manner
26 described more fully below. Scanner 208 preferably comprises a conventional
27 scanner device that is substantially identical to scanner 34 of system 10.

28 Processing of a financial transaction using system 200 begins by placing a bill
29 document (such as bill document 400 shown in Figure 8A) to be processed into

1 scanner 208 so as to permit at least one side 402 of the document 400 containing an
2 optical character recognition line (OCR) 404 which contains numerical data 405
3 visually displaying information related to the transaction to be processed (e.g., amount
4 due 406 and customer account number 408). It should be understood that although
5 the functional components and operation of system 200 will be described in
6 connection with processing of document 400, advantageously, system 200 can be used
7 to scan other types of billing documents (e.g., those illustrated in Figures 8B-8F), in
8 accordance with this aspect of the present invention.

9 For reasons that will become apparent below, in order for a billing document
10 to be processable using system 200, the document must contain an OCR line
11 containing the aforesaid types of visual numeric data found in exemplary document
12 400. Preferably, this OCR line in the billing documents processable in system 200 is
13 printed in a standard OCR-A font, however, other print fonts may be used to form the
14 OCR line in billing documents processable by system 200 without departing from this
15 aspect of the present invention.

16 When the document 400 is placed into the scanner 208, the scanner 208
17 indicates same to the display 206, whereupon the human operator (not shown) of the
18 terminal 202 commands the scanner 208 to scan the entire side 402 of the document
19 400 containing the visual data 405 to generate a computer-readable scanned image of
20 side 402 of the document 400 (i.e., computer-readable data from which an
21 appropriately provisioned computer may generate a display image of the at least one
22 scanned side 402 of the document 400). This scanned image of side 402 is then
23 transmitted to the image characterization generator 204 in order to generate therefrom
24 recognition characteristics for permitting the system 200 to determine whether
25 document 400 has a format that matches that of another billing transaction document
26 and to execute further processing based upon this determination, as will be described
27 in greater detail below.

28 When the scanned image is first received by the generator 204, it is processed
29 by an image de-skewing processor 210, such as Scanfix Image Processor available

1 from TMS Sequoia, of Burlingame, California, which adjusts the scanned image data
2 by rotating and/or translating the scanned image so as to cause two adjacent edges
3 (e.g., the top and left side edges) of the scanned image (i.e., the edges of the scanned
4 image generated from the top and left side edges of the document 400) to be aligned
5 with the ordinate and abscissa of an orthogonal coordinate system whose center is
6 chosen so as to coincide with the dark pixel of the scanned image closest to those two
7 adjacent edges. Once the processor 210 has accomplished this processing of the
8 scanned image data, the scanned image data is next processed by the noise eliminator
9 212, which processes the image data to remove dark pixels (i.e., non-whitespace
10 pixels) therefrom that were erroneously generated as a result of noise. The noise
11 eliminator 212 accomplishes this by locating isolated groups of contiguous dark pixels
12 in the scanned image data having respective sizes (i.e., respective numbers of pixels)
13 smaller than three dark pixels; these isolated groups of contiguous dark pixels are then
14 removed from the scanned image data and replaced with whitespace by the processor
15 212.

16 After being processed by the noise eliminator 212, the scanned image data is
17 processed by the image enhancer processor 214, which processor 214 enhances the
18 dark pixels remaining in the scanned image after processing of the scanned image data
19 by the noise eliminator processor 212. Processor 214 accomplishes this by locating
20 the dark pixels remaining in the scanned image after processing of the scanned image
21 by the processor 212, and by extending by predetermined numbers of pixels (e.g., 5
22 pixels in each of the positive and negative ordinate directions, and 25 pixels in each of
23 the positive and negative abscissa directions) each of these remaining dark pixels in
24 both of the two mutually orthogonal directions of the coordinate system to which the
25 scanned image was aligned by the de-skewing processor 210. That is, predetermined
26 numbers of whitespace pixels surrounding and extending from the remaining dark
27 pixels in the two mutually orthogonal directions of the coordinate system are replaced
28 with dark pixels. Any resulting extension of the dark pixels that would extend
29 beyond the edge of the scanned image is prevented from doing so by truncating the

1 extension by a predetermined number of pixels sufficient to prevent the dark pixel
2 extensions from coming within 5 pixels of the edges of the scanned image.

3 After being processed by the image enhancer 214, the result, enhanced
4 scanned image is processed by dark pixel group locator processor 222. Locator
5 processor 222 then generates respective imaginary rectangles around the respective
6 groups of contiguous dark pixels such that the respective rectangles each include two
7 sides are parallel to the ordinate and two sides are parallel to the abscissa of the
8 coordinate system to which the scanned image was aligned by the processor 210, and
9 such that the respective rectangles include all of the respective dark pixels of each of
10 the respective groups of contiguous dark pixels. The locator processor 222 then
11 selects those imaginary rectangles, closest to the origin of the coordinate system,
12 whose respective longitudinal dimensions exceed a predetermined threshold (e.g., 1
13 inch), and determines the respective coordinates of at least one predetermined vertex
14 (e.g., the respective vertex having the minimal abscissal coordinate value and the
15 maximal ordinate coordinate value for the respective rectangle) and dimensions of a
16 predetermined number (e.g., no more than 25) of these selected imaginary rectangles.
17 The respective vertex coordinates and dimensions of these imaginary rectangles are
18 output by the locator processor 222 as recognition characteristics for the scanned
19 document 400, which recognition characteristics are transmitted from the generator
20 204 to the recognition characteristic comparison processor 220.

21 In accordance with system 200 of this aspect of the present invention, archive
22 system 228 (e.g., which comprises an optical and/or magnetic mass storage system in
23 which data may be stored and from which such data may be retrieved) has stored
24 within it respective sets of reference recognition characterizations, of the type
25 generated by locator processor 222 from the scanned image of the document 400,
26 obtained from respective scanned images of respective reference billing documents
27 having their own respective formats. Preferably, the respective formats of these
28 respective reference billing documents are characteristic of billing documents that are
29 expected to be submitted by customers for processing via terminal(s) 202. Preferably,

1 the reference recognition characterizations are generated by a reference
2 characterization generator station (not shown) which comprises elements 208 and 204
3 and a graphical user interface input/output device (not shown) for permitting a user to
4 process reference billing documents to generate respective sets of reference
5 recognition characteristics therefrom, and to command these sets of reference
6 recognition characteristics to be stored in the archive 228. The graphical user
7 interface device of the reference characterization station also permits the user to input
8 the respective coordinate positions of the respective OCR lines of the respective
9 reference billing documents by blocking off respective rectangle surrounding the
10 respective scanned images of the respective reference billing documents, using a
11 graphical input device (e.g., a mouse-based input system). The user also determines
12 empirically and inputs (or receives from the party generating the billing documents)
13 the name, EFT payment account, and bank routing number of payee associated with
14 each of the reference billing documents, and the length and parsing form (e.g., OCR
15 font, customer billing account number and payment amount field information (i.e.,
16 position, length, and field offset information), etc.) of the respective OCR lines of
17 each of the reference billing documents, which data is also stored in the archive 228 in
18 association of the reference recognition characteristics of the respective reference
19 billing documents. If the OCR line of a particular type of reference billing document
20 may change from one such billing document to another, this is also input by the user
21 interface and stored in the archive 228 in association with the respective reference
22 characterization for the respective billing document. Optionally, check digit
23 information may also be stored in the archive 228 in association with the reference
24 characterizations in order to permit analysis of same to be accomplished.

25 Processor 220 compares the recognition characteristics of the particular
26 document 400 being processed with the sets of reference recognition characteristics
27 stored in the archive 228. More specifically, the vertex coordinates and dimensions of
28 the imaginary rectangles generated by the generator 204 from the scanned image of
29 the document 400 are compared with respective reference recognition characteristics

1 (i.e., vertex coordinates and dimensions of imaginary rectangles) generated by the
2 process used to generate the recognition characteristics from the scanned image of
3 document 400, to determine whether a match exists between the recognition
4 characteristics from the scanned image of document 400 and any one of the sets of
5 reference recognition characteristics stored in the database archive system 228.
6 Preferably, this is accomplished by first comparing the recognition characteristics
7 from the scanned image of document 400 to the sets of reference characteristics, and
8 unless the respective dimensions of at least three of the imaginary rectangles from the
9 scanned image of document 400 match to within a predetermined error tolerance (e.g.,
10 2 percent) of corresponding respective vertices and dimensions in a respective set of
11 reference recognition characteristics stored in the system 228, processor 220 signals
12 that the format of the scanned document 400 does not match any of the formats of the
13 reference documents from which the reference recognition characteristics stored in the
14 database archive 228 were generated. If such a "no match" condition is determined by
15 the processor 220 to exist, the bill document 400 may be sent to the reference
16 characterization generator station to permit the human operator to determine whether
17 to input the reference characteristics and other bill document identification
18 information (i.e., the other types of information stored in association with each set of
19 reference recognition characteristics previously stored in the database archive 228)
20 manually for storage in the archive system 228 as a new set of reference recognition
21 characteristics to permit other bills having the same format as document 400 to be
22 processable by terminal 202 in the future, or to process the bill payment transaction as
23 a "one-of-a-kind" transaction (i.e., without storing such recognition characteristics and
24 information in the database archive 228 for future use by the processor 220).
25 Otherwise, if the predetermined match error tolerance conditions are found to exist,
26 processor 220 selects those sets of reference recognition characteristics that are found
27 to satisfy such conditions, and calculates the displacement differences that exist
28 between each of the imaginary rectangles of the scanned image of the document 400
29 and those described in these selected sets of reference recognition characteristics (i.e.,

1 the displacements that must be applied to the imaginary rectangles of the scanned
2 image of document 400 to accomplish a "best fit" match of same with the
3 corresponding imaginary rectangles described in these selected sets of reference
4 recognition characteristics). Such "best fit" match conditions are determined to exist
5 for given corresponding rectangles of the recognition characteristics of the scanned
6 image of the document 400 and a given respective set of reference recognition
7 characteristics, when the absolute pixel displacement differences between the
8 respective abscissa and ordinate coordinates of the vertices of the rectangles are
9 within 40 pixels and 60 pixels of each other, respectively, and the respective lengths
10 and widths of the rectangles are within 20 pixels and 2 pixels of each other,
11 respectively. Once these absolute displacement differences have been calculated by
12 the processor 220, processor 220 "scores" the degree of best fit match condition that
13 exists between the imaginary rectangles of the scanned image of the document 400
14 and those described in the aforesaid selected sets of reference recognition
15 characteristics, whereby to determine which one of the aforesaid selected sets of
16 reference recognition characteristics best matches the recognition characteristics of the
17 scanned document 400. Preferably, this scoring is made according to the scheme
18 described in the following Table.

1	<u>Table</u>	
2	<u>Abscissa and Ordinate Displacements (in pixels)</u>	<u>Score</u>
3	0-2	25
4	3	23
5	4	21
6	5	18
7	6	15
8	7	13
9	8	11
10	9	10
11	10	1
12	> 10	0
13		
14	<u>Length Difference (in pixels)</u>	<u>Score</u>
15	0-1	25
16	2	21
17	3	18
18	4	15
19	5	5
20	6	1
21	> 6	0
22		
23	<u>Width Difference (in pixels)</u>	<u>Score</u>
24	0	25
25	1	23
26	2	10
27	> 2	0

29 The scores in each of the above categories is summed for each of the selected
 30 sets of reference recognition characteristics, and the respective score sum for each
 31 selected set of reference recognition characteristics is then averaged by dividing the
 32 respective score sum by the number of imaginary rectangles described by that
 33 respective selected set of reference recognition characteristics. The resultant averaged
 34 scores are then rounded to the nearest integer, and the selected set of reference
 35 recognition characteristics having the highest averaged score is determined to be the
 36 best match to the recognition characteristics generated from the scanned image of
 37 document 400.

1 The bill document format information (e.g., the length and parsing form of the
2 OCR line) associated with the reference billing document from which the reference
3 recognition characteristics were generated which were determined to constitute the
4 best match to the recognition characteristics generated from the document 400, is then
5 retrieved from the system 228 and forwarded to the field location generator 218.
6 Generator 218 then uses this information to determine the location and parsing of the
7 fields in the OCR line of the scanned image of the document 400. This OCR field
8 location and parsing information is then transmitted from the generator 218 to the
9 image processor 216, together with the original scanned image of the document 400,
10 which processor 216 uses this information to apply to the particular OCR field
11 location of the scanned image, optical character recognition to extract therefrom the
12 numerical data 405 of the OCR line of the document 400.

13 This numerical data 405 is then transmitted to the ACH/EFT request generator
14 224. Generator 220 also causes the archive 228 to transmit to the generator 224 the
15 name, EFT payment account, and bank routing number of payee associated with the
16 reference billing document whose reference recognition characteristics were
17 determined to most closely match those of document 400. The generator 224 then
18 causes display 206 to display this information and to prompt via the display 206 for
19 the user/customer at the display 206 to indicate via the user interface 206 whether the
20 displayed information is correct. If the user/customer indicates that the displayed
21 information is correct, the generator 224 then causes the display 206 to prompt the
22 user/customer to provide means to pay the bill whose billing information is displayed
23 on the display 206, otherwise the user/customer is prompted to input to the generator
24 224 the corrected billing information, which corrected information, once input, is
25 displayed on the display with a request that the user verify correctness of same. Once
26 the user/customer indicates that the billing information displayed on the display 206 is
27 correct, the generator 224 causes the display 206 to request that the user/customer
28 indicate to the system 200 via the user interface 206 how the user/customer wishes to
29 make payment based upon the displayed billing information. Interface 206 may

1 comprise a conventional point of sale debit card reading/transaction mechanism (not
2 shown) to permit the user/customer to accomplish this. The information obtained
3 from reading the customer's debit card and provision of the customer's PIN via the
4 interface 206 may then be utilized by the generator 224, together with the aforesaid
5 billing information, to generate an ACH EFT request to transfer funds from the
6 customer's bank account (indicated via the debit card information) to the bill payee's
7 bank account, to pay the customer's bill as indicated on the billing document 400.
8 This request is transmitted from the generator 224 to the ACH/EFT system via the
9 interface 226, and a copy of said request is stored in the archive 228 in association
10 with the other billing information and scanned image obtained from the document 400
11 by the system 200. Once the ACH system notifies the generator 224 that the request
12 has been executed, the generator 224 provides to the payee system 232 via the
13 interface 230 a copy of the notice, the submitted ACH/EFT request, and a statement of
14 the customer's billing account number in order to permit the payee 232 to update its
15 records to reflect the customer's payment to reduce the outstanding balance of the
16 customer's billing account. Alternatively, the ACH/EFT request may be forwarded
17 by the generator 224 to the payee 232 via the interface 230 for submission by the
18 payee 232 directly to the ACH/EFT system. The archive 228 may also be adapted to
19 permit the payee 232 to access the other information associated with the payee (e.g.,
20 the particular EFT requests generated for effectuating payment of bills generated by
21 that payee and scanned images of such bills) stored in the archive 228.

22 Also alternatively, system 200 may be adapted to store ACH/EFT requests
23 from a plurality of transactions and to submit the stored requests as a batch to the
24 ACH/EFT system and/or payee(s).

25 System 200 may also be modified such that interface 206 comprises
26 conventional means (not shown) for permitting the user/customer to make payment
27 via check (or other negotiable instrument), credit card, and/or cash tendered to the
28 operator of the interface 206.

1 Further alternatively, if systems 10, 200 are appropriately modified, they may
2 be utilized in conjunction with each other such that a customer's or user's bill may be
3 processed by system 200 to generate the aforesaid type of billing information
4 therefrom, and system 10 may then be used to process a check or other negotiable
5 instrument tendered by the customer or user to effectuate payment of said bill.

6 Also, as shown in Figures 9-11, a modification 200' of the system 200 has
7 similar architecture to that of system 10. As shown in Figures 9-11, system 200' may
8 include a plurality of payment terminals 202A', 202B', 202C', each having
9 substantially identical construction and operation and each of which is connected via a
10 suitable wide area network to a collection system 24'. Each of the terminals 202A',
11 202B', 202C' comprises a local controller/processor 40' which controls operation of
12 optical scanner 208, image characterization generator 204, input/output device 206,
13 local storage system 42' and interfaces 44', 45 so as to process a document 400 to
14 generate a scanned image thereof and to generate recognition characteristics from the
15 scanned image in the manner described previously in connection with system 200, and
16 also to transmit to the local controller 50' the recognition characteristics generated
17 from document 400, via the interfaces 44', 48'. In this system 200', the processor 50'
18 is adapted to carry out the functions of the recognition characteristic comparator 220,
19 field location generator 218, and image processor 216. In embodiment 200', billing
20 information and customer/user responses from the user interface 206 and transmitted
21 from and to, respectively, the generator 224 via the controller 50', interfaces 48', 44',
22 and local processor 40'. Data is exchanged between the various components of the
23 collection system 24' and the storage archive 228 via interface 58'.

24 Of course, it should be appreciated that payment terminal 202 could comprise
25 elements 206, 208, 204, 216, 218, 220, 224, and 226 without departing from the
26 second aspect of the present invention. In such an alternate construction of system
27 200, the processor 220 may download reference recognition characteristics from the
28 archive 228, as needed to accomplish the processing described above, which archive

1 228 may be located remotely from the terminal 202 and be connected to the terminal
2 202 a conventional wide area network connection system (not shown).

3 Figures 8A-8F illustrate various types of bill document formats that can be
4 recognized by system 200 in accordance with the present invention. Of course,
5 Figures 8A-8F are merely illustrative and are not intended to be limiting.

6 Thus, it is evident that there has been provided, in accordance with the present
7 invention, financial transaction processing systems and methods which fully achieve
8 the advantages, and satisfy the aims and objectives, hereinbefore set forth. Although
9 the present invention has been described in connection with preferred embodiments
10 and methods of use, it will be apparent to those skilled in the art that many variations,
11 modifications, and alternatives thereof are possible without departing from the present
12 invention. For example, while imaginary rectangles are described for accomplishing
13 a "best fit" match, any polygon or geometric shape may be employed in the practice
14 of the invention. Also, although various of the functional components of the systems
15 of the first and second aspects of the present invention (e.g., recognizer 32, processor
16 40, record generator 38, interfaces 44, 48, 56, 58, 60, transaction generator 52, and
17 controller 50 of system 10; image characterization generator 204, comparator 220,
18 location generator 218, image processor 216, request generator 224, and interfaces
19 226, 230) preferably are embodied in whole or in part as one or more distributed
20 computer program processes running on one or more conventional general purpose
21 computers (e.g., IBM-compatible 80X86 based, Apple MacIntosh, and/or RISC
22 microprocessor based computers), conventional telecommunications devices (e.g.,
23 modem, TCP/IP, and/or ISDN means) networked together by conventional hardware
24 and software, other types of computers, telecommunications, and network devices
25 may be used without departing from the present invention. Furthermore, it should be
26 understood that one or more of these functional components may alternatively be
27 constructed in whole or in part out of custom, dedicated electronic hardware and/or
28 software, without departing from the present invention.

1 Further alternatively, each of the terminals 18, 20, 22, 202 of the systems
2 10,200 may be adapted to include its own respective ACH/EFT request generator and
3 to directly contact the EFT/ACH system whereby to permit the respective operator of
4 the terminal to be able to submit such EFT/ACH requests directly to the EFT/ACH
5 system and to determine immediately whether submitted requests will clear the
6 EFT/ACH system.

7 Yet other changes are possible. For example, the invention has been described
8 in connection with the processing of, for example, paper checks, other media,
9 including, e.g. microfilm records or the like advantageously may be processed in
10 accordance with the present invention. Furthermore, a color scanner may be
11 employed in place of the gray scale scanner described. The invention also
12 advantageously may be employed at point of service terminals communicating
13 through a network.

14 Moreover, the invention advantageously also may be used for processing
15 transactions other than straight financial transactions.



1 What is claimed is:

- 2 1. A system for use in processing a transaction based at least in part upon
 3 visual data representing information related to said transaction and formed on a
 4 document having a particular format, said system characterized by:
 5 a. an optical scanner (208) for generating a scanned image of at least a
 6 portion of said document containing said visual representation;
 7 b. an image characterization generator (204) for generating recognition
 8 characteristics from said scanned image;
 9 c. a recognition characteristic comparator (220) for comparing said
 10 recognition characteristics to respective sets of reference recognition characteristics
 11 generated from respective other transaction documents having different respective
 12 formats and for determining therefrom whether said particular format matches one of
 13 the respective formats of said other documents;
 14 d. a field location generator (218) for determining, based upon the one
 15 respective format when the particular format is determined to match said one
 16 respective format, location of a field in said scanned image to which optical character
 17 recognition may be applied to generate therefrom said information; and
 18 e. an image processor (216) for utilizing optical character recognition to
 19 generate said visual data from said location.
 20 2. A system according to claim 1, characterized by one or more of the
 21 following features:
 22 a. wherein said characterization generator includes an image de-skewer
 23 (210) for registering the scanned image with respect to a coordinate system, and
 24 wherein said image de-skewer preferably registers said scanned image by registering
 25 dark pixels closest to respective adjacent edges of said scanned image with respect to
 26 said coordinate system;
 27 b. wherein said characterization generator comprises a noise eliminator
 28 (212) for eliminating noise in said scanned image by replacing dark or light portions
 29 of fewer than 3 pixels in said scanned image with whitespace, or darkspace, as the



REPLACED SHEETS		SG
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- 1 case may be, and wherein said characterization generator preferably also comprises an
2 image enhancer (214) for enhancing said scanned image by replacing whitespace, or
3 darkspace, as the case may be, extending in two, preferably mutually orthogonal,
4 directions around each dark or light pixel, as the case may be, remaining after
5 elimination of said noise, with respective predetermined numbers of dark or light
6 pixels, respectively, in each of said directions;
- 7 c. wherein said characterization generator comprises a dark pixel group
8 locator (222) for locating groups of dark pixels whose sizes exceeds a predetermined
9 threshold, and wherein said recognition characteristics preferably comprise locations
10 of said groups of dark pixels located by said dark pixel group locator, and said
11 respective sets of reference recognition characteristics comprise respective sets of
12 locations of groups of dark pixels from respective scanned images of said respective
13 other transaction documents;
- 14 d. wherein the transaction comprises a financial transaction, and the
15 document includes visual financial data; and
- 16 e. wherein said information comprises an amount payable from a customer,
17 and said visual representation comprises an amount due represented numerically and
18 an account number of said customer.
- 19 3. A method for use in processing a transaction based at least in part upon
20 visual data representing information related to said transaction and formed on a
21 document having a particular format, said method characterized by:
- 22 a. generating an optically scanned image of at least a portion of said
23 document containing said visual representation;
- 24 b. generating recognition characteristics from said scanned image;
- 25 c. comparing said recognition characteristics to respective sets of reference
26 recognition characteristics generated from respective other transaction documents
27 having different respective formats and determining therefrom whether said particular
28 format matches one of the respective formats of said other documents;





- 1 d. determining, based upon the one respective format when the particular
2 format is determined to match said one respective format, location of a field in said
3 scanned image to which optical character recognition may be applied to generate
4 therefrom said information; and
- 5 e. utilizing optical character recognition to generate said visual data from
6 said location.
- 7 4. A method according to claim 3, characterized by one or more of the
8 following features:
- 9 a. further comprising eliminating noise in said scanned image, prior to
10 comparison step (c), by replacing dark or light portions of fewer than 3 pixels in said
11 scanned image with whitespace, or darkspace, respectively, and if desired, further
12 comprising enhancing said scanned image by replacing whitespace, or darkspace, as
13 the case may be, extending in two, preferably mutually orthogonal directions around
14 each dark or light pixel, as the case may be, remaining after elimination of said noise,
15 with respective predetermined numbers of dark or light pixels, respectively, in each of
16 said directions;
- 17 b. further comprising locating groups of dark or light pixels whose sizes
18 exceed a predetermined threshold, and wherein said recognition characteristics
19 preferably comprise locations of groups of dark or light pixels, as the case may be,
20 whose sizes exceed a predetermined threshold, and said respective sets of reference
21 recognition characteristics comprise respective sets of locations of groups of dark or
22 light pixels, respectively, from respective scanned images of said respective other
23 transaction documents;
- 24 c. wherein the transaction comprises a financial transaction, and the
25 document includes visual financial data; and
- 26 d. wherein said information comprises an amount payable from a customer,
27 and said visual representation comprises an amount due represented numerically and
28 an account number of said customer.





- 1 5. A system for processing an electronic transaction based upon visual
2 information related to said transaction contained on a document tendered by a party to
3 said transaction, comprising:
4 a. an optical scanner for generating a computer-readable scanned image of
5 said document;
6 b. an optical character recognizer for generating, from said scanned image,
7 transaction data indicative of at least a portion of said visual information;
8 c. an authorization record generator for generating based upon said
9 transaction data a record of said transaction for being assented to by said party prior to
10 completion of said transaction, and for generating from the record once the record is
11 assented to by said party, a computer-readable record of assent of said party to said
12 transaction; and
13 d. a collection system for generating in response to said transaction data
14 and said computer-readable record, an electronic financial transaction request for
15 being used by an electronic financial transaction system to execute said electronic
16 financial transaction.
17 6. A system according to claim 5, characterized by one or more of the
18 following features: wherein said document is a draft authorizing payment of funds to
19 another party, said electronic financial transaction system comprises an Automated
20 Clearing House system (ACH), and said financial transaction comprises an electronic
21 funds transfer (EFT) to said another party in an amount equal to that authorized in
22 said draft.
23 7. A system according to claim 6, characterized by one or more of the
24 following features:
25 a. further comprising, a computer-readable storage archive for storing said
26 scanned image, said computer-readable record of assent, and said transaction data,
27 wherein said storage archive preferably comprises a non-volatile optical storage
28 medium;





- 1 b. wherein said collection system is also for automatically re-submitting,
2 upon occurrence of a predetermined event, said EFT to said ACH, wherein said
3 predetermined event preferably comprises receipt by said collection system of
4 indication that insufficient funds exist to complete said EFT;
- 5 c. wherein said scanned image is of an entirety of at least one side of said
6 document, and said collection system is also for generating a copy of said document,
7 based upon said scanned image, upon occurrence of a predetermined event, wherein
8 said document is a check, and said predetermined event preferably comprises receipt
9 by said collection system of indication that insufficient funds exist to complete said
10 electronic financial transaction;
- 11 d. wherein said document is a check, and said collection system is also for
12 generating another document including two portions, one of said portions containing a
13 copy of said check, said copy having dimensions that are smaller than those of said
14 check, and another of said portions containing MICR-encoded data identical to
15 MICR-encoded data contained on said check, said MICR-encoded data being formed
16 in accordance with American Banking Association standard format for permitting said
17 two portions to together form another check;
- 18 e. wherein said record of said transaction comprises a written document for
19 being signed to indicate said assent, and said authorization record generator comprises
20 said optical scanner, said computer-readable record being generated by said scanner;
- 21 f. wherein said authorization record generator is also for generating data
22 for uniquely identifying said transaction and for being used to associate said
23 transaction data, said scanned image, and said computer-readable record with each
24 other;
- 25 g. further comprising a user-input device for permitting a user to input
26 information for identifying type of said transaction, said authorization record
27 generator is also for generating said record of said transaction based upon said
28 information for identifying type of said transaction, and said collection system is also
29 for generating said request based upon said information for identifying type of said





- 1 transaction, wherein said information for identifying type of said transaction
2 preferably comprises a payment amount and payee in said transaction;
3 h. wherein said collection system is also for transmitting said request to at
4 least one of: a payee in said transaction and an Automatic Clearing House system;
5 and
6 i. wherein said scanner and said authorization record generator are located
7 at a point of sale.
- 8 8. A method for processing an electronic transaction based upon visual
9 information related to said transaction contained on a document tendered by a party to
10 said transaction, characterized by:
11 a. generating a computer-readable scanned image of said document;
12 b. generating, from said scanned image, transaction data indicative of at
13 least a portion of said visual information;
14 c. generating from said transaction data a record of said transaction for
15 being assented to by said party prior to completion of said transaction, and generating
16 from the record once the record is assented to by said party, a computer-readable
17 record of assent of said party to said transaction; and
18 d. generating in response to said transaction data and said computer-
19 readable record, an electronic financial transaction request for being used by an
20 electronic financial transaction system to execute said electronic financial transaction.
- 21 9. A method according to claim 8, characterized by one or more of the
22 following features:
23 a. wherein said document is a draft authorizing payment of funds to
24 another party, said electronic financial transaction system comprises an Automated
25 Clearing House system (ACH), and said financial transaction comprises an electronic
26 funds transfer (EFT) to said another party in an amount equal to that authorized in
27 said draft, and, if desired, automatically re-submitting, upon occurrence of a
28 predetermined event, said EFT to said ACH, wherein said predetermined event
29 preferably comprises determination that insufficient funds exist to complete said EFT;





- 1 b. storing said scanned image, said computer-readable record of assent, and
2 said transaction data;
- 3 c. wherein said scanned image is of an entirety of at least one side of said
4 document, and said method further comprises generating a copy of said document,
5 based upon said scanned image, upon occurrence of a predetermined event,
6 wherein said document preferably is a check, and said predetermined event comprises
7 determination that insufficient funds exist to complete said electronic financial
8 transaction;
- 9 d. wherein said document is a check, and said method further comprises
10 generating another document including two portions, one of said portions containing a
11 copy of said check, said copy having dimensions that are smaller than those of said
12 check, and another of said portions containing MICR-encoded data identical to
13 MICR-encoded data contained on said check, said MICR-encoded data being formed
14 in accordance with American Banking Association standard format for permitting said
15 two portions to together form another check;
- 16 e. wherein said record of said transaction comprises a written document for
17 being signed to indicate said assent, and said computer-readable record is generated
18 by an optical scanner;
- 19 f. further comprising, generating data for uniquely identifying said
20 transaction and for being used to associate said transaction data, said scanned image,
21 and said computer-readable record with each other; and
- 22 g. wherein said scanned image and said record of said assent are generated
23 at a point of sale.

