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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : B42D 15/10	A1	(11) International Publication Number: WO 99/62725
		(43) International Publication Date: 9 December 1999 (09.12.99)

(21) International Application Number: PCT/US99/12282

(22) International Filing Date: 2 June 1999 (02.06.99)

(30) Priority Data:
09/090,067 3 June 1998 (03.06.98) US

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(81) Designated States: CA, JP, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: IDENTIFICATION DOCUMENT WITH DOCUMENT SPECIFIC REDUCED SCALE PRINTING

(57) Abstract

An identification document which includes card specific information printed on the card in a first location at a relatively large scale which permits the information to be read without magnification and duplicates the card specific information at a second location on the card at a significantly smaller scale which requires magnification to clearly read the small scale information. The micro–printing of small scale card specific information, such as a person's date of birth on a driver's license, at a second location on the identification card allows the micro–printed text to be compared to the large scale text to determine if the large scale text has been altered.

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IDENTIFICATION DOCUMENT WITH DOCUMENT SPECIFIC REDUCED SCALE PRINTING

The present invention relates to identification documents and, more specifically, to the use of reduced scale printing on such documents to inhibit the alteration or forgery of such cards.

There are a large number of documents which are commonly used to identify individual people or objects, or which represent or convey financial value. Driver's licenses and employee badges are two examples of highly prevalent identification documents. Identification documents may also be employed with objects. Such documents may be used to establish that a particular object has been inspected, passed through customs or possesses some other attribute which affects its value. For example, an identification document may be used to establish the provenance of an artwork or the pedigree of an animal. Documents may also be employed as financial instruments such as money orders and stock certificates.

The value of these identification documents provides an incentive for the unlawful alteration or counterfeiting of such documents. A large variety of means, both simple and sophisticated have been developed to hinder the alteration and counterfeiting of such documents.

A relatively simple and cost efficient type of identification card for an individual typically contains textual matter pertaining to the specific individual identified in the card, such as the person's name, address, date of birth and some type of identifying number such as a driver's license, social security or other unique serial number. The card may also contain information on the person's physical characteristics such as hair color, eye color, height and weight and display the person's signature and photograph.

Such cards are not foolproof, however, and it is not uncommon for individuals to attempt to alter such documents by changing some of the printed text found on the card or by substituting a different photograph. For example, alterations to the date of birth on such cards may be made by minors who wish to illegally

purchase alcohol or such individual may attempt to substitute their own photograph in a card which identifies an older individual.

To prevent such tampering and the production of counterfeit cards, identification cards may employ various well known deterrent methods. For example, the card may contain elements which are difficult to replicate such as holograms. The cards may also be constructed of materials which are destroyed upon an attempt to tamper with the card. The cards may also employ means to record data which cannot be directly read by a human viewer such as magnetically recorded or bar coded data. This recorded data may also be encrypted to provide further security. Micro-printing, which cannot be easily read without magnification and which is often found on paper currency, may also be used. The difficulty of faithfully reproducing the micro-printed text inhibits the production of counterfeit documents. A brief review of several of these methods can be found in U.S. Patent No. 5,284,364.

These measures provide different levels of deterrence. Generally, the more sophisticated measures provide a greater measure of security but at a higher level of cost.

The present invention provides a cost efficient mechanism for enhancing the tamper resistance of an identification document.

The invention comprises, in one form thereof, an identification document which includes printed matter conveying information specific to an individual at a large scale which enables a viewer to easily read the information and printing that same individual specific information on the identification document at a second location at a significantly smaller scale. The printing of the information at the second location may either graphically reproduce the first printed matter at a smaller scale or it may represent that same information in a graphically different manner.

An advantage of the present invention is that alterations to the large scale printed maker on the document which has been duplicated elsewhere on the document in micro-printed text can be detected by comparing the large scale text to the small scale micro-printed text. This provides a cost efficient mechanism for deterring the alteration of the large scale text on such documents.

Another advantage of the invention is that by micro-printing individual specific information on the identification document, the production of counterfeit identification cards is inhibited. For example, if identical micro-printed text were placed on all of the documents, a counterfeiter who was able to reproduce the micro-printed text could produce a large number of counterfeit documents with that micro-printed text. If, however, the micro-printed text varied from document to document, the counterfeiter will have to reproduce a number of different micro-printed text strings to produce a large number of counterfeit documents with sufficient variety to escape detection.

Yet another advantage of the invention is that the small scale printed matter may be placed at more than one location on the document. The public can be widely notified of the use of one of the locations while maintaining at least one location confidential. In this manner the publicized location will work as a deterrent to those considering alteration or counterfeiting of the document while the confidential location may be overlooked by those actually engaging in such activities. A balance between the advantages of publicity, which can deter illicit activity, and confidentiality, which can facilitate the detection of such activity, may thereby be achieved. Alternatively, the use of such micro-printed text may be kept completely confidential or publicized in its entirety in an attempt to maximize one of these two benefits.

The above mentioned and other features and advantages of this invention, and the manner of attaining them, will become more apparent and the invention itself will be better understood by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawings, wherein:

Figure 1 is a view of an identification card embodying the present invention.

Figure 2 is a block diagram of an apparatus for producing identification cards embodying the present invention.

Figure 3 is a flow chart of a software package and process which may be used to implement the present invention.

Corresponding reference characters indicate corresponding parts throughout the several views. Although the drawings represent an embodiment of the present invention, the drawings are not necessarily to scale and certain features may be exaggerated or simplified in order to clearly illustrate and explain the present invention. The exemplification set out herein provides an illustrative embodiment of the invention and is not intended to be an exhaustive illustration of the invention or to be construed as limiting the scope of the invention.

Referring now to the drawings and particularly to Figure 1, there is shown an identification card 10. In the illustrated embodiment card 10 is a driver's license which includes a variety of information including the name and address 12, photograph 14, signature 16, date of birth 18, driver's license number 20 and organ donor status 22 of the particular person identified by the card.

The information printed on the card may be either common information which is found on all of the cards, e.g., the name of the state issuing the driver's license, or information which is specific to the individual document (such as a serial number) or the individual person or object identified in the card. This latter type of individual specific information may or may not be information which is unique to the individual.

The distinction between individual specific and unique information is illustrated by the differences between the information found on the illustrated card 10. The organ donor status of the identified individual is individual specific information because it designates the organ donor status of the identified individual. However, in a card system with more than a nominal number of identified individuals, there will be a large number of people with the same organ donor status, e.g., "Y" for individuals who have agreed to donate organs. Thus, the organ donor status information will not be unique to the individual. Similarly, the date of birth of each individual will be individual specific information but is unlikely to be information which is unique to the identified individual. No two individuals holding a card 10, however, will have the same driver's license number. Thus, the driver's license number is information which is unique to the individual person or card.

The illustrative embodiment of card 10 includes a ghost image 30 of the photograph 14 on the card over which information may be printed. The ghost image is a duplicate of photograph 14 but is printed at a much lighter tone so that darker text printed over the ghost image can be easily read. The use of such a ghost image makes it difficult for a person who has obtained the card of another individual to substitute his or her own photograph 14 in the card. A comparison of the photograph 14 and ghost image 30 will immediately reveal any such substitution.

Printing text over a ghost image also makes changing the text by scratching out the original text and replacing it with different text more difficult. This is because such a "scratch and replace" approach will be likely to scratch the ghost image in a manner which can be visually detected.

The name and address 12, date of birth 18, photograph 14, as well as much of the other information contained on the card is printed on a scale which is sufficiently large to allow a person viewing the card to read this printed matter without magnification. The printed matter on card 10, however, also includes micro-printed matter which is printed at a second, significantly smaller scale. On illustrated card 10, this small scale printed matter includes the last two digits of the year in which the identified individual was born 24, 25, the individual's full date of birth 26, and the state name 28. The small scale text 24, 25, 26, 28 is printed at a scale, e.g., a 2 point font, which can be read by many people with the unaided eye but which requires magnification for the text to be easily resolved with sufficient clarity to be read. Alternatively, the text could be printed at an even smaller scale such as a 1 point font which, for a significant number of people, would require magnification for the text to be resolved by the viewing person with sufficient clarity to be read.

As can be seen in Figure 1, the last two digits of the year of birth of the identified individual 25 are micro-printed on card 10 to take the place of periods behind the initials of the Commissioner issuing the identification card 10. The year of birth of the individual is also printed at a large scale elsewhere on the card as indicated by reference numeral 18. A second micro-printed text 26 of the individual's year of birth is located elsewhere on the document overlaying a graphical element and is also spaced from the large scale text displaying that same information.

Longer strings of micro-printed text may also be employed. For example, micro-printed text 28 of the individuals full date of birth is shown located within the state emblem 27. In addition to the micro-printed individual specific information, i. e., the individual's year and date of birth 24, 25 and 26, information which is common to all of the cards is also micro-printed on card 10. The micro-printed common information 28 is the name of the issuing state in the illustrative embodiment.

The micro-printing of information common to all of the cards helps deter counterfeiting of the cards by making duplication of the cards difficult. This common micro-printed text, however, does not prevent someone from altering individual specific information on a validly issued card. Micro-printing the individual specific information which is most likely to be altered helps deter and detect such alterations by allowing the large scale text to be compared to the more difficult to alter small scale text. One item of individual specific information for which there is often significant concern of alteration is the date of birth of the identified individual. Driver's licenses are often used to check the age of individuals who purchase alcohol and underage individuals have been known to alter the year of birth on their driver's license to enable them to illegally purchase alcohol.

Printing equipment which is capable of producing text at very small scales is becoming widely available and can be used to economically produce identification cards with small scale text which varies from card to card. The use of such printing equipment facilitates the production of card 10. Such equipment may also be used in an attempt to alter a pre-existing card 10. To alter a pre-existing card 10, however, the small scale text could not merely be printed on a fresh document. Instead, to alter a document, the original small scale text would have to be removed and then new small scale text would have to be reproduced on the existing card at the precise location and orientation of the removed original small scale text. Such alterations present considerable pragmatic obstacles to those contemplating the alteration of information which is reproduced elsewhere on the card at a small scale. Thus, micro-printing individual specific information on an identification card when creating the

card is relatively inexpensive yet at the same time creates meaningful obstacles to the alteration of that information.

This use of micro-printed text can be disclosed to the public at large or kept confidential. There are advantages to each approach. Publicizing the use of such text can have a deterrent effect. Maintaining the use of such text confidential can make detection of alterations and counterfeit documents easier if the malfeasors do not attempt to alter or counterfeit the micro-printed text. Alternatively, by utilizing micro-printed text at two locations and publicizing only one, the entity issuing the cards can attempt to realize the advantages of both of these approaches.

The information which is printed at the second smaller scale may also be encrypted so that the smaller scale information represents the same information as the larger scale information but is not a visually identical reproduction of the larger scale information. For textual matter, the smaller scale information may also be printed using a different font than the larger scale information. Where different fonts are used and the information is not encrypted, the small scale text is also not a visually identical reproduction of the larger scale information. However, in the applications where the small scale information is encrypted or reproduced in a different font, the small scale information still represents the same underlying informational content as the large scale information but does so in a manner which is not a graphical reproduction of the large scale information.

Although only a single exemplary embodiment of an identification card has been illustrated in the drawings, those having ordinary skill in the art will recognize that the disclosed invention is not limited to the illustrated embodiment. For example, a driver's license number, social security number or cardholder name could be reproduced on a small scale instead of, or in addition to, a date of birth. The present invention may also be used with employee tags and the individual's employee number, clearance rating or other individual specific information can be reproduced at a small scale.

Turning now to Figure 2, one possible arrangement of an apparatus for creating cards with card specific micro-printed text is illustrated in highly schematic form. The illustrated apparatus includes a digital camera 32 for capturing a digital

image of the person identified in card 10, a digitizing device 34 for converting analog information into digital information, a micro-computer 36, a data entry device 38 and a printing device 40. The illustrated apparatus may take various forms and utilize different components depending upon the type of information which is to be printed on the identifying document. For example, a camera would not be necessary if the document will not include a photographic image.

Digital camera 32 is a conventional digital camera of which there are many suitable cameras widely available and well known in the art. Device 34 may be a scanner for digitizing an image of the identified person's signature, fingerprint, an analog photograph and/or other identifying information. Alternatively, device 34 can be a capture device for directly digitizing a person's signature, fingerprint and/or other identifying information. Data entry device 38 may be a keyboard for entering individual specific information such as the name, address, birth date etc. of the identified individual.

Microcomputer 36 is a conventional personal computer having a microprocessor such as a commonly available and well known Pentium chip manufactured by Intel. Microcomputer 36 receives, stores and manipulates the digital images and data and subsequently produces an output which is transferred to printing device 40.

Those persons having ordinary skill in the art will recognize that instead of using a separate personal computer, a wide variety of alternative configurations which might employ a network server or microprocessors integrated with one or more of the other pieces of the illustrated apparatus could be used to achieve the same functionality as the illustrative embodiment.

Computer 36 also includes storage media on which computer programs are stored for receiving digital information from devices 32, 34 and 38, processing the information and outputting digital information which can be processed by printing device 40 to generate identification document 10. The computer programs stored within computer 36 may include an identification card template to which card specific information is added prior to generating an identification document 10.

Prior to entering card specific information in the card template, the card layout or template must be designed. An extremely large variety of different document layouts can be used with the present invention. One illustrative process for designing an identification document is to begin with the step of designing and digitizing a graphical background for the document. This may be done with a conventional desktop publishing software program.

Figure 3 provides a flow chart which illustrates a process which may be used in the implementation of the present invention. Some of the specific software programs which may be utilized when carrying out the invention include EPISUITE by G & A Imaging, Ltd. of Hull, Quebec, Canada; Identifier for Windows by Imaging Technology Corp. of Hudson, Massachusetts, USA; and IDS 7100 by NBS Imaging Systems Inc. of Fort Wayne, Indiana, USA.

The background graphic may advantageously include several medium tones such as gray or light blue which can be used for "hiding" the small scale text. The background graphic is then imported into a software program along with variable text fields which are placed in specific areas on top of the background graphic to create a card layout or card template. In addition to the conventional large scale text fields comprising such items of information as the cardholder name and date of birth, these text fields should include smaller scale relatively dark toned textual matter at a font size of 2 or 3 points or less located on top of the medium-toned portion of the earlier designed graphical background. The dark text on medium-toned (or light-toned) background permits the text to be read while minimizing the contrast between the dark text and background. Similarly, light-toned text can be placed on a darker-toned background. Minimizing the contrast between the small scale text and background reduces the possibility that persons viewing the card will notice the small scale text and thereby "hides" the text in the background color. In card 10, the "hiding" of text is exemplified by small scale text 24 which consists of two dark toned numerals printed over a medium-toned background color 23.

Another method of making the small scale text visually unobtrusive is to place the small scale text within a complex graphical image. In this manner the discontinuities in tone and hue created by the small scale text will be surrounded,

and camouflaged, by other small scale discontinuities in tone and hue created by the surrounding and underlying image. In card 10, this is exemplified by placing small scale text 26 in a state emblem 27.

The small scale text can also be printed on a portion of the card which does not include a background color as illustrated by the two periods 25 in card 10. By placing the small scale text on a clear or white background, the text will be more apparent and easier to read when verifying the accuracy of the large scale text.

When producing cards for individual cardholders, individual specific information is input into the appropriate text fields in the card template and the resulting identification card is output to the printing device and a hard copy of the card is generated by the printing device.

Printers capable of printing small scale text are well known in the art. For example, NISCA, Hitachi, DataCard and Atlantek all manufacture 12 dpm (i.e. dots per millimeter) or300 dpi (i.e., dots per inch) dye diffusion thermal transfer printers which can be used to print small scale text in a manner known in the art. Indigo, a Netherlands company, manufactures a Digital Offset printer under the trademark E-Print 1000 which is known in the art and may be used to implement the present invention.

As will be recognized by those having ordinary skill in the art, high quality color laser copiers may be used instead of printers to generate the identification documents. For example, Canon and Xerox both make color laser copiers capable of implementing the present invention in a manner well known in the art. As with conventional printers, such copiers have a digital interface which allows them to receive digital data and print a hard copy image therefrom.

With a printing device which produces images at a resolution of 12 dpm (300 dpi) and even up to 8 dpm (200 dpi), the small scale text can be reduced to a 2 point (2/72 inch) (.07 cm) font and still be clearly and legibly printed. With higher resolution printing devices, such as printers with a resolution of 32 dpm (800 dpi), the size of the text can be reduced to an even smaller scale while still clearly and legibly printing the text.

It is also envisioned that cards 10 can have more complex images reduced to a small scale. For example, a signature or photograph of the identified individual could be digitally reduced in scale and reproduced on card 10. More complex images' however, require more sophisticated software to appropriately reduce the image and higher resolution printing devices to clearly and legibly reproduce the complex image - both of which would add to cost of producing documents having such reduced scale complex images.

Often times color printing devices utilize ribbons having panels of only a limited number of colors and several passes must be made to overlay different colors on a particular location to produce certain colors by the resulting combination. By including a panel of the color used to print the small scale text (such as black) only one printing pass is required for printing the small scale text and the potential for problems associated with maintaining the proper registration of the card stock beneath the printer to properly overlay the different colors to form the final color of the small scale text is minimized.

Card stock on which card 10 is printed may be a polyvinyl chloride (PVC), a polyester, a polycarbonate, a polyolefin (such as the polyolefin-based film manufactured under the registered trademark Teslin by PPG of Pittsburgh, Pennsylvania, USA), or other suitable material. It is possible to preprint some of the printed matter which is common to all of the cards on the card stock prior to printing individual specific material on the card stock. It is generally preferable, however, to print the entirety of the card at one time.

The apparatus for printing the cards may be located at a single location, or some portions of the apparatus may be located at a central site. When different locations must be interconnected, information may be conveyed between the different apparatus components via a network, telecommunication line or other well known data transfer means.

While the present invention has been disclosed and illustrated with reference to an identification card, it could also be modified and implemented with other valuable documents. For example, it could be used with checks and other negotiable instruments or even paper money, by using unique serial numbers with the

documents and micro-printing the serial number of the instrument on the document (and/or the monetary amount of a money order or certified check). It is envisioned that the large scale implementation of such a system with such valuable documents could enable the use of automated verification means which would employ OCR (optical character recognition) technology to read and compare the large scale and small scale printed matter.

Thus, while this invention has been described as having an exemplary design, the present invention may be further modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains.

CLAIMS

1. A document containing non-identifying and identifying information, said document comprising:

first printed matter rendered at a first location on said document and at a first scale enabling said first printed matter to be resolved by a viewing person without magnification;

second printed matter representing said first printed matter rendered at a second location on said document and at a second scale, said second scale being significantly smaller than said first scale, said second location spaced from said first location whereby said first and second printed matter is printed in at least two separate and distinct locations on said document; and

wherein said first and second printed matter conveys identifying information.

2. The identification document of Claim 1 wherein said second printed matter cannot be clearly resolved by a viewing person without magnification of the second printed matter.

3. The identification document of Claim 1 wherein said second printed matter consists of text rendered in a single color.

4. The identification document of Claim 1 wherein said second printed matter consists of relatively dark toned text printed on a background color which is lighter toned than said text.

5. The identification document of Claim 1 wherein said second printed matter consists of relatively light toned text printed on a background color which is darker toned than said text.

6. The identification document of Claim 1 wherein said document identifies a particular person and said first and second printed matter is specific to the identified person.

7. The identification document of Claim 5 wherein said second printed matter cannot be resolved by a viewing person without magnification of the second printed matter.

8. The identification document of Claim l wherein said first and second printed matter comprise alphanumeric characters.

9. The identification document of Claim l wherein said first and second printed matter comprises at least two digits of the year of birth of a person identified in said document.

10. The identification document of Claim l wherein said second printed matter is a graphical reproduction of said first printed matter.

11. A system of tamper resistant identification documents comprising:

a plurality of identification documents, each of said documents displaying information specific to a particular person;

each of said documents comprising first printed matter rendered at a first location on said documents at a first scale enabling said first printed matter to be resolved by a viewing person without magnification; and second printed matter representing said first printed matter at a second location on said documents and at a second scale, said second scale being significantly smaller than said first scale, said second location on each card being spaced from said first location on each card whereby said printed matter is represented in at least two separate and distinct locations on each said card, and wherein said printed matter of each card is specific to the particular person identified in each card.

12. The system of Claim 11 wherein said second printed matter cannot be resolved by a viewing person without magnification of the second printed matter.

13. The identification document of Claim 11 wherein said second printed matter consists of text which is printed in a single color.

14. The system of Claim 11 wherein said second printed matter consists of relatively dark toned text printed on a background color which is lighter toned than said text.

15. The system of Claim 11 wherein said second printed matter consists of relatively light toned text printed on a background color which is darker toned than said text.

16. The system of Claim 11 wherein the first and second printed matter is unique to each document of said plurality.

17. The identification document of Claim 16 wherein said second printed matter cannot be clearly resolved by a viewing person without magnification of the second printed matter.

18. The identification document of Claim 11 wherein said first and second printed matter comprise alphanumeric characters.

19. The identification document of Claim 11 wherein said first and second printed matter comprises at least two digits of a year of birth of the person identified.

20. The identification document of Claim 11 wherein said second printed matter is a graphical reproduction of said first printed matter.

21. A method of printing a document containing identifying information for a particular person comprising:

providing a base card;

printing information which is specific to the particular person identified on said base card at a first location and at a first scale enabling said printed information to be resolved by a viewing person without magnification; and

representing said information on said base card at a second location and at a second scale, said second scale being significantly smaller than said first scale, said second location spaced from said first location whereby said information is represented in at least two separate and distinct locations on said base card.

22. The method of Claim 21 wherein said information represented at said second location is represented at a second scale which requires the information to be magnified for a viewing person to clearly resolve the information represented at said second location.

23. The method of Claim 21 wherein said step of representing said information at said second location consists of printing said information in a single color.

24. The method of Claim 21 wherein said step of representing said information at said second location consists of printing said information in a relatively dark toned color on a lighter toned background.

25. The method of Claim 21 wherein said step of representing said information at said second location consists of printing said information in a relatively light toned color on a darker toned background.

26. The method of Claim 21 wherein said step of representing said information at said second location comprises graphically reproducing said first printed matter.

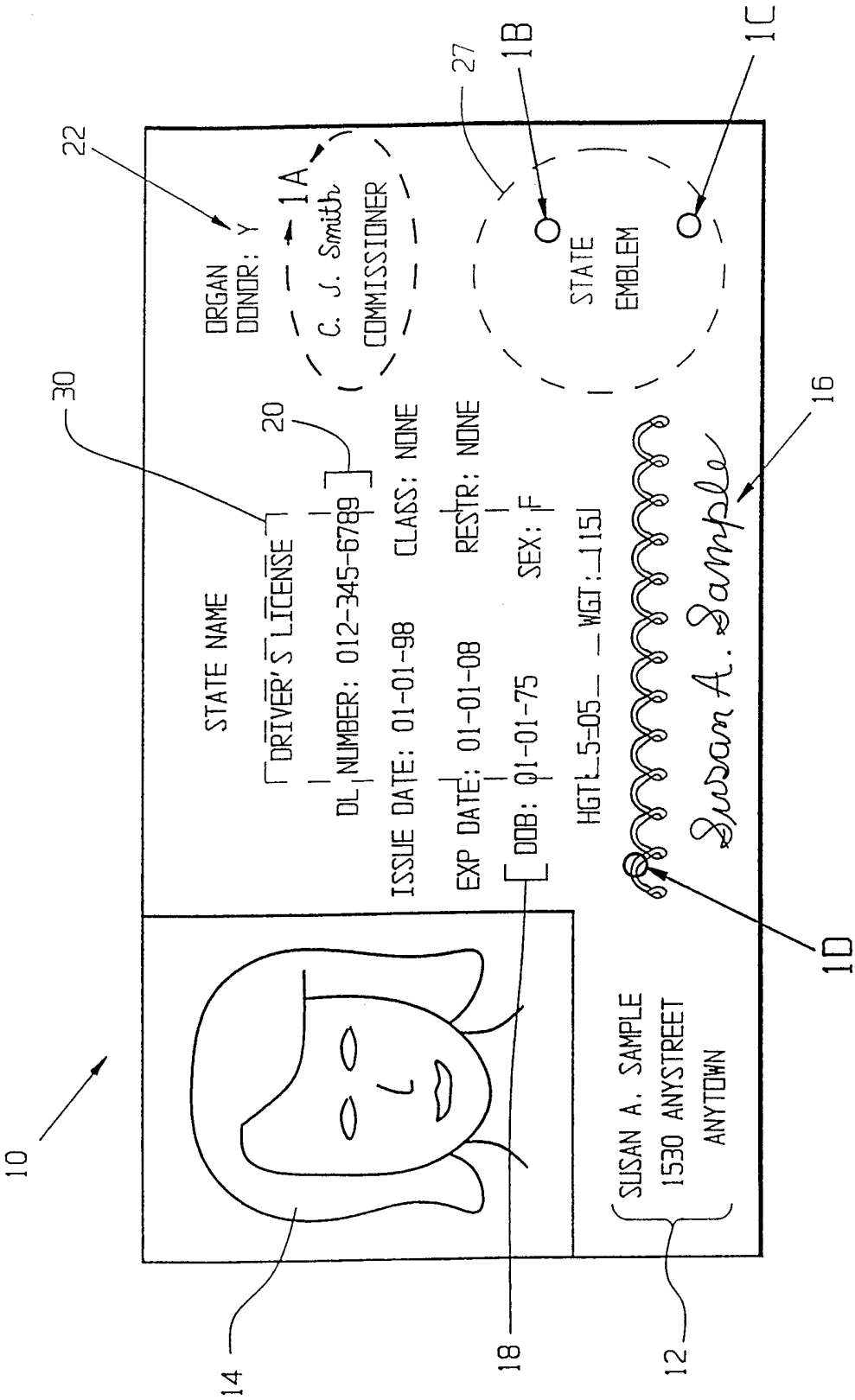

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COMMISSIONER
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DRIVER'S LICENSE
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ISSUE DATE: 01-01-98
RESTR: NONE
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18
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FIG. 1

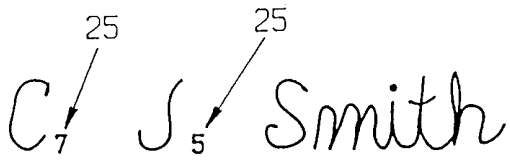


FIG. 1A



FIG. 1B

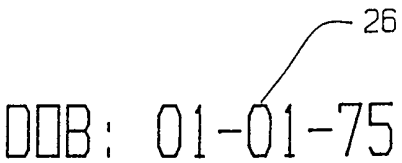


FIG. 1C

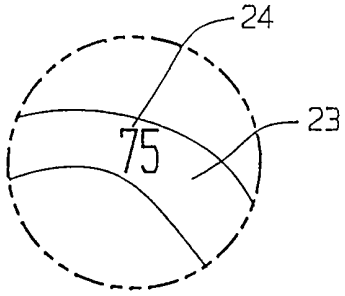
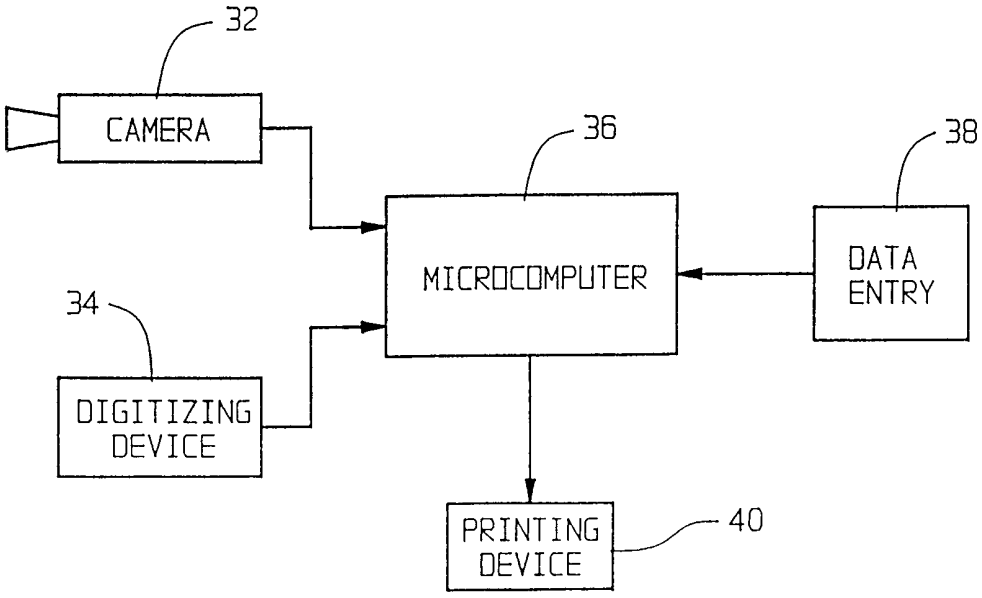


FIG. 1D



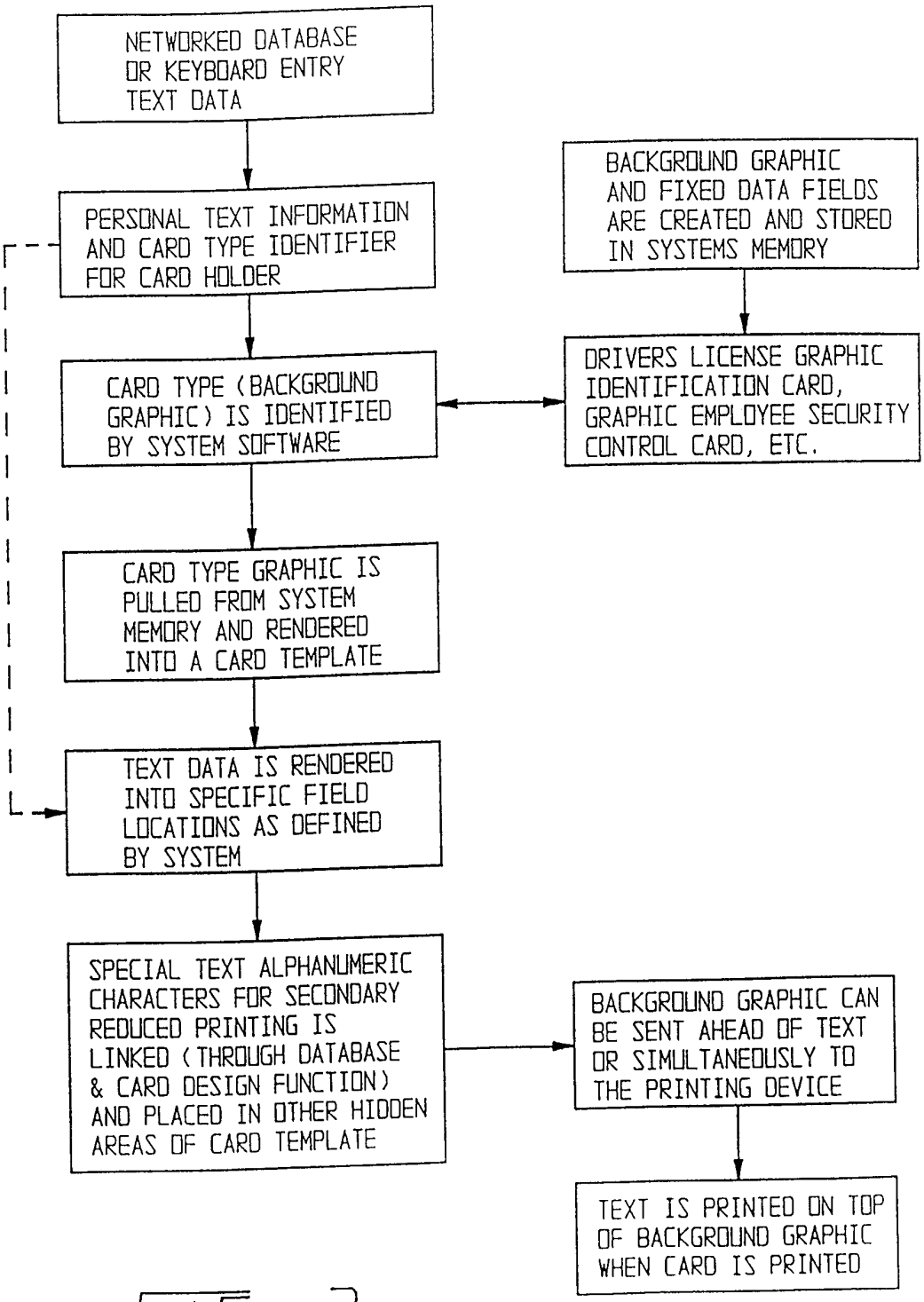

NETWORKED DATABASE OR KEYBOARD ENTRY TEXT DATA
PERSONAL TEXT INFORMATION AND CARD TYPE IDENTIFIER FOR CARD HOLDER
CARD TYPE (BACKGROUND GRAPHIC) IS IDENTIFIED BY SYSTEM SOFTWARE
CARD TYPE GRAPHIC IS PULLED FROM SYSTEM MEMORY AND RENDERED INTO A CARD TEMPLATE
TEXT DATA IS RENDERED INTO SPECIFIC FIELD LOCATIONS AS DEFINED BY SYSTEM
SPECIAL TEXT ALPHANUMERIC CHARACTERS FOR SECONDARY REDUCED PRINTING IS LINKED (THROUGH DATABASE & CARD DESIGN FUNCTION) AND PLACED IN OTHER HIDDEN AREAS OF CARD TEMPLATE
BACKGROUND GRAPHIC AND FIXED DATA FIELDS ARE CREATED AND STORED IN SYSTEMS MEMORY
DRIVERS LICENSE GRAPHIC IDENTIFICATION CARD, GRAPHIC EMPLOYEE SECURITY CONTROL CARD, ETC.
BACKGROUND GRAPHIC CAN BE SENT AHEAD OF TEXT OR SIMULTANEOUSLY TO THE PRINTING DEVICE
TEXT IS PRINTED ON TOP OF BACKGROUND GRAPHIC WHEN CARD IS PRINTED

FIG. 3

INTERNATIONAL SEARCH REPORT

Inte tional Application No
PCT/US 99/12282

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B42D15/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B42D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 440 078 A (POITEL) 1 July 1912 (1912-07-01) the whole document	1,3,4,8, 10,11, 13,14, 18,20, 21,23,24
A	EP 0 439 909 A (STANDARD REGISTER) 7 August 1991 (1991-08-07) column 6, line 52 -column 7, line 5; figure 3	1,11,21
A	GB 139 157 A (HEDMAN) 25 August 1921 (1921-08-25) the whole document	1,11,21

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 September 1999	12/10/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Loncke, J

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INTERNATIONAL SEARCH REPORT

Inter onal Application No
PCT/US 99/12282

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 597 592 A (MAURER) 1 July 1986 (1986-07-01) column 3, line 63 -column 4, line 43; figure 1	1,11,21

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

Interr onal Application No
PCT/US 99/12282

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