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Remarks:
Amended claims in accordance with Rule 137(2) EPC.

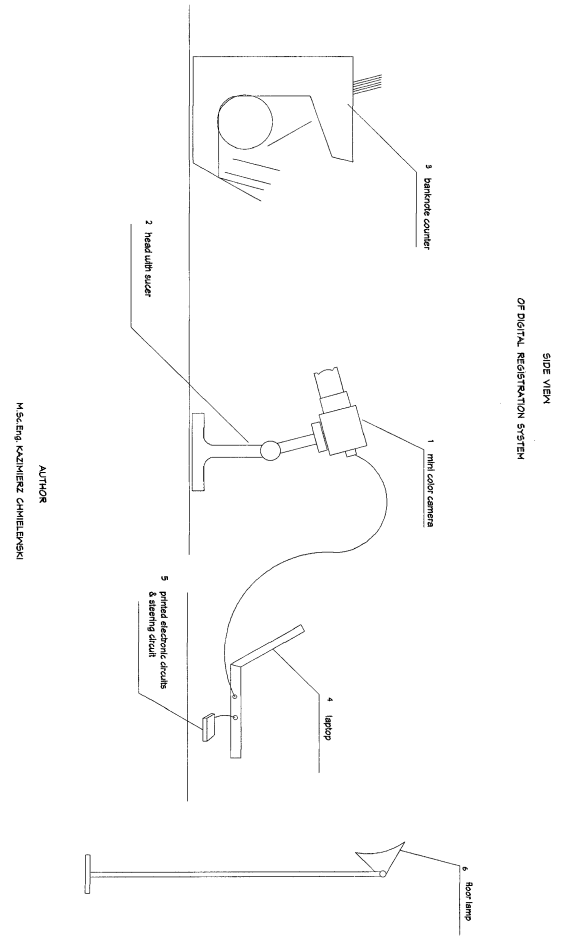
(54) **DIGITAL REGISTRATION SYSTEM OF BANKNOTE SERIAL NUMBERS**

(57) The subject of the invention is using of synergy high advanced technology, which results are written in a relational table of database. The serial number obtaing the compound unique key, which are a basic key as an identificator and auxiliary key, which created by identificator of bank branch and precise register time.

Using kwerends can check up if serial numbers are doubles or existed in other register of tables, having comprehensive control of the banknotes which are illegaly introduced into market.

The system have applied combination a few unique functions of grade programs and high advanced mini camera, set up on mini articulated head before banknote counter or on the wall, at a small distance from a banknote image, and works in tandem with the computer. The process can be controlled manually or automatically.

The digital banknote register system through compound key of serial numbers gives banks an instrument of constant banknotes inspection, registering their path of circulation, essential and indispensable for eventual inspection by law enforcement bodies.



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Description

[0001] The project concerns advanced optoelectronic, informatic and image processing tools. The subject of the invention is using of synergy high advanced technology, which results are written in a relational table of database, then using kwerends can check up if serial numbers are doubles or existed in other register of tables.

[0002] The system is distinctive of it, that applied combination a few unique functions of grade programs and high advanced mini camera. Created vision system will find application in comprehensive control of the banknote serial numbers, which are illegaly introduced into market.

[0003] The relational table of database allowing of the checking up daily paid banknotes with a few tables of registerd banknotes if their serial numbers are dubles or belongs to stolen, suspected, counterfeit, withdrawn from the circulation or are at a hand seif.

[0004] The system comprise with mini digital color camera in high resolution (1) set up on mini articulated head (2) before banknote counter (3) at a small distance from a banknote image, and works in tandem with the computer (4).

[0005] The mini camera can be mounted also on the wall or on a tripod stand.

[0006] The process can be made manually or automatically controlled through printed integrated circuits to image processing connected with elektronic steering circuit (5) and a floor lamp (6) in a clauded weather.

[0007] Speed of the mini camera is sinchronized with banknote counter, so the application of advanced antishake mini color camera in high resolution of IDS Imaging Development-Germany and program Adobe Photoshop CC allow to transfer of images in 2 chanels at the same time, a complete image as well as only embraced a serial number as region of interest (ROI).

[0008] Moreover advanced tools to the image processing as well as program Photoshop CC through his unique function set up video frames to layers separately for single frames, even the image was made in a rapid motion.

[0009] Then optical character recognition (OCR) FineReader through his specific fumction to whitening a background of ROI, allowing for recognizing a serial number from region of interest of banknote from his background.

[0010] Next serial numbers are saved in Microsoft Word as an exact copy and then imported to the relevant relational table of database Microsoft Access 2016. Each serial number written down as the text in table of relational database, which obtaining an unique compound key, comprised with a basic key as identifier and auxiliary key which created by identifier of local bank branch and precise register time. The serial numbers are registered separately for each volume. Furthermore for relational table of database were formed the attaching and selecting kwerends.

[0011] For adding any two tables in respect of research function in selecting kwerend, used attaching kwerend and then from an opened window with attached table, using kwerend creator to duplicates selecting only, without any couplings with two or more tables and writing down not short instructions as a criterion in selecting kwerend.

[0012] These problems are easily solvable with other approach but, the new approach require a bit of creative imagination and using database tools the result is obtaining faster and more effective as follow on the instructions recomended to these kwerends by program authors in introduction to the kwerends.

[0013] The unique functions applyied in this system are providing for control all banknotes reserves at that instant being in a local bank branch.

[0014] All banknotes will be written down in the tables : stolen, suspected and embraced further researches, withdrawn from circulation, laid out to cash payments, laid out to carriage under convoy, laid out to cash machine, remained in hand safe, or from currently payments.

[0015] The vision system allow for checking up by using kwerends, if serial numbers aren't doubles, or it belongs to stolen, suspected banknotes or withdrawn from circulation or they are registered in others tables.

[0016] Possibility keeping up to date the registration numbers and volumes of banknotes, allow to more safely lead cash turnover, especially carriage under convoy and laid out to cash machine, or laid out to cash desks.

[0017] Besides, excess of banknotes from current payments can be handed over from cash desk to next cooperator, where registered and banderoled banknotes will be located in hand safe. In the eventuality of bank robbery at cash desk, it's value can be diminished, and in case robbed of an hand safe, their banknotes will be already registered.

[0018] Using projected system will improve prevention of banknotes robbery, not registered as yet in a wide range. Then stolen banknotes will become detected considerably faster, reducing their value for potential offenders .

[0019] Digital register system of serial numbers and volumes also allow to implementation of central register of serial numbers and volumes of stolen banknotes which where stolen and still are in quest and withdrawn from the circulation. Domestic (central) stolen banknote registers and banknotes withdrawn from circulation should be updated systematically, by their regional bank centrals.

[0020] This system will create among the banks mutual interaction and promptly handed over information with warning about serial numbers and volumes of stolen and counterfeit banknotes, will speed up detectability of the perpetrators of robbery, and in the future will restric a scale their occuring.

[0021] Access to central register of stolen and withdrawn from circulation banknotes should be encrypted by secret key. Banknotes from current payments can be inspected instantly after closing the cash desks through

check out by special FineReader in time written down in it's schedule, if the serial numbers are doubles in comparing with the serial numbers been listed on the relational tables of stolen, counterfeit or banknotes withdrawn from circulation or already registered in other tables of domestic as well foreign currency.

[0022] This vision system allow to mutual periodic an interchange of encrypted information about banknotes stolen, counterfeit and withdrawn from the circulation, between national banks. Furthermore digital banknote register system gives banks an instrument of constant banknote inspection, bouth domestic and foreign currency, registering their path of circulation, essential for eventual inspection by law enforcement bodies.

[0023] The digital register system of serial numbers and volumes served by the high resolution camera, gives posibility speed comparison the graphic of registered banknote with the pattern, preliminary clasifying banknote as true or counterfeit. An appraisal of banknote will be achieved by computer, which graphic card support high resolutions and easy detect subtle differennces, indiscernible to eye or magnifying glass.

[0024] So in combination with the results of control obtained in the scope of research in doubling serial numbers, as well as comparison with central register of stolen banknotes and withdrawn from circulation, gives confirmation of probability the true or counterfeit.

[0025] All system procedures can be defined in one of the programming languages : C/C++, C#, visual C++, visual C#, visualBasic or Pascal/Turbopascal.

[0026] Then based on a subroutine should perform integrated printed circuits or selecting them from being on the market in range of image-processing and connected with printed electronic steering circuit, the system can be made automatically.

[0027] In conclusion my vision system with specific funtions in the process, extending the range of investigation allow to get under comprehensive control the serial numbers of banknotes in bank branches.

[0028] The invention solves the years standing banking problem with carriage money under convoy, or laid out to cash machine, or robbery at a cash desk - having in any local bank branch this affordable and desirable vision system. It is competitive also with reference to several times more expensive and quite large device (japanize-britain) been on the market, whereas the vision system will carry out a few essential functions more than competitive device.

[0029] Moreover the weight of optoelectronic with mini articulated head with sucer used in my system it's 250 gram only, becouse computer and banknote counter are in every bank branches.

System requirements:

[0030]

1. mini color antishake camera advanced technology, with sensor ½", resolution min. 1600 x 1200 pix,
2. banknote counter with min. 600 fps, set up on rubber/felt pad,
3. installed programs: drivers of mini camera IDS Imaging Development, Photoshop CC, OCR or FineReader, Microsoft Office 2016,
4. computer Win7 / 8.1 / 10 with processor min. 2Ghz (x64), RAM 4GB with Microsoft DirectX Runtime installed, with graphic card Nvidia or other with resolution minimum c'a 1024 x 768 and integrated memory min. 1GB.
5. application using a few little integrated printed circuits for image-processing, and connected with printed electronic steering circuit (5).

Claims

1. The subject of the system is using of synergy advanced optoelectronic, informatic, image processing tools and the result is written in relational table of database. The system is distinctive of it, that applied combination a few unique functions of grade programs and high advanced mini camera.

2. The system according to the claim (1), is distinctive of it, that applied of advanced tools to the image-processing, allow to transfer of images in two chanels, a complete image of banknote as well as only embraced serial number (ROI), at the same time.

3. The system according to the claim (1), is distinctive of it, that program Photoshop CC, set up video frames to layers separately for single frames giving possibilities to other program to whiten a background in ROI and recognize the text.

4. The system according to the claim (1), is distinctive of it, that advanced tools to the image-processing allow for extracting a serial number from banknote background, even the image is in rapid motion. Next serial numbers are written in Word as exact copy, then imported to the relational table of Accsess database as a text.

5. The system according to the claim (1), is distinctive of it, that the serial number written as the text in table of relational database, obtaining the compound unique key, which are a basic key as an identificator and auxiliary key, which created by identificator of bank branch and precise register time.

6. The system according to the claim (1), is distinctive of it, that for the search functions in selecting kwerend of relational table is created new approach, using the attaching kwerend for adding any two tables, without any couplings with two or more tables and

writing down not short instructions as a criterion in kwerend as are recomended by authors of introduction to the kwerends, solving the problem faster and more effective in obtaining the results for the control process.

7. The system according to the claim (1), is distinctive of it, that will assure comprehensives control process of banknotes from daily paid in comparison with banknotes already registered in tables :
stolen, suspected and embraced further researches, withdrawn from circulation, laid out to cash desks, laid out to carriage under convoy, laid out to cash machine, remained in hand safe, - allowing check up by using kwerends, if serial numbers aren't doubled.

8. The system according to the claim (1), is distinctive of it, that allow to implementation of central registers of serial numbers and volumes stolen banknotes, which where stolen and still are in quest, as well banknotes withdrawn from circulation.

9. The system according to the claim (1), is distinctive of it, that having full image of registered banknote can compare graphic with the pattern, preliminary clasifying banknote as true or counterfeit. So in combination with results of control obtained in the scope of research in doubling serial numbers, as well as comparison with other registered tables, gives confirmation of probability the true or counterfeit.

10. The system according to the claim (1), is distinctive of it, that all system procedures can be defined in one of the programming languages : C/C++, C#, visual C++, visual C#, visualBasic or Pascal/Turbopascal, and can be made automatically through application using a few integrated printed circuits for image-processing, and connected with printed electronic steering circuit as show (5) of drawing.

Amended claims in accordance with Rule 137(2) EPC.

1. The automatic of all procedures on Keyboard and Mouse of digital serial number registration system designed using the schematic and printed circuit board functions and C-like User Language Program (ULP) for writing dialogues with micoprocessores of the grate program for innovators Autodesk Eagle or it can be also Proteus program.

2. The system of claim (1), wherein a schematic and printed circuit board functions allow to konfiguration of Out and In pins for a microcontroller and then select all indispensable components with appropriate parameters. The requied components are determined in description line (36-46) and comprise with 16 items. Furthermore the microcontroller should have a built-in supervisory module for low voltage and konfigured resistors pulling up and lowering on Input.

3. The system of claims (2), wherein the microcontroller should have as well allocated addressing space with Input- Output ports and dedicated interrupt.
Then the interrupt will be designed for allowing to processing of alarm events activated through keyboard or sent from observation camera of local bank branch, occured as a result of discerned a masked or armed person .

4. The system of claims (1-3), wherin applied combination of a few programs functions : a camera captures images of banknotes and calibration with selection region of interest (ROI), then set up a sequence of video frames to layers for single frames and whitening a background in ROI, which steps provided easy and cheap approach quite different from others solutions to recognizing a text.

5. The system of claims (1-3), wherin the microcontroller has a watchdog (a special steering clock), which resets the microcontroller being in special cases, if it's program has blocked in endless loop -then the microcontroller wil be reseted.

6. The system of claims (1-4), wherin an antishake camera in high resolution and banknote counter allow for extracting a serial number from banknote, even it's image is in motion 10 - 30 frames/second, without any expensive and considerably largish devices. On condition that the lens plain of the camera (1) is set up parallel to the banknote plain in motion at the moment when been heaved high into view at the banknote counter (3), what is showed on the side view of digital registration system, avoiding an optical distortion of images.

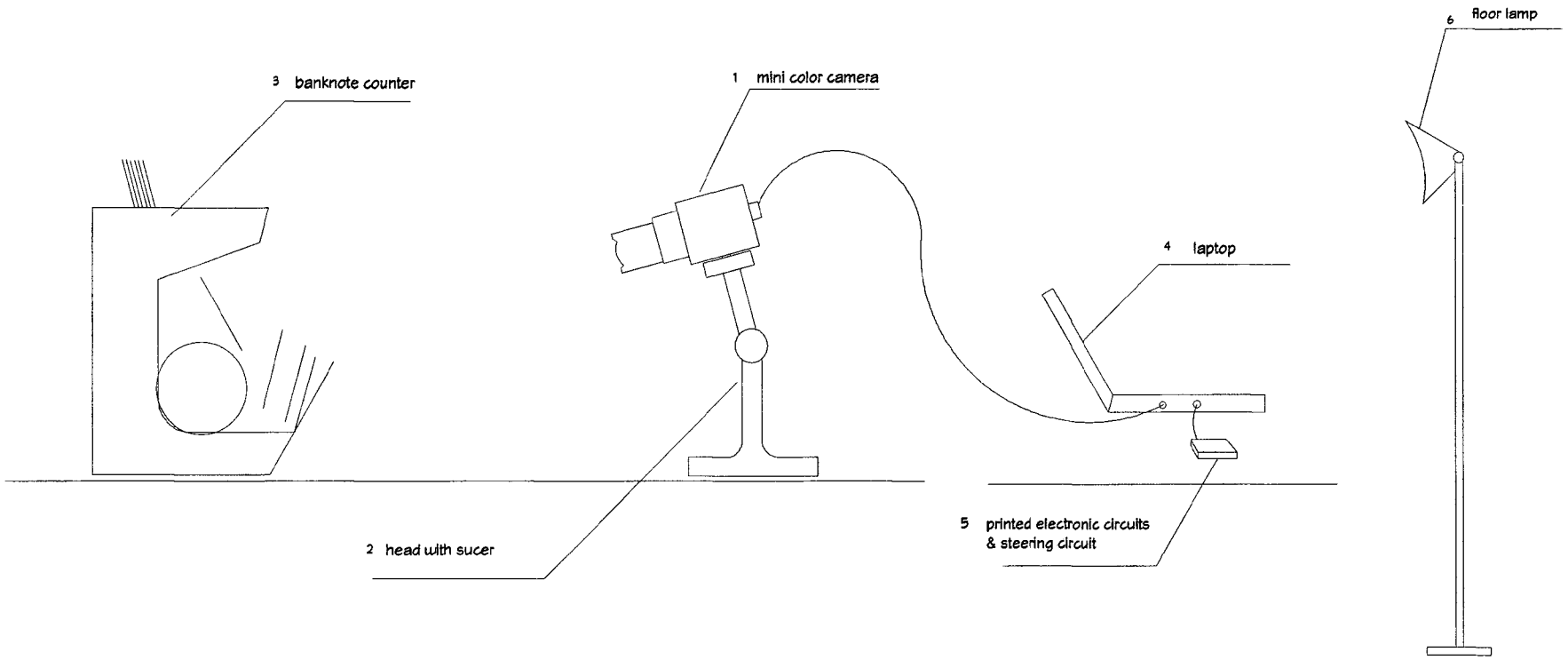
7. The system of claims (1-6), wherin for comprehensive control process of banknote serial numbers from daily paid table (1) in comparison with banknotes serial numbers already registered in tables mentioned in description line (55-59) from (a-h) used other approach to Access a special searching tool (named kwerenda). Instead of recomended by program authors through coupling two tables (1) + one from (a-h) tables and writing down instruction as a criterion, in this system will be enough adding the copies one of the tables from the list mentioned in description line (55-59) from (a-h) to the copy of table (1) daily paid banknote serial numbers. Then using Access special searching tool check up if serial numbers aren't doubled in two added copies of table (1) + one from (a-h) tables.

The result is obtaining faster and not uncomfortable.

8. The system of claims (1-7), wherin should use a microscopic examination in a laboratory equipped with electron microscope of magnifying power at least 200 000 x. The examination should be responsibly drew up to distinguish chemical composition of the printing ink and paper analysis, which will be the basis for certify that the banknote is counterfeit. Without the examination discribed above, the banknote can be designed to suspective only.

SIDE VIEW

OF DIGITAL REGISTRATION SYSTEM



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EUROPEAN SEARCH REPORT

Application Number
EP 18 00 0951

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2008/013646 A2 (ICVN INC [US]; PARASKEVAKOS THEODORE G [US]) 31 January 2008 (2008-01-31) * paragraphs [0006], [0007] * * paragraphs [0011] - [0021] * * figures 1-4 *	1-10	INV. G07D7/2033 G07D11/30
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X	US 8 837 805 B1 (AVIYANTS RAFAEL [US]) 16 September 2014 (2014-09-16) * column 3, line 39 - column 6, line 30 * * figures 1-11 *	1-10	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	5 June 2019	Bauer, Sebastian

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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O : non-written disclosure
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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