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(54) DETECTION OF COUNTERFEIT OBJECTS

ERFASSUNG VON VERFÄLSCHTEN OBJEKTEN

DETECTION DE CONTREFACONS

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Description

[0001] This invention relates to the detection of counterfeit objects. In particular, it relates to the detection of counterfeit objects by detecting unauthorised material of which the object is made or on which it is printed or otherwise formed.

[0002] The production of counterfeit objects, in particular, counterfeit bank notes is continually increasing on the back of continuing improvements in printing technology, particularly colour printing. Counterfeit notes are now being made which appear, to the unaided eye, virtually indistinguishable from a genuine note.

[0003] Genuine monetary notes are now generally made to a specific formulation such as security or unbleached paper. Counterfeit notes, on the other hand, are generally but not always made from bleached paper. It is known to differentiate bleached from unbleached paper by viewing the paper under a source of ultraviolet radiation, such as an ultraviolet (UV) lamp which emits light having a wavelength which peaks in band of from 300 to 400 nm.

[0004] Bleached paper includes chemical components which fluoresce when exposed to ultraviolet radiation, that is, the molecules in the composition of the paper are excited and emit light at a longer wavelength which peaks in the band of from 400 to 500 nm. Because wavelengths of 300 to 400 nm generally lie outside the spectral region of the human eye and because wavelengths of from 400 to 500 nm lie within the spectral region, the phenomena of fluorescence allows some counterfeits to be detected with the human eye.

[0005] This process can be automated with the use of electronics by providing a sensor and a comparator which compares the intensity of the fluorescent light sensed with a reference level so as to provide an indication as to whether the paper is likely counterfeit or not. Such an apparatus is disclosed in US-A-4 558 224. However, some genuine money notes if washed acquire a deposit of chemicals which fluoresce and some counterfeit notes are made with paper containing little or no fluorescent materials and so the fluorescing phenomenon is not always an infallible way of deciding whether a note is counterfeit or not.

[0006] US-A-4 296 326 discloses apparatus for checking documents such as banknotes, in which the apparatus is arranged to convey a document on drums past detectors. This apparatus also carries out a measurement of fluorescence of the document when the latter is illuminated by ultraviolet radiation. In addition, further tests are performed. One such further test involves detecting reflected ultraviolet radiation. This is performed in order to determine whether the document carries a particular type of watermark. The test involves taking a reflectivity measurement in one area of the banknote (outside the area where the watermark is expected), and comparing this with measurements within a watermark area. Thus, the ultraviolet reflectance test is limited to

detecting only variations in reflectivity across the banknote, and each measurement has to be performed at specific, known areas of the banknote.

[0007] According to the present invention there is provided apparatus for detecting counterfeit objects, the apparatus comprising:

means for illuminating a test object with ultraviolet light;

detector means for detecting (i) reflected light from said object having a first wavelength within a first wavelength band, (ii) fluorescent light from said object having a second wavelength within a second wavelength band different from said first wavelength band, said second wavelength band including wavelengths at which counterfeit objects may fluoresce when exposed to said ultraviolet light, and (iii) a reference light level from the illuminating means, the detector means being operable to provide a measurement output dependent upon the detected reflected light and the detected fluorescent light; and

decision means for deciding whether said object is counterfeit or not and providing an appropriate indication, the decision means being responsive to the detected reflected light and the detected fluorescent light and including comparison means for performing a comparison of at least the detected reflected light with the detected reference light level;

characterised in that the detector means is arranged such that the detected reference light level depends on the intensity of the light emitted by the illuminating means but does not depend on the test object.

[0008] The invention also provides a method for determining the genuineness of a test object using counterfeit detection apparatus, the method comprising illuminating the test object with ultraviolet light and determining genuineness on the basis of the fluorescence of the test object and the ultraviolet light reflected therefrom, characterised in that the testing operation initially involves the manual positioning of the detection apparatus and test object relative to each other, and in that the genuineness decision uses an ultraviolet reflective measurement having a magnitude which is determined by the absolute reflectivity of the test object and not by the relationship between the reflected light and a reference light level dependent on the test object.

[0009] Counterfeit detection apparatus embodying the invention will now be described, by way of example, with reference to the accompanying diagrammatic drawings, in which:

Figure 1 is a plan view of a first embodiment of the apparatus;

Figure 2 is a section taken on line 2-2 of Figure 1;

Figure 3 is a section taken on line 3-3 of Figure 1;

Figure 4 is a block diagram of the processor of the

apparatus of Figure 1;

Figure 5 is a block diagram of a second embodiment of a counterfeit detection apparatus;

Figure 6 shows a perspective view of a hand-held scanning unit housing the apparatus of Figure 5;

Figure 7 is a side view of the hand-held unit;

Figure 8 shows a front view of the hand-held unit;

Figure 9 is a perspective view of another form of hand-held unit; and

Figure 10 is an under plan view of the unit of Figure 9.

[0010] It has been discovered that genuine and counterfeit bank notes often have different reflectivities particularly when exposed to ultraviolet radiation in the band of from 300 to 400 nm. Thus by applying two tests to sense both the fluorescent light and the reflected light from a bank note exposed to ultraviolet radiation, a bank note can be declared genuine or counterfeit with great certainty.

[0011] Figure 1 shows apparatus for irradiating a bank note with light and then measuring the amount of fluorescent light and reflected light.

[0012] As shown the apparatus includes a generally rectangular container 100 having a window 102 against which a bank note to be sensed can be placed. Within the container 100 there is provided an elongate light source 104 for producing light in the 365 nm region and directing it through the window 102. Also within the container are two photo diodes 105 and 106 spaced apart from one another but angularly inclined so that their optical axes intersect generally at the outer surface of the window 102. Each photo-diode 105 and 106 is mounted on the floor of a respective tubular opaque housing 108 and 110. The inner walls of the housing are lined with reflective material to increase the sensitivity of the photo-diodes. A 365 nm band pass optical filter 112 covers the housing 108 and a 450 nm band pass optical filter covers the housing 110.

[0013] The lamp 104 is surrounded on three sides by reflective material 116 for example aluminium foil which reflects light generally in the direction of the window 102 to concentrate the light at the window.

[0014] Preferably the reflective material is so positioned around the light source that the optical plane of the light directed at the window, makes the same angle with the window as do the optical axes of the photo detectors in a manner to ensure that the photo-detectors receive the maximum fluorescent and maximum reflected light from any bank note placed on the window 102.

[0015] The window 102 is provided by a glass plate which reflects some of the light received from the source 104 back to the photo-diode 105. The light is principally reflected back from the glass-air boundary of the plate and typically is around 8% of the light directed at the glass plate.

[0016] When a genuine bank note is placed on the window the amount of reflected light at 365 nm is usually

fairly small and so typically the amount of reflected light will increase from 8% to a value in the range of from 12 to 18%. Thus it will be seen that the light reflected from the plate when no bank note is present can be used as a reference level to compare the degree of reflection with when a bank note is present.

[0017] Thus any diminution in light output from the lamp due to ageing or any other defect is automatically compensated. Other errors are also eliminated because the light paths and components used to determine the reference level are the same as the light paths and components used to effect a measurement.

[0018] In the case of fluorescence the amount of fluorescent light emitted by a counterfeit bank note is generally several orders higher than the amount of light emitted by a genuine bank note and so any degradation of the light source 104 makes little or no difference to the detection of fluorescent light.

[0019] An electronic processor (not shown but which will be described in more detail hereinafter) monitors the light received by both photocells with the lamp 104 switched on. In the absence of a bank note on a window the photocell 105 will provide a steady state output. As soon as a bank note is placed on the window the output from the photocell 105 will rise and a trigger signal is then generated to activate two measurement circuits for measuring the outputs of the two photocells 105 and 106.

[0020] The measurement circuits provide readings which can be displayed by a display device 126, and a decision circuit will, in response to the readings, activate one of two optical indicators 122 and 124 respectively indicating that the bank note is genuine or counterfeit.

[0021] A printer (not shown) may be provided to record the values displayed by the display device 126.

[0022] It will thus be seen that the apparatus is automatically activated by the placement of a bank note on the window to determine whether the bank note is genuine or counterfeit.

[0023] The block diagram of Figure 4 shows the processor in more detail. Each photocell 105 and 106 feeds a respective trigger circuit 130 and 132 for detecting a rapid change in signal for example as a result of a bank note being placed on the window. Either or both trigger circuits 130 and 132 feed a signal to an actuator 134 which actuates two measurement circuits 136 and 138 (for example by supplying power to them or deactivating inhibitors which inhibit their operation). A delay circuit 140 deactuates the measurement circuits 136 and 138 after a short measurement period. A first comparator 142 compares the output of the photocell 105 with a reference value stored in a store 144 and if the detected value exceeds the reference value, an output is generated which is fed simultaneously to the gates 146 and 148. The signal stored in the store 144 is derived from the photocell 105 during the quiescent state of the apparatus. The output of the photocell 105 is amplified by an amplifier 150 by a factor of between 25% and 50%

and stored in the store 144. As soon as the actuator 140 is triggered, the amplifier 150 is inhibited so that the store 144 only stores the quiescent value of reflected light. A comparator 152 compares the output of the measurement circuit 138 with a reference value 154 and when the reference value is exceeded generates an output signal which is fed to the two gates 146 and 148.

[0024] The gate 146 responds when a genuine note is detected to energise the indicator 122. Similarly the gate 148 responds to energise the indicator 124 when a counterfeit note is detected. The actual values at the outputs of the two measured circuits 136 and 138 are fed to the display 126 for display thereby.

[0025] It will be appreciated that the value of the reference signals stored in the stores 144 and 154 can be adjusted as required.

[0026] Because of the possible effects of ambient light on the photocells 105 and 106, the apparatus is advantageously shielded by a cover which provides a slot through which a bank note can be inserted onto the window.

[0027] Instead the light source can be modulated at a selected frequency and the outputs of the photo diodes demodulated at the same frequency to eliminate the effects of ambient light.

[0028] If it is required to make more precise measurement of the fluorescence signal then it can be normalised to the reference level in the same way as the reflectance signal.

[0029] To a near approximation the following relationship applies:

$$rs = (Ps/Pr) * r_g / (1 - r_g)^2$$

where Ps is the reflected portion of the irradiating signal from the specimen, Pr is similarly that portion returned from the glass plate to be used as a reference, and r_g is the coefficient of reflectance from the glass plate. It will be noted that the effect of variation in r_g is negligible if small and significant if r_g is allowed to become large. Also that the relationship is inherently non linear and has been simplified to a first approximation. More precise normalisation could be carried out if required.

[0030] It has been observed that UV reflection from a bank note varies with the degree of soiling. It may be possible to measure the degree of soiling and to compensate by adjusting the reference values stored accordingly.

[0031] The apparatus shown in Figure 5 measures both fluorescent light and reflected light using a single monitor to determine whether a bank note is counterfeit or genuine.

[0032] The apparatus comprises an ultraviolet (UV) lamp 2 which is preferably mounted in a hand-held scanning unit. The UV lamp 2 is arranged to emit radiation at a frequency which is known to cause bleached paper to fluoresce.

[0033] A detector 3 is arranged to receive both fluorescent and reflected radiation from a bank note 1 but not directly from UV lamp 2 without being reflected. The monitor may be a photo-diode or phototransistor, for example, sensitive to the appropriate light frequency or frequencies. In particular the monitor should be sensitive to fluorescent light in the 400-500 nm range and to reflected ultraviolet light in the 300-400 nm range so as to be sensitive to counterfeit notes of bleached paper which fluoresce or counterfeit notes which don't fluoresce but because they are counterfeit often have a higher reflectance to ultraviolet light than genuine notes. An electrical signal is applied from monitor 3 to one input of a comparator 4.

[0034] A second detector or monitor 5 is arranged to receive UV radiation directly from lamp 2. The signal from this is first amplified by an amplifier 6 and applied to a resistor 7 the other end of which is earthed. Thus, the voltage across the resistor 7 is proportional to the intensity of the radiation emitted by the lamp. Resistor 7 forms part of a potentiometer, the slider connection of which itself is applied as a second input to comparator 4. The slider can be set to provide a threshold value representing a predetermined proportion of the voltage which is proportional to the UV intensity.

[0035] The comparator 4 is arranged to output a signal if the signal received by the monitor 3 is greater than or equal to the set detection threshold. When the threshold is reached it means that a certain proportion of the light impinging upon note 1 has been reflected or re-emitted as fluorescence and therefore it is assumed that the note is counterfeit.

[0036] The signal from the comparator 4 is applied through a low pass filter (for example an RC filter 8, 9 as shown in Figure 5) to a timer 10. This timer produces a pulse of, for example, approximately one second which actuates a buzzer 11 and a visual alarm in the form of an LED 12. In the example shown buzzer 11 and LED 12 are mounted in parallel between an output line from timer 10 and ground. Other types of alarm, whether audible or visual or both can be used in addition or as an alternative to those shown. The output pulse from timer 10 may also be applied to a line driver 13 which is adapted to provide a suitable signal for application to a management system. This management system may be used to provide a warning to a remote control position, such as a manager's or security office in a shop for example, that a counterfeit note has been identified. Thus, as an alternative or in addition to the warnings at the point of sale (ie the till) management or security is discretely informed. The line driver may, in one example, provide TTL signals.

[0037] It is useful to be able to monitor the output of the lamp directly so that lamp degradation can be noted and thus the lamp replaced in good time. This is achieved in the example shown in Figure 6 by applying the output from amplifier 6 to a first input of a second comparator 14. The other input of comparator 14 is tak-

en from a potentiometer 15 which is used to set a low threshold value for the voltage monitored by lamp monitor 5 and which is therefore proportional to the UV intensity of lamp 2. If the signal from amplifier 6 is less than this low threshold value then a signal is output from comparator 14 to a warning means such as a second LED 16 forming a lamp level low indicator. When this LED lights then the operator is warned to replace the lamp or one of its components.

[0038] The apparatus is most preferably configured as a hand-held scanning unit and one, non-limiting example of a suitable housing in which the apparatus may be mounted is shown in Figures 6 to 8. The unit comprises a head 17 in which the UV lamp 2 is mounted to illuminate an object placed underneath the head. A handle 18 is preferably shaped with a series of ridges for example to facilitate a good hand grip. Power for the apparatus is provided through a mains lead 19 which can be from a mains supply, from an adjacent till or EPOS unit, or by other means. It may alternatively be possible for the apparatus to be powered by batteries, which may be rechargeable batteries, for true portability. A basic on/off switch 20 is provided which enables lamp 2 to be illuminated and therefore the detection apparatus to function only when the switch is depressed by a thumb for example when the unit is being held. If this configuration is adopted then the unit is arranged to operate only in the scan position. In one embodiment, the signal to a remote control or monitoring station, such as a security office, may be transmitted by mains-born signalling. This may be achieved by applying pulses of known frequency onto the mains. If different frequencies are applied by different units then an operator at the remote position, when receiving a signal indicating a counterfeit note, will know which scanning unit has identified that note.

[0039] The unit may be temporarily mounted in position, eg by a suitable bracket mounting, when in use and/or when 'dormant'. The portable and adaptable nature of the unit enables great versatility of use in different environments and situations and with different attachments thereto.

[0040] It should be noted that the detection circuitry is effectively only operated when the ON/OFF switch is used to actuate the lamp, thereby minimising power consumption and reducing false readings from objects other than those desired to be tested.

[0041] An alternative hand-held scanning unit in the form of a wand is shown in Figures 9 and 10. As shown, the wand has a cylindrical housing 58 having a switch 60 on one side and an ultraviolet lamp 62 on the opposite side. A sensor 64 is located adjacent the lamp 62. The unit operates in a similar manner to the unit of Figures 6 to 8.

[0042] The counterfeit objects may be other than bank notes and could be any object, the authenticity of which relies to some extent on the type of paper or other material it is formed from or printed on. In some examples

the genuine article may glow under UV light, in which case the apparatus can be suitably modified, eg by reversing the input connections to comparator 4 so that a signal less than a threshold level actuates an alarm.

Claims

1. Apparatus for detecting counterfeit objects, the apparatus comprising:

means (2; 104) for illuminating a test object with ultraviolet light;
 detector means (3,5; 105,106) for detecting (i) reflected light from said object having a first wavelength within a first wavelength band, (ii) fluorescent light from said object having a second wavelength within a second wavelength band different from said first wavelength band, said second wavelength band including wavelengths at which counterfeit objects may fluoresce when exposed to said ultraviolet light, and (iii) a reference light level from the illuminating means, the detector means being operable to provide a measurement output dependent upon the detected reflected light and the detected fluorescent light; and
 decision means (4,7 to 13; 122,124,142,146, 148,152) for deciding whether said object is counterfeit or not and providing an appropriate indication, the decision means being responsive to the detected reflected light and the detected fluorescent light and including comparison means (4; 142) for performing a comparison of at least the detected reflected light with the detected reference light level;

characterised in that the detector means is arranged such that the detected reference light level depends on the intensity of the light emitted by the illuminating means but does not depend on the test object.

2. Apparatus according to Claim 1, wherein said second wavelength band is within the range 400 to 500 nm.
3. Apparatus according to any preceding claim including a glass plate (102) for supporting a said object on one side thereof with the illumination means (104) and the detector means (105,106) being located on the other side thereof and directed at the object through said glass plate.
4. Apparatus according to Claim 3 including reference means (144) for storing a first reference level which is a function of the light reflected by the glass plate (102) in the absence of an object thereon and re-

ceived by the detector means (105, 106).

5. Apparatus according to any preceding claim including means responsive to the detector means to provide a record of the magnitude of the received signals having wavelengths in said first and second bands. 5
6. Apparatus according to any preceding claim wherein said decision means comprises means (122, 124) for providing a first indication when the object is counterfeit and for providing a second, different indication when the object is genuine. 10
7. Apparatus according to Claim 1 or Claim 2, wherein the detector means (3,5) is operable to provide a single signal representative of the combination of the reflected ultraviolet light and the fluorescent light, said comparison means (4) being operable to compare said signal with a signal representative of the detected reference light level. 15 20
8. Apparatus according to Claim 7, wherein said detector means (3,5) comprises a first sensor (3) for detecting reflected ultraviolet light and fluorescent light and a second sensor (5) for detecting the reference light level. 25
9. Apparatus as claimed in any preceding claim, the apparatus being operable to detect counterfeit banknotes. 30
10. Apparatus according to claim 9, wherein the decision means (4, 7 to 13; 122, 124, 142, 146, 148, 152) is operable to determine the authenticity of the banknote paper in response to the reflected light and the fluorescent light. 35
11. Apparatus according to any preceding claim including shielding means for shielding said detector means from ambient light. 40
12. Apparatus as claimed in claim 11, when dependent on claim 9 or 10, wherein the shield is a cover which provides a slot through which a banknote can be inserted onto a window through which said ultraviolet light passes. 45
13. A method for determining the genuineness of a test object using counterfeit detection apparatus (17; 50 58; 100), the method comprising illuminating the test object with ultraviolet light and determining genuineness on the basis of the fluorescence of the test object and the ultraviolet light reflected therefrom, characterised in that the testing operation initially involves the manual positioning of the detection apparatus and test object relative to each other, and in that the genuineness decision uses an ultraviolet 55

reflective measurement having a magnitude which is determined by the absolute reflectivity of the test object and not by the relationship between the reflected light and a reference light level dependent on the test object.

14. A method as claimed in claim 13, for detecting the genuineness of banknotes.
15. A method as claimed in claim 14, wherein the step of determining genuineness comprises determining the authenticity of the banknote paper.
16. A method as claimed in claim 13, 14 or 15, wherein the genuineness decision uses an ultraviolet reference measurement which is representative of and varies substantially only with the intensity of the ultraviolet light illuminating the test object, the decision involving comparing this with at least the reflected ultraviolet light level.

Patentansprüche

1. Vorrichtung zur Erkennung von Fälschungsgegenständen, aufweisend:

eine Einrichtung (2; 104) zur Beleuchtung eines Testgegenstands mit ultravioletttem Licht, eine Detektoreinrichtung (3, 5; 105, 106) zur Erfassung (i) von reflektiertem Licht von dem Gegenstand mit einer ersten Wellenlänge innerhalb eines ersten Wellenlängenbands, (ii) von Fluoreszenzlicht von dem Gegenstand mit einer zweiten Wellenlänge innerhalb eines von dem ersten Wellenlängenband verschiedenen zweiten Wellenlängenbands mit Wellenlängen, bei denen Fälschungsgegenstände fluoreszieren können, wenn sie dem ultravioletten Licht ausgesetzt werden, und (iii) eines Bezugslichtpegels von der Beleuchtungseinrichtung, wobei die Detektoreinrichtung in Abhängigkeit von dem erfaßten reflektierten Licht und dem erfaßten Fluoreszenzlicht eine Meßausgabe liefern kann, und eine Entscheidungseinrichtung (4, 7-13; 122, 124, 142, 146, 148, 152) zur Entscheidung, ob der Gegenstand gefälscht ist, und zum Liefern einer entsprechenden Angabe, wobei die Entscheidungseinrichtung auf das erfaßte reflektierte Licht und das erfaßte Fluoreszenzlicht anspricht und eine Vergleichseinrichtung (4; 142) zum Durchführen eines Vergleichs mindestens des erfaßten reflektierten Lichts mit dem erfaßten Bezugslichtpegel beinhaltet;

dadurch **gekennzeichnet**, daß die Detektoreinrichtung so eingerichtet ist, daß der erfaßte Be-

zugslichtpegel von der Intensität des von der Beleuchtungseinrichtung emittierten Lichts, jedoch nicht von dem Testgegenstand abhängt.

2. Vorrichtung nach Anspruch 1, wobei sich die zweite Wellenlängenbandbreite im Bereich von 400 bis 500 nm befindet.
3. Vorrichtung nach einem der vorhergehenden Ansprüche, mit einer Glasplatte (102) zum Tragen eines Gegenstands auf ihrer einen Seite, wobei die Beleuchtungseinrichtung (104) und die Detektoreinrichtung (105, 106) auf ihrer anderen Seite angeordnet und dem Gegenstand durch die Glasplatte hindurch zugewandt sind.
4. Vorrichtung nach Anspruch 3, mit einer Referenzeinrichtung (144) zum Speichern eines ersten Bezugspegels, der eine Funktion des von der Glasplatte (102) in Abwesenheit eines darauf befindlichen Gegenstands reflektierten und von der Detektoreinrichtung (105, 106) empfangenen Lichts darstellt.
5. Vorrichtung nach einem der vorhergehenden Ansprüche mit einer auf die Detektoreinrichtung ansprechenden Einrichtung, um eine Aufzeichnung der Größe der empfangenen Signale mit Wellenlängen in dem ersten und in dem zweiten Band vorzunehmen.
6. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei die Entscheidungseinrichtung eine Einrichtung (122, 124) zur Lieferung einer ersten Angabe, wenn der Gegenstand eine Fälschung darstellt, und zur Lieferung einer anderen zweiten Angabe, wenn der Gegenstand echt ist, aufweist.
7. Vorrichtung nach Anspruch 1 oder 2, wobei die Detektoreinrichtung (3, 5) ein einziges Signal abgeben kann, das die Kombination des reflektierten ultravioletten Lichts und des Fluoreszenzlichts darstellt, und die Vergleichseinrichtung (4) das genannte Signal mit einem den erfaßten Bezugslichtpegel darstellenden Signal vergleichen kann.
8. Vorrichtung nach Anspruch 1, wobei die Detektoreinrichtung (3, 5) einen ersten Sensor (3) zur Erfassung reflektierten ultravioletten Lichts und Fluoreszenzlichts sowie einen zweiten Sensor (5) zur Erfassung des Bezugslichtpegels beinhaltet.
9. Vorrichtung nach einem der vorhergehenden Ansprüche, die Fälschungs-Banknoten erkennen kann.
10. Vorrichtung nach Anspruch 9, wobei die Entscheidungseinrichtung (4, 7-13; 122, 124, 142, 146, 148,

152) die Echtheit von Banknotenpapier aufgrund des reflektierten Lichts und des Fluoreszenzlichts bestimmen kann.

11. Vorrichtung nach einem der vorhergehenden Ansprüche, mit einer Abschirmeinrichtung, um die Detektoreinrichtung von Umgebungslicht abzuschirmen.
12. Vorrichtung nach Anspruch 11, soweit von Anspruch 9 oder 10 abhängig, wobei die Abschirmung eine Abdeckung darstellt, die einen Schlitz aufweist, durch den eine Banknote auf ein Fenster geführt werden kann, durch das das ultraviolette Licht hindurchtritt.
13. Verfahren zur Bestimmung der Echtheit eines Testgegenstands unter Verwendung einer Fälschungserkennungsvorrichtung (17; 58; 100), wobei der Testgegenstand mit ultraviolettem Licht beleuchtet wird und die Echtheit auf der Grundlage der Fluoreszenz des Testgegenstands und des von ihm reflektierten ultravioletten Lichts bestimmt wird, dadurch gekennzeichnet, daß der Testvorgang zunächst die manuelle Positionierung der Erkennungsvorrichtung und des Testgegenstands relativ zueinander beinhaltet und daß die Echtheitsentscheidung eine Ultraviolett-Reflektionsmessung einer Größe verwendet, die von der absoluten Reflektivität des Testgegenstands und nicht von der Beziehung zwischen dem reflektierten Licht und einem vom Testgegenstand abhängigen Bezugslichtpegel bestimmt wird.
14. Verfahren nach Anspruch 13 zur Erkennung der Echtheit von Banknoten.
15. Verfahren nach Anspruch 14, wobei der Schritt des Erkennens der Echtheit die Echtheitsbestimmung des Banknotenpapiers beinhaltet.
16. Verfahren nach Anspruch 13, 14 oder 15, wobei die Echtheitsentscheidung eine Ultraviolett-Bezugsmessung beinhaltet, die die Intensität des den Testgegenstand beleuchtenden ultravioletten Lichts darstellt und sich im wesentlichen lediglich mit diesem verändert, und wobei die Entscheidung dessen Vergleich mit mindestens dem reflektierten ultravioletten Lichtpegel beinhaltet.

Revendications

1. Appareil de détection d'objets contrefaits, l'appareil comprenant :

des moyens (2 ; 104) pour illuminer un objet de test avec de la lumière ultraviolette ;

des moyens formant détecteur (3, 5; 105, 106) pour détecter (i) la lumière réfléchie par ledit objet ayant une première longueur d'onde située à l'intérieur d'une première bande de longueurs d'ondes, (ii) la lumière fluorescente provenant dudit objet ayant une deuxième longueur d'onde située à l'intérieur d'une deuxième bande de longueurs d'ondes différente de ladite première bande de longueurs d'ondes, ladite deuxième bande de longueurs d'ondes comportant des longueurs d'ondes pour lesquelles les objets contrefaits peuvent être fluorescents lorsqu'ils sont exposés à ladite lumière ultraviolette, et (iii) un niveau de lumière de référence provenant des moyens d'illumination, les moyens formant détecteur pouvant être actionnés pour fournir une sortie de mesure dépendant de la lumière réfléchie détectée et de la lumière fluorescente détectée ; et des moyens de décision (4, 7 à 13; 122, 124, 142, 146, 148, 152) pour décider si ledit objet est contrefait ou non et fournir une indication appropriée, les moyens de décision répondant à la lumière réfléchie détectée et à la lumière fluorescente détectée et comportant des moyens de comparaison (4; 142) pour effectuer une comparaison au moins de la lumière réfléchie détectée avec le niveau de lumière de référence détecté ;

caractérisé en ce que les moyens formant détecteur sont agencés de façon que le niveau de lumière de référence détecté dépende de l'intensité de la lumière émise par les moyens d'illumination, mais ne dépende pas de l'objet de test.

2. Appareil selon la revendication 1, dans lequel ladite deuxième bande de longueurs d'ondes est située à l'intérieur de la plage allant de 400 à 500 nm.
3. Appareil selon l'une quelconque des revendications précédentes, comportant une plaque de verre (102) pour soutenir un dit objet sur un côté de celle-ci, les moyens d'illumination (104) et les moyens formant détecteur (105, 106) étant situés de l'autre côté de celle-ci et dirigés vers l'objet à travers ladite plaque de verre.
4. Appareil selon la revendication 3, comportant des moyens de référence (144) pour stocker un premier niveau de référence qui est une fonction de la lumière réfléchie par la plaque de verre (102) en l'absence d'un objet sur celle-ci et reçue par les moyens formant détecteur (105, 106).
5. Appareil selon l'une quelconque des revendications précédentes, comportant des moyens répondant aux moyens formant détecteur en fournissant un

enregistrement de l'amplitude des signaux reçus ayant des longueurs d'ondes situées dans lesdites première et deuxième bandes.

6. Appareil selon l'une quelconque des revendications précédentes, dans lequel lesdits moyens de décision comprennent des moyens (122, 124) pour fournir une première indication lorsque l'objet est contrefait et pour fournir une deuxième indication différente lorsque l'objet est authentique.
7. Appareil selon la revendication 1 ou la revendication 2, dans lequel les moyens formant détecteur (3, 5) peuvent être actionnés pour fournir un signal unique représentant la combinaison de la lumière ultraviolette réfléchie et de la lumière fluorescente, lesdits moyens de comparaison (4) pouvant être actionnés pour comparer ledit signal à un signal représentant le niveau de lumière de référence détecté.
8. Appareil selon la revendication 7, dans lequel lesdits moyens formant détecteur (3, 5) comprennent un premier capteur (3) pour détecter la lumière ultraviolette réfléchie et la lumière fluorescente et un deuxième capteur (5) pour détecter le niveau de lumière de référence.
9. Appareil selon l'une quelconque des revendications précédentes, l'appareil pouvant être actionné pour détecter des billets de banque contrefaits.
10. Appareil selon la revendication 9, dans lequel les moyens de décision (4, 7 à 13; 122, 124, 142, 146, 148, 152) peuvent être actionnés pour déterminer l'authenticité du papier du billet de banque en réponse à la lumière réfléchie et à la lumière fluorescente.
11. Appareil selon l'une quelconque des revendications précédentes, comportant des moyens de protection pour protéger lesdits moyens formant détecteur de la lumière ambiante.
12. Appareil selon la revendication 11, lorsqu'elle dépend de la revendication 9 ou 10, dans lequel la protection est constituée d'un couvercle présentant une fente à travers laquelle un billet de banque peut être inséré vers une fenêtre que traverse ladite lumière ultraviolette.
13. Procédé de détermination de l'authenticité d'un objet de test utilisant un appareil de détection de contrefaçons (17; 58; 100), le procédé comprenant l'illumination de l'objet de test avec de la lumière ultraviolette et la détermination de l'authenticité sur la base de la fluorescence de l'objet de test et de la lumière ultraviolette réfléchie par celui-ci, caracté-

risé en ce que l'opération de test implique initialement le positionnement manuel de l'appareil de détection et de l'objet de test l'un par rapport à l'autre, et en ce que la décision d'authenticité utilise une mesure de réflexion d'ultraviolets ayant une amplitude qui est déterminée par la réflectivité absolue de l'objet de test et non par la relation entre la lumière réfléchie et un niveau de lumière de référence dépendant de l'objet de test.

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14. Procédé selon la revendication 13, pour détecter l'authenticité de billets de banque.

15. Procédé selon la revendication 14, dans lequel l'étape de détermination d'authenticité comprend la détermination de l'authenticité du papier du billet de banque.

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16. Procédé selon la revendication 13, 14 ou 15, dans lequel la décision d'authenticité utilise une mesure de référence d'ultraviolet qui est représentative et qui varie sensiblement seulement avec l'intensité de la lumière ultraviolette illuminant l'objet de test, la décision impliquant la comparaison de celle-ci au moins avec le niveau de lumière ultraviolette réfléchie.

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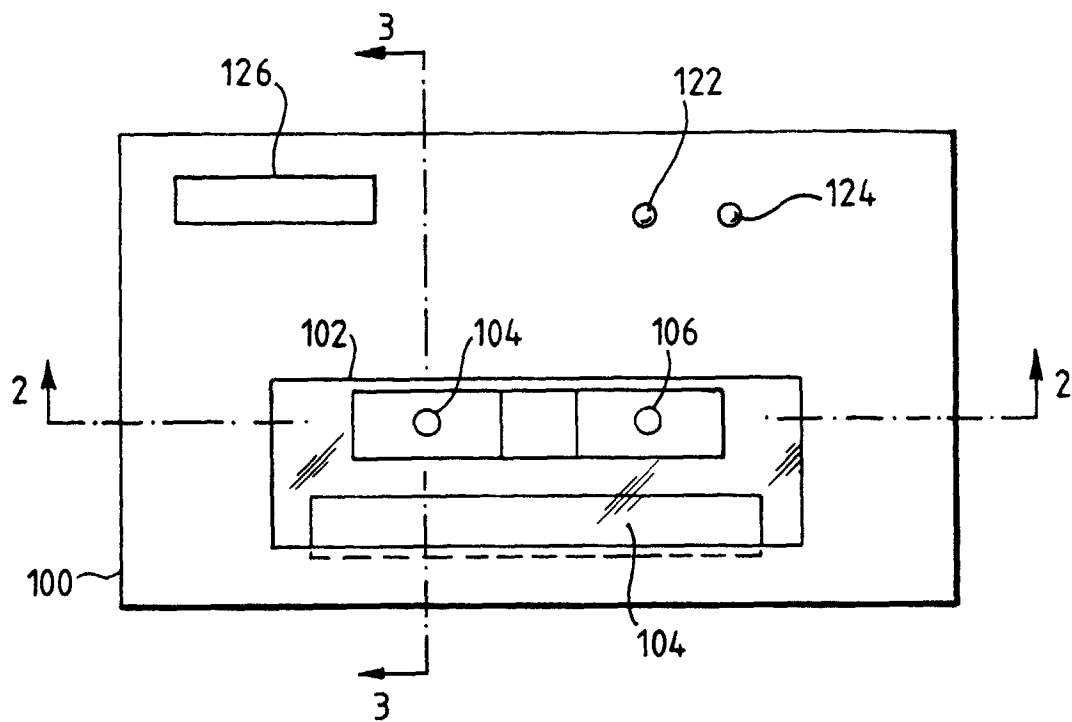


Fig. 1.

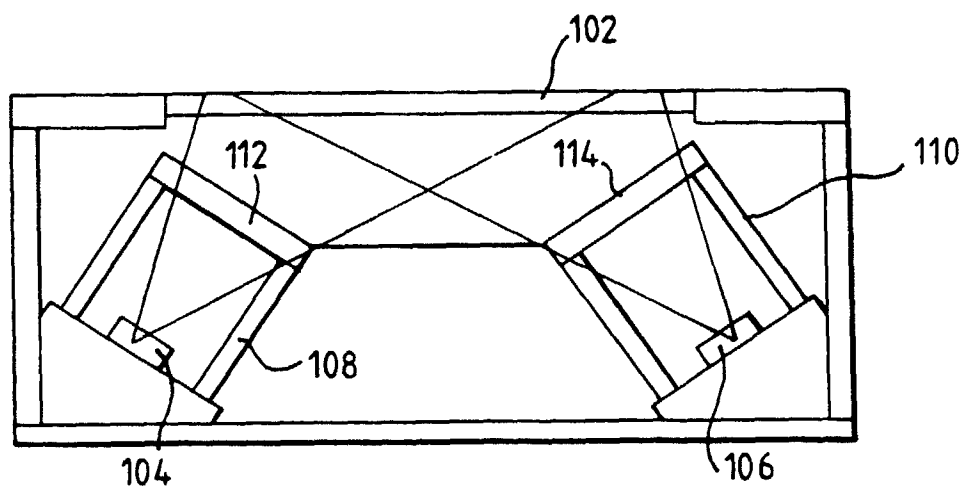


Fig. 2.

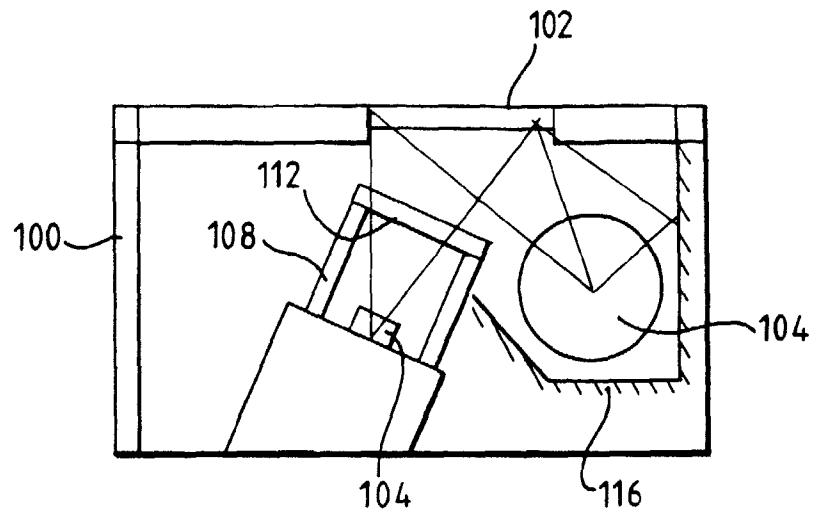


Fig. 3.

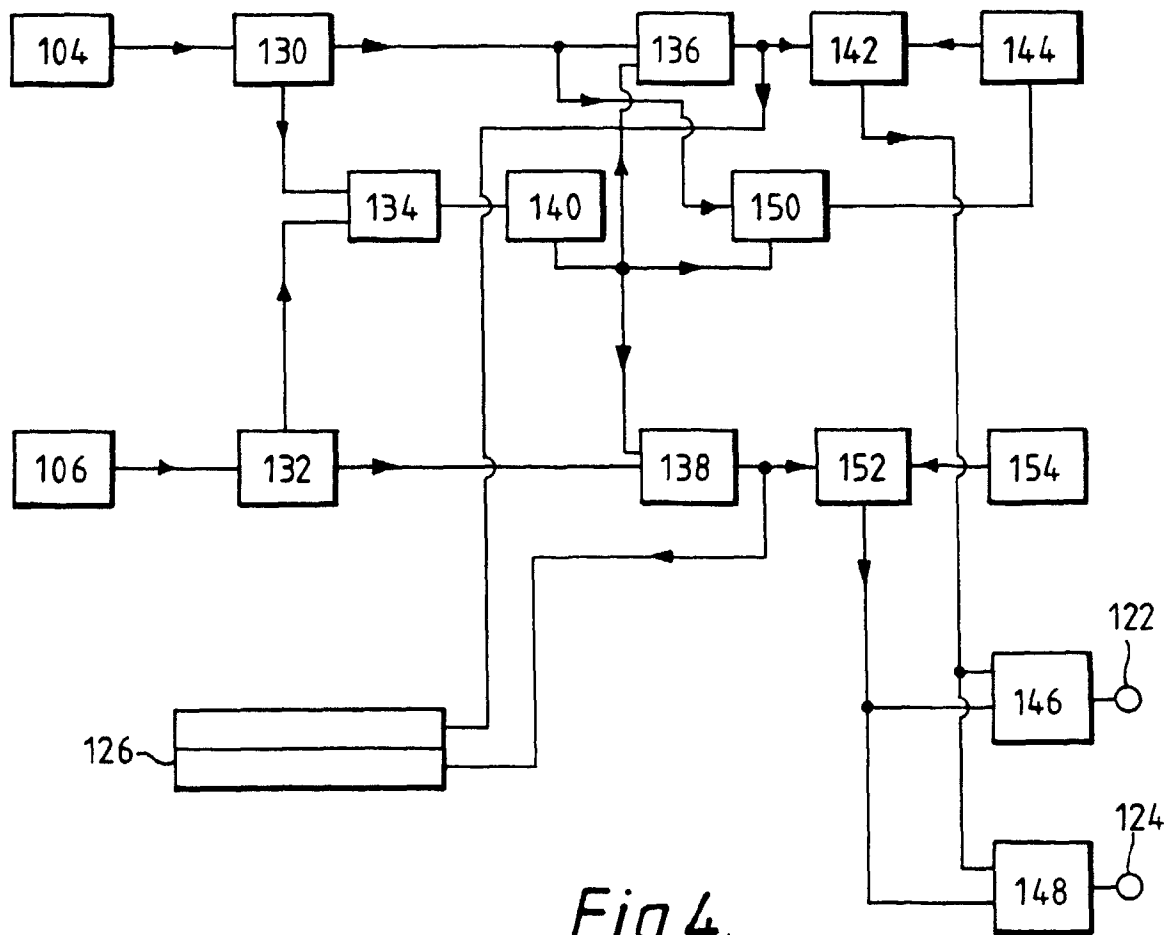


Fig. 4.

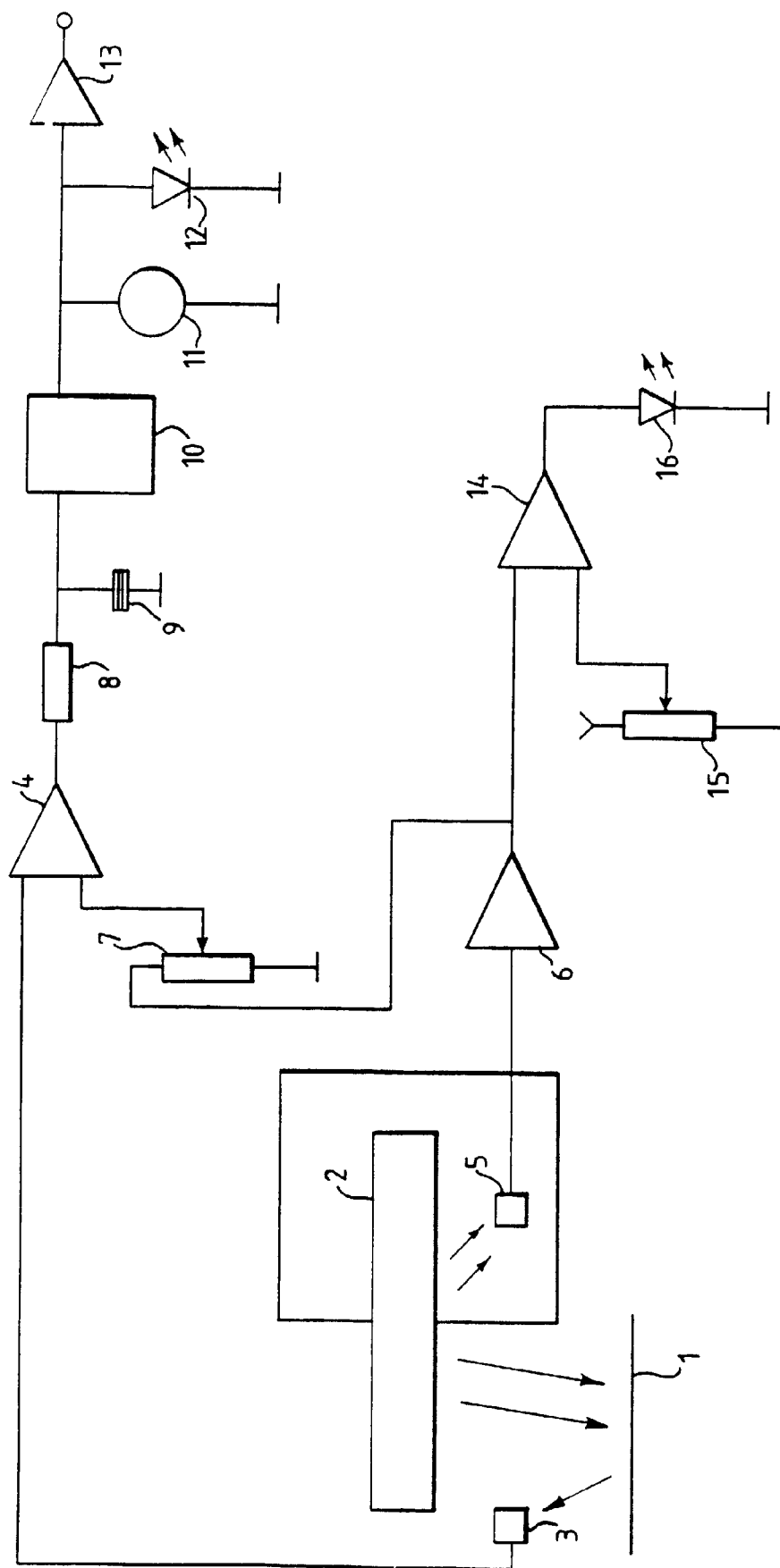


Fig.5.

