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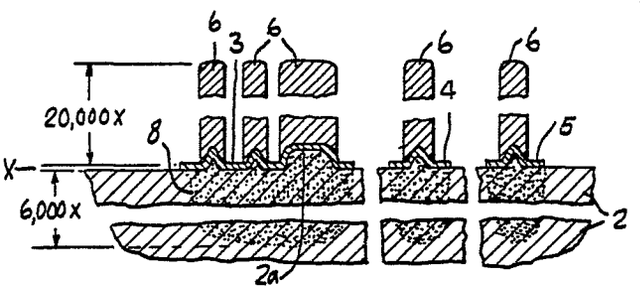
(54) Encoded security document.

(57) Documents (1) are encoded with at least one thin, transparent coating (3, 4, 5) normally invisible, but detectable by electrical capacitance measurement. Each document consists of a substrate (2) on which is applied (A) at least one of the thin coatings, and (B) conventional printing, preferably intaglio (6). The coating includes particles (8) sputter deposited into the substrate surface and is applied before or after printing. The coating is confined to a limited area of the substrate surface and itself constitutes a code for identification. A second coating can be applied so that all areas of the surface have the same appearance to mask visual discovery of the first coating.



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The field of the invention concerns security documents having defeating indicia for effective protection against counterfeiting.

Considerable effort has been directed to provide a security document difficult to counterfeit. Means were sought whereby the genuineness of the security document can be effectively discerned. In order to be acceptable, the means only should be detectable under limited circumstances, and should otherwise be undetectable. Acceptable means should be capable of encoding. When detected, such means should have a clear and unmistakable presence, should withstand wear, aging and other physical impairment of the substrate; and should be economically feasible.

The code should not be obviously visible, should not be capable of application by standard printing techniques, should be applicable to various types of substrates employed to form document of a security nature, should require high cost, highly specialized equipment for application, yet provide a document only marginally increased in cost over the non-coded product. Further, the coating of which the code is formed must be formed of a material which is non-toxic, stable, and detectable with low cost equipment.

Accordingly, the invention thus provides a method of detecting the presence of a coating upon a printed substrate comprising a document of value; the coating is solely machine detectable as a measure of electrical capacitance between a plate electrode and a portion of said coating.

The invention thus further provides a printing medium for forming the security document, the printing medium having a machine detectable mark including a substrate of a

first material forming the mark and deposited on a portion only of one surface of the substrate, the characterized in that particles of the second material are embedded at limited locations in said first material including a subsurface region under the coating, said second material being only detectable by electrical capacitance detection.

Still further, the invention provides a security document of value having a mark detectable by apparatus responsive to a particular physical characteristic of the mark and thereby distinguishable from a counterfeit document lacking such a mark; characterized by a substrate of a first material free from said physical characteristic, a mark defining coating of a second material having said physical characteristic, said coating consisting of a particulate generally invisible very thin layer sputter-deposited on a portion only of one surface of the substrate and a sub-surface region below said thin layer formed of discrete particles of said second material embedded within said first material under said coating, as a continuation of said thin surface layer, the physical characteristic of said particulate material being electrical capacitance, said second material being visually nondetectable but its presence capable of being sensed only by said detecting apparatus and visually observable matter printed on said document.

The preferred embodiments of this invention now will be described, by way of example, with reference to the drawings accompanying this specification in which:

Figure 1 is a plan view of a document prepared in accordance with the invention.

Figure 2 is a fragmentary cross-sectional view taken along line 2-2 of Figure 1, with the vertical dimensions greatly enlarged and the horizontal dimensions somewhat enlarged.

Figure 3 is a view similar to Figure 2, showing a modified embodiment of the invention.

Figure 4 is a fragmentary enlarged sectional view of a coated substrate in accordance with the invention prior to printing thereon.

Figure 5 is a fragmentary enlarged sectional view of a coated substrate constructed in accordance with the invention and having coatings on both sides thereof.

Figure 6 is a fragmentary enlarged view in section of another coated substrate constructed in accordance with the invention and two partially overlapped coatings on one side thereof.

Figure 7 is a view similar to Figure 6, showing a further modification of the invention having the two completely overlapped coatings on one side thereof.

Figure 8 is another fragmentary enlarged sectional view of a substrate constructed in accordance with the invention and having complementary coatings which completely cover one surface of the substrate.

Figure 9 is a fragmentary enlarged sectional view of a substrate having a coded coating and a uniform coating over the coded coating.

Figure 10 is a fragmentary enlarged sectional view showing another modification of the invention wherein the substrate carries a uniform coating and a coded coating is applied thereto.

Figure 11 is a fragmentary enlarged sectional view illustrating a substrate having two separately detectable coatings applied to one surface thereof.

Figure 12 is a diagrammatic representation illustrating means for coding a web to be printed with a marginal code corresponding to the denomination to be printed on the web.

Figure 13 is a diagrammatic representation illustrating the printing, inspection and the trimming method to be followed with a web produced by the apparatus of Figure 12.

Figure 14 is a diagrammatic flow representation illustrating means for detecting one of the two coatings on the materials of Figure 11.

Figure 15 is a diagrammatic flow representation illustrating means for detecting the other coating on the materials of Figure 11.

Figure 16 is another diagrammatic flow representation illustrating means for detecting both the coatings on the materials of Figure 11.

Figure 17 is a diagrammatic flow representation illustrating means producing the modified embodiment of the invention shown in Figures 6 to 8.

Figure 18 is a diagrammatic flow representation illustrating the means for forming the modified substrate shown in Figure 9.

Figure 19 is a diagrammatic flow representation illustrating means for forming the material of Figure 10.

Figure 20 is a diagrammatic flow diagram of the process for handling a web through the process of forming the security document according to the invention.

Briefly, a coating is applied to a substrate. The coating has a physical characteristic which is machine only detectable but otherwise is invisible. The detectable physical characteristic preferably is electrical capacitance. The coating may be applied in a prescribed pattern, in continuous bands along the one dimension of the document, in combination with printing, overprinting or the like, or alone, and constitutes a code. Further, the first or characteristic containing coating may be overlaid with a second coating in partial or full registry therewith. Portions of the first coating, that is, particles thereof, enter the substrate below its surface by being driven thereinto during deposition of the said coating. By "machine only detectable" it is meant that the coating is not visible and can only be detected by some detecting machine, i.e. is not observable to the naked eye.

Referring now to the drawings, in Figures 1 and 2 a security document, in the form of a stock certificate, is indicated generally by reference character 1 and comprises a substrate 2 and a coating in the form of three bands 3, 4 and 5 deposited on a portion thereof. Substrates may be formed of paper, that is a porous fibrous cellulosic material, or may comprise a spunbound polyolefin composition, e.g. polyethylene or polypropylene such as marketed under the trademark TYVEK by the E. M. DuPont DeNemous Company and/or is described in United States Patent 3,169,899 (Steuber). The coating must have a distinctive physical characteristic, e.g., electrical conductivity, resistivity, etc. which is absent from the substrate. The deposit of said coating on the substrate can be effected at any time subsequent to formation of the substrate.

It may be accomplished by use of coating apparatus as shown in diagrams or by a modification of the apparatus as shown in the patent to Kuehnle, No. 3,829,373 entitled "THIN FILM DEPOSITION APPARATUS USING SEGMENTED TARGET MEANS". The coating apparatus which deposits the bands 3, 4 and 5 of electrically conductive material, such as indium tin oxide at specific locations on substrate 2. The bands, and particularly the location thereof, constitute a code which identifies the finished document as a genuine document and also can serve as a code representing denominational values.

In the illustrated example, which is a stock certificate for 100 shares, the location code is a bar code in which both the width and number of bars are significant. The code identifying the number of shares consists of a wide band 3 and two narrow bands 4 and 5, as illustrated. The invention is applicable to all documents of value, including currency.

Substrate 2 carrying bands 3, 4 and 5 thereafter is printed with words or other indicia required to complete the finished document 1. The printing of such documents is commonly done by an itaglio printing process, in which the substrate material is forced under high pressure into inked recesses in a printing plate, so that the material of the substrate is raised in ridges under the ink, as shown at 2a in Figure 2.

The bands 3, 4 and 5 have a thickness preferably less than 200 Angstrom units, and are transparent and invisible. The ink deposited on the substrate during the printing process typically has a thickness, including the raised ridge in the substrate, of about 0.002". Thus, the ink thickness is about

twenty thousand times the thickness of the conductive bands 3, 4 and 5, as indicated by the dimensions X and 20,000 X in Figure 2. The contours of the inked letters, as shown in cross-section at 6 in Figure 2, are variable when viewed on a scale such as that employed for the vertical dimensions in Figure 2. The contours shown at 6 in Figure 2 are idealized.

Some of the particles of the coating material are driven into the substrate during the coating process and penetrate the substrate to a considerable depth, forming sub-surface regions 8 (Figure 2). Regions 8 are much thicker than the coatings 3, 4 and 5. For example, the depth of penetration of the particles may range up to about 6,000 X where X is the thickness of the sputtered coating. The density of distribution of the penetrated particles is greatest near the surface of substrate 2, said density decreasing inversely with the depth of penetration.

Preferably, the thickness of the coating bands 3, 4 and 5 should not exceed about 200 Angstrom units so that the coating is as thin as possible with maintenance of its integrity. Generally, the coating thickness is limited to that which would make the coating readily visible. In some instances, even a visible coating may be acceptable or even desirable. With some coating materials, the thickness can be greater than 200 Angstrom units without the coating becoming visible. It is important that the likely counterfeiter be unaware of the presence of the code. Where the coating material is indium tin oxide, the coating is not visually apparent at a thickness of 200 Angstom units. Further, reduction in coating thickness is an economic benefit in speeding the coating process.

Referring to Figure 3, a security document 10 differs from the document represented by reference character 1 in that the document 10 is printed first and the characteristic coating represented by reference character 7 is applied thereafter. Thus the inked letters appear to provide characters 7 having the coating bands 10', 11 and 12. The banks 10', 11 and 12 cover some of the inked letters completely. The particles which penetrate the letters during the coating process do not go all the way through those letters, since the ink leyer is thicker than the maximum depth of penetration of the particles.

Both the coated bands 3, 4 and 5 and 10', 11 and 12 can be detected either conductively, inductively or capacitatively; preferably, capacitive detection is elected.

Referring to Figure 4, the substrate 2 of Figure 2 is illustrated but the overprint 6 is absent. Such a material can be prepared as a printable sheet material in condition for printing to make same into a document of value.

In Figure 5, the substrate 13 has been supplied with a coating 16. A second coating 17 is applied to the opposite surface of the substrate 15. Both coatings 16 and 17 may be electrically conductive, and each may be detected separately and conductively by apparatus including spaced contacts which physically engage one coating. Inductance or capacitance means would detect both coatings at the same time, and could be used if the two coatings and the detecting apparatus were designed to cooperate. This is desired.

The document 20 of Figure 6 carries a coating 20' and the second coating 21, which partially overlaps the coating 20. Either coating 20' or 21 may be electrically

conductive and the other nonconductive. Alternatively, both coatings may be electrically conductive. Using the two coatings of different materials, both electrically conductive, enables the conductivity of the combined coatings to be controlled so that the conductivity remains within predetermined limits.

The document 22 of Figure 7 carries coating 23 completely overlapping coating 22'. Again, either or both coatings may be electrically conductive. If only the coating 22' is electrically conductive, sensing by contact is not possible but so that sensing must be effected by capacitive measurements.

Since the coatings 20' and 21 are of different materials, the characteristics of the substrate 13 in regions under only one coating, as at 20a, will be different from the characteristics in regions under the overlapped coatings, as at 21a. This difference is indicated by the different representations used in the Figure for the two regions. Similar differences in the characteristics of the substrate are indicated, in similar manner, in Figure 7.

In Figure 8, a coated substrate is illustrated on which a coded electrically conductive coating is applied in spaced regions such as bands 24, with the spaces between the bands 24 being covered with a second coating 25 of a different and electrically nonconductive material. Since all surfaces of the substrate 13 are coated, the same external gloss or texture appears throughout the surface of the resulting document. The location of the conductive bands 24 cannot be determined by visual observation. Substantially all materials capable of being electrically deposited produce coatings which, in the preferred thickness range, have the same visual

appearance. Thus, it is not difficult to select a material for coating 25 which visually matches the code coating 24.

Figure 9 illustrates a printable, coated substrate 30 carrying a first coded coating 32 deposited on portions of the substrate 30 and another coating 34 has been deposited on the entire surface of the substrate. The whole surface of the substrate 30 is of the same appearance with the location of the coded coating 32 concealed from visual observation.

In Figure 10, substrate 30' is illustrated wherein the uniform coating 35 is deposited first on the entire surface of the substrate 30' and the coded coating 36 is applied over only a portion of the coating 35. The coatings 35 and 36 are selected to be substantially the same in visual appearance, so that the location of the coded coating is not visually detectable.

Figure 11 shows a modified embodiment of the invention wherein a first coating 41 covers selected portions of the substrate 40 and a second coating 42 covers other selected portions, partially overlapping the first coating 41. The two coatings 41, 42 are detectable separately because of different characteristics in the two coatings. One of the coatings 41,42 may be electrically conductive.

Referring to Figures 12 and 13, there is illustrated a process for placing a coded coating on a web of material to be printed and thereafter printing security documents of value on the web, so as to make sure that the printed data, such as the denomination, on the documents corresponds to the code represented by the coating.

A roll of sheet material, shown at 260, is first passed through a margin printer 61 where, at spaced locations

on at least one margin of the web, there is printed data identifying the denomination to be printed. The web then is passed through apparatus 62 for coating the document with a denominationally coded coating 68 corresponding to the markings on the margin. The coating 68 can be in the form of bands, as shown. The coated web represented by reference character 63 then is transferred to printing press 64 (Figure 13) where documents 65 are printed on the web. The resulting printed web, which may have been cut into sheets, passes to an inspection station where it is determined that the printing on the document 65 corresponds to the code and to the information printed in the margins. The web or sheets then pass to a trimmer 66 which cuts off the margins 67.

The coated bands, 3, 4 and 5 may be detected either conductively by apparatus having contacts which engage the bands, or inductively or capacitively, by apparatus that does not contact the bands 3, 4 and 5.

While it may appear that the ink letters 6 in Figure 2 would interfere with a conductive contact with the bands 3, 4 and 5, it should be noted that the bands are much wider than the printed letters 6, and that the bands 3, 4 and 5 are continuous. Hence, conductive contacts made at spaced points on any of the bands 3, 4 or 5 may be utilized to measure the conductivity of the band between those contact points. The surface finish of the contact probes which engage the bands 3, 4 and 5, should have a range of variation of smoothness of the same order of magnitude as the thickness of the printed letters 6, so that some points on the contact probes engage the bands, even though the printed letters intervene between the probes and the bands. The problem

described above with respect to the contact with the bands 3, 4 and 5 does not exist with coatings 10, 11 and 12 since the latter are placed over the printed letters 7.

Where the anti-counterfeit protection coatings are deposited on documents subject to substantial wear, the conductivity of the material decreases, and hence its impedance increases, as the coating and possibly the underlying substrate, becomes worn. The measurement of impedance may be used as a measure of wear. For example, in a given document, a range of 5K-10K ohms would indicate that the document was genuine, while an impedance in the 9K-10K range would indicate that the document should be retired from circulation.

Referring to Figure 15, the document 39 comprising the coated substrate 40 of Figure 11 with the inked letters printed on it passed through detecting apparatus 43 for detecting the first coating 41 and is forwarded to a location 44 marked 'PASS" if the required coating is found and is diverted to a second location marked "FAIL" if the required coating is missing. In Figure 15, the same document 39 is passed through detecting apparatus 47 which detects only the second coating and either forwards it to a "PASS" location 48, or diverts it to a "FAIL" location 49.

In Figure 16, the document 39 travels successively through an apparatus 43 for detecting the first coating and an apparatus 47 for detecting the second coating. The document must be passed by both detectors 43 and 47 in order to reach the "PASS" location 50. Failure of either coating to be detected results in diversion of the document to one of the "FAIL" locations 51 and 52.

The encoding coatings described herein preferably have a thickness of 200 Angstrom units but may include those

from 50 Angstrom units to 300 Angstrom units in thickness.

Measurement of capacitance functions as the preferred detecting method and can provide quantitative measurements useful in determining denominational information. Capacitance measurement is effective even after the document has been exposed to steam, hot water and repeated abrasion or other abuse.

In addition to the use of Indium Tin Oxide, very thin films of Tin Oxide-Antimony oxide were deposited.

Figure 17 is a diagrammatic flow representation illustrating the process for applying the coating such as shown in Figure 4. In that process, the substrate is passed to a first encoding coating apparatus 14 and thence to a second coded coating apparatus 15. Figure 18 illustrates the process of applying a uniform coating over a coded coating. The substrate 30 is passed into and through an encoding coating apparatus 31 and from there, is taken through the uniform coating apparatus 33.

A flow diagram comprises Figure 20 to the coating of paper, for example, to provide the security document in accordance with the invention. Other substrates may be able to use less elaborate apparatus. If a spunbound olefin sheet is used, the various vacuum pumping steps described below may be considerably simplified, and to some extent even eliminated since this material has much less absorbed gas and moisture than paper sheet.

The continuous web 100 to be coated is supplied from a unit 101 which may include two alternately used web supply reels and a splicer, and then passes through a tension control 102, an aligner 103, a web cleaner 104, a static eliminator 105, and a web quality test and marker unit 106.

The web quality test and marker unit may be a photoelectric apparatus which scans the web for holes, slimy spots and other imperfections, and marks the web in one margin adjacent any such imperfection. The web then passes through a web break detector 107, which controls a web driving motor 110 and an associated brake, so as to stop the motor and apply the brake quickly when a break in the web is detected.

The web then passes through an accumulator 111, comprising a set of opposed pairs of rolls which accumulates a substantial length of web.

A coating apparatus 112 just beyond the accumulator along the path of the web and is evacuated to a very low pressure. The repair of a break in the web is facilitated if the web is stopped with the break outside the coating unit 112. The accumulator 111 stores a sufficient length of web so that the web can be stopped with the break in the accumulator, or elsewhere outside the coating unit 112. If the web is so stopped, the coating unit 112 does not have to be opened to repair the broken web.

The web leaving the coating apparatus 112 moves through a coating quality test and marking unit 113, which marks a margin of the web wherever the coating is inadequate. Preferably, this test and marking unit marks the margin of the web opposite to the margin marked by the web quality test and marking unit 106. The web then passes through a tension control and aligner unit 114, similar to the units 102 and 103. The web thereafter passes through a humidifier 115 which restores the paper web to its normal moist condition so that it will be suitable for printing. (Dehumidified paper tends to be brittle and to break up during printing.) If the material of the web is other than paper the

humidifier 115 may not be necessary. The web 115 passed from the humdifier to a printer 116, which prints a value code in the margins as described in connection with Figure 12. The web then passes to a trimmer and cutter 117, which removes excess margin material and cuts the web transversely into sheets. The sheets pass to a set of quality mark detectors 121. These detectors sense the marks applied to the web by the web quality tester 106 and by the coating quality tester 113. One of the detectors responds to marks applied to one margin by the web quality tester 106 and directs those rejected sheets to a first stacker 123. The other detector responds to marks applied by the unit 113 and directs those rejected sheets to a second stacker 123. Sheets which pass both the quality mark detectors are delivered to a stacker 124 where the correctly coded sheets are accumulated.

If desired, all sheets rejected, for whatever reason, might be discharged into the same stack. While a singly continuously receiving stacker 124 for the good sheets is indicated, a pair of alternately receiving stackers may be used in place of stacker 124.

The encoding coating preferably is applied to the substrate employing r.f. cathode sputtering techniques, including a cathode electrode formed of the material being sputtered. An anode or biased electrode is placed on the opposite side of the substrate. The two electrodes are supplied with electricity at radio frequency and at high voltage (6000 volts or more). The coating chambers are filled with argon or other inert gas at a very low pressure, so that it is ionized by the high electric field. The ions are

toward and impinge on the cathode and sputter material particles therefrom. The particles are attracted toward the bias electrode during the half cycles when the electrodes are of the proper polarity. The particles sputtered from the electrode by the impinging ions travel in a straight line toward the bias electrode, and are intercepted by the substrate. The particles accumulate on that surface as a coating or in some cases penetrate the web for a substantial distance, so that the interface between the coating and the web forms a very strong bond.

The material particles which are driven by the applied high voltage may be energized with thousands of volts, and hence can be driven below the surface of the web. Typically, penetration depths range from 50 to 150 Angstrom units per thousand electron volts. Thus a graded interface is formed, even when the web and the coating material are mutually insoluble. The interface between the coating and the web can be so diffused that it is impossible to determine where the coating ends and the web begins. Such an interface provides an especially strong bond between the coating and the web.

CLAIMS:

1. A method of making a security document of value characterized by the steps of:

a. depositing on a portion of at least one surface of the substrate, a coating of a solely machine detectable material in a code,

b. printing the document upon said coated coded substrate,

c. depositing said coating by sputtering so as to drive particles of the coating into the surface of the substrate beneath the coating to define a substantial sub-surface region below the surface of the substrate.

2. A security document of value having a mark detectable by apparatus responsive to a particular physical characteristic of the mark and thereby distinguishable from a counterfeit document lacking such a mark, characterized by

a. a substrate of a first material free from said physical characteristic,

b. a mark defining coating of a second material having said physical characteristic, said coating consisting of a particulate generally invisible very thin layer sputter-deposited on a portion only of one surface of the substrate and a sub-surface region below said thin layer formed of discrete particles of said second material embedded within said first material under said coating as a continuation of said thin surface layer, the physical characteristic of said particulate material being electrical capacitance, said second material being visually nondetectable but its presence

capable of being sensed only by said detecting apparatus and

c. visually observable matter printed on said document.

3. The security document according to claim 1 characterized in that the depth of the sub-surface region is substantially greater than the thickness of the thin layer.

4. The security document according to claim 2 characterized in that at least part of said visually observable matter is printed over the coating.

5. The security document according to any one of claims 2, 3 or 4 characterized in that said visually observable matter is printed on the substrate, and the coating is applied over at least part of the visually observable matter and over a part of the substrate not covered by the observable matter.

6. The security document according to any one of claims 2 through 5 characterized in that said document is an elongated sheet and said coating is a pattern formed of at least one band extending across the short dimension of the sheet.

7. The security document according to any one of claims 2 through 5 characterized in that said coating having the physical characteristic is confined to a limited area of the substrate surface.

8. The security document according to any one of claims 2, 3 or 4 characterized in that said coating extends over at least one area of said document.

9. The security document according to any one of claims 2, 3 or 4 characterized in that said coating comprises at least a pair of spaced bands extending across the narrow dimension of said document.

10. The security document according to any one of claims 2, 3 or 4 characterized in that said coating is located in different limited areas of the document, the location depending upon the nature of said document and each location being different for different documents.

11. The security document according to any one of claims 2, 3 or 4 characterized in that said coating is overprinted.

12. The security document according to any one of claims 2, 3 or 4 characterized in that said coating is overprinted in registry with said coating.

13. The security document according to any one of claims 2, 3 or 4 characterized in that there is a second coating over the substrate, said physical characteristic being absent from said second coating.

14. The security document according to any one of claims 2, 3 or 4 characterized in that there is a second coating over the substrate, said physical characteristic being absent from said second coating and a nonconductive coating over the substrate and the first coating.

15. The security document according to any one of claims 2, 3 or 4 characterized in that there is a printing layer between the substrate and the coating having the physical characteristic.

16. The security document according to any one of claims 2, 3 or 4 characterized in that said coating covers completely one surface of the substrate so that all parts of the surface not covered by printed matter have a uniform finish.

17. The security document according to any one of claims 2, 3 or 4 characterized in that said coating comprises a plurality of transparent thin layers each of different particulate materials other than said first material on one surface of the substrate and each material partially having a substantial number of the particles embedded in a subsurface region of the substrate, one only of said layers comprising the coating having said characteristic and covering only a portion of said one surface, said coating being detectable only by apparatus insensitive to the presence of the other of said layers.

18. The security document according to claim 17 characterized in that at least part of said visually observable matter is printed over at least one of the layers.

19. The security document according to claim 17 characterized in that at least one layer is applied over at least a part of the visually observable printed matter.

20. The security document according to claim 17 characterized in that the outer one of the layers is of wear resistant material.

21. The security document according to claim 17 characterized in that all of said one surface is covered by the outer one of said layers.

22. The security document according to claim 17 characterized in that only the portion of said one surface not covered by said one layer is covered by a second of the layers.

23. The security document according to any one of claims 17 through 22 including a second one of said layers of a material detectable by apparatus insensitive to the presence of said one layer, said second layer being on a portion of said one surface of the substrate differing at least in part from the portion covered by said one layer.

24. The security document according to claims 23 or 24 characterized in that a transparent second coating of machine detectable material is located on a portion of the opposite surface of the substrate from said first mentioned coating and partially embedded in a subsurface region of said opposite surface.

25. The security document according to claim 24 characterized in that the said coatings respectively on opposite sides of the substrate are independently detectable.

26. A security document printing medium having a machine detectable mark including a substrate of a first material the mark formed as a coating of a second material and deposited on a portion only of one surface of the substrate, characterized in that particles of the second material are embedded at limited locations in said first material including a subsurface region under the coating, said second material being detectable only by electrical capacitance detection.

27. A security document printing medium according to claim 26 characterized in that said substrate is an elongated web and said mark is formed as at least one band extending lengthwise of the web.

28. A security document printing medium according to claim 26 characterized in that said mark is in the form of a pattern.

29. A security document printing medium according to claim 26 characterized in that said web is coated with a plurality of coatings of different materials other than said first material on one surface of the substrate, one only of said coatings being electrically capacitively detectable.

30. A method of detecting the presence of a coating upon a printed substrate comprising a document of value characterized in that the coating is sole machine detectable as a measure of electrical capacitance between a plate electrode and a portion of said coating.

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FIG. 1

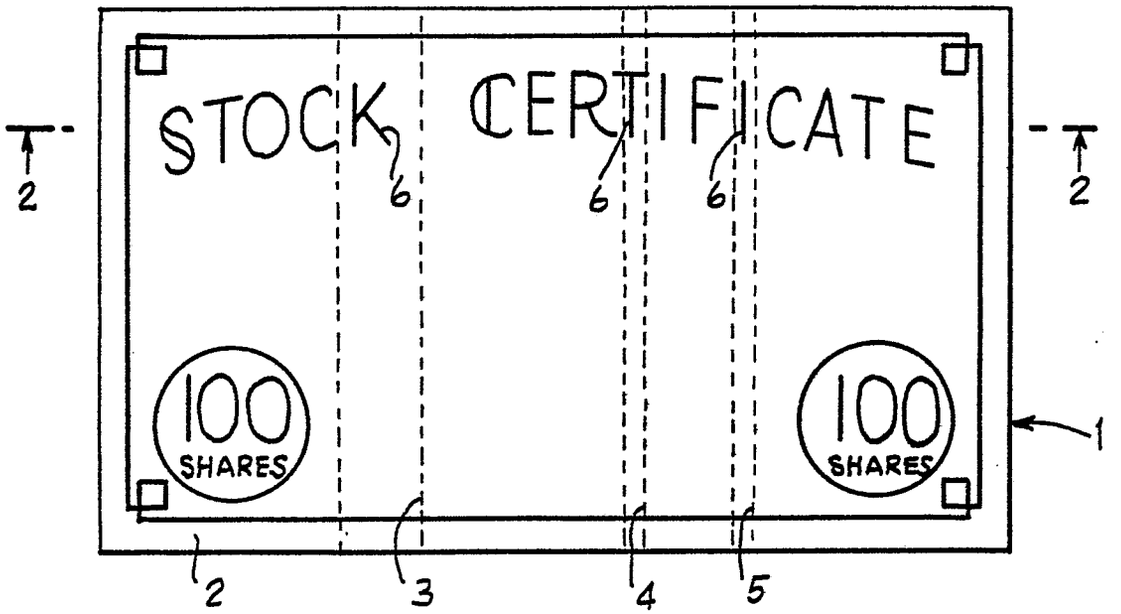

FIG. 2

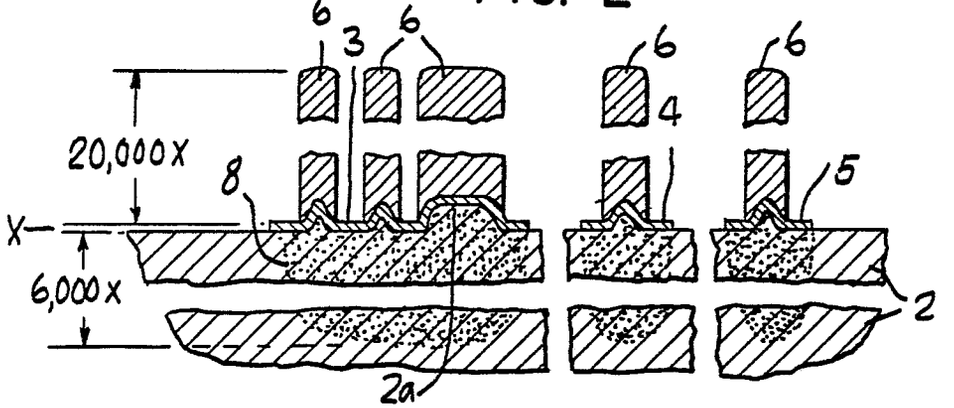

FIG. 3

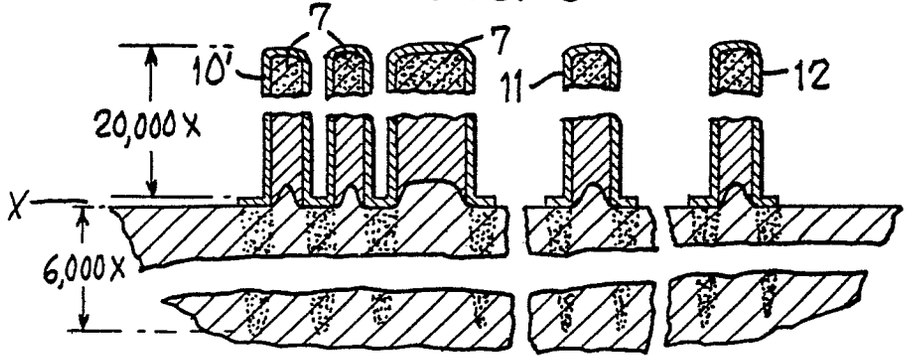

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FIG. 4

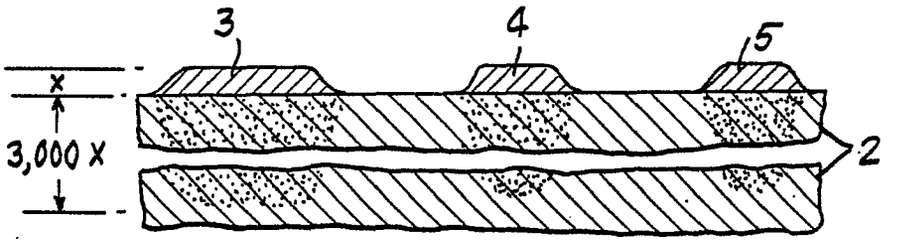

FIG. 17

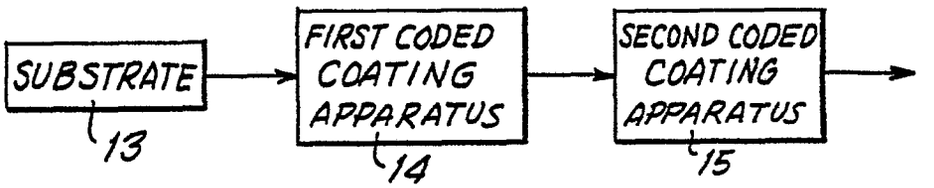

FIG. 5

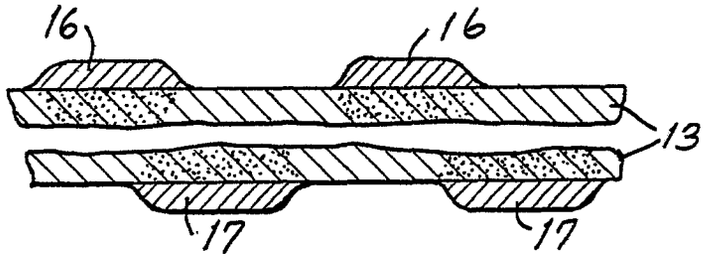

FIG. 6

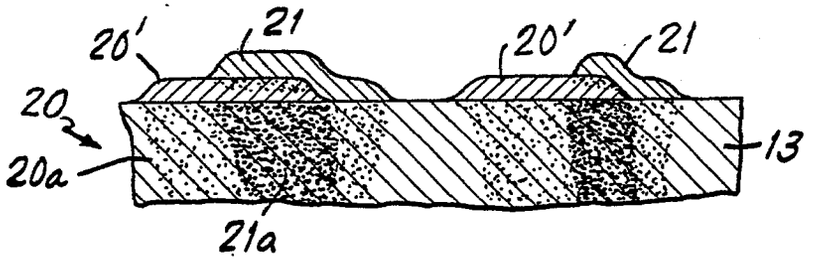

FIG. 7

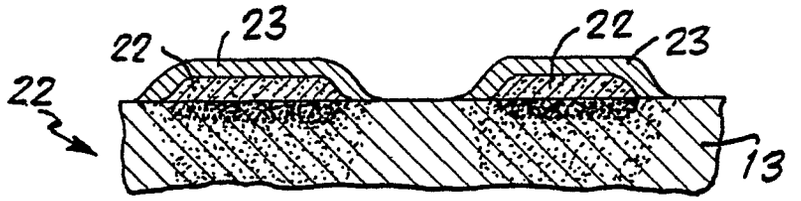

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FIG. 8

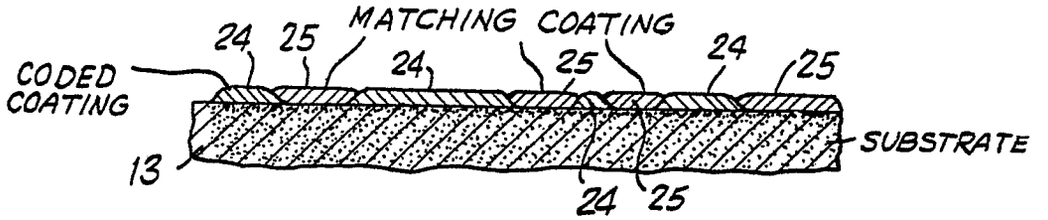

FIG. 18

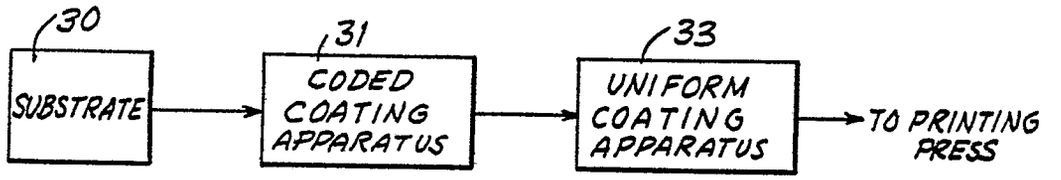

FIG. 9

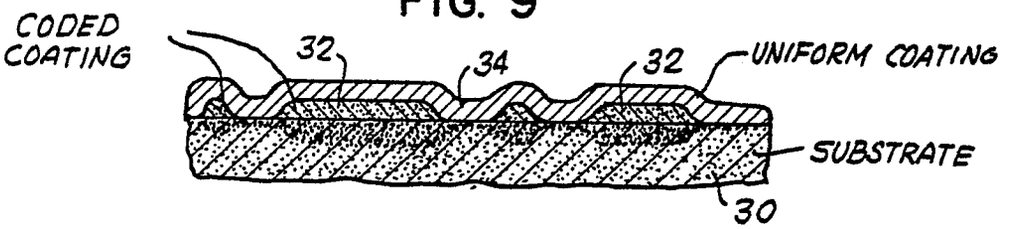

FIG. 19

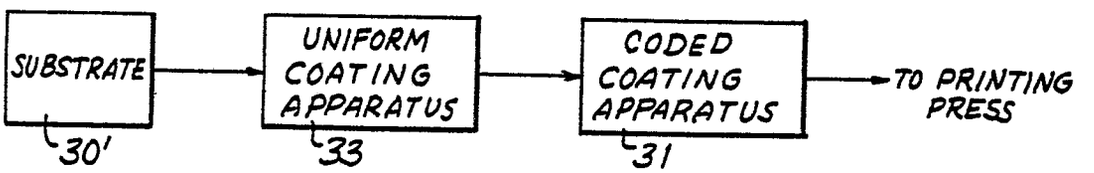

FIG. 10

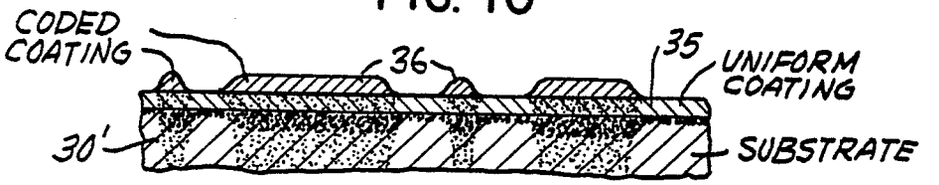

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FIG. 11

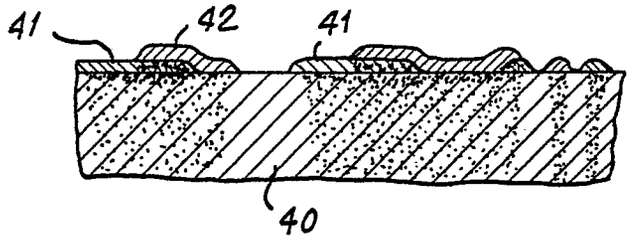

FIG. 14

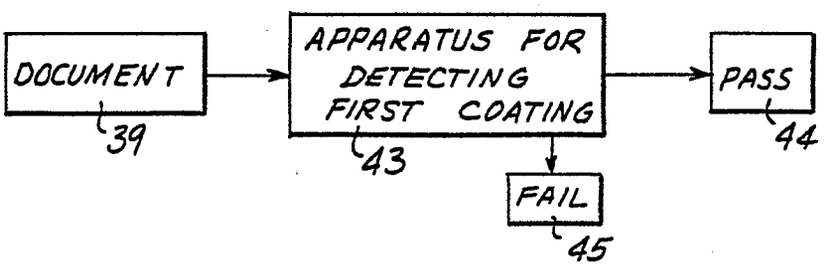

FIG. 15

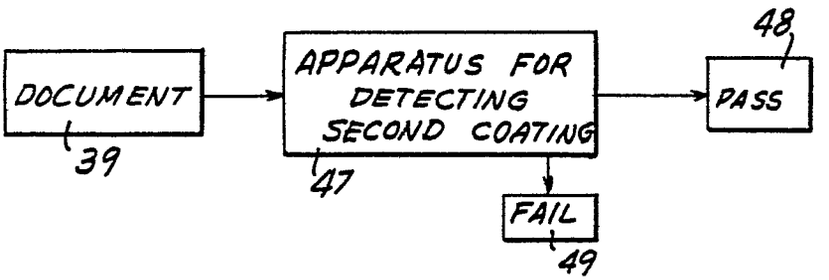

FIG. 16

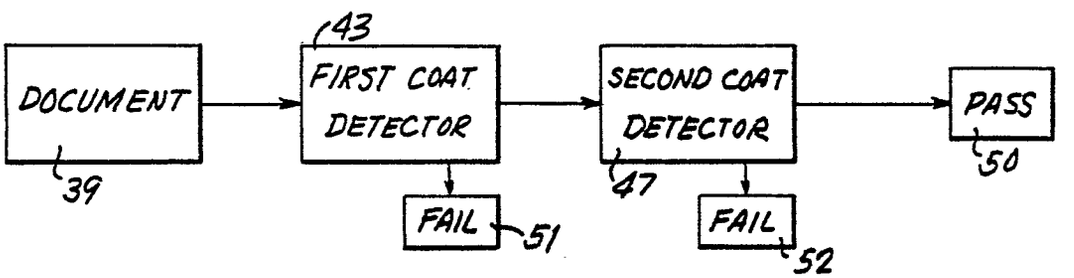

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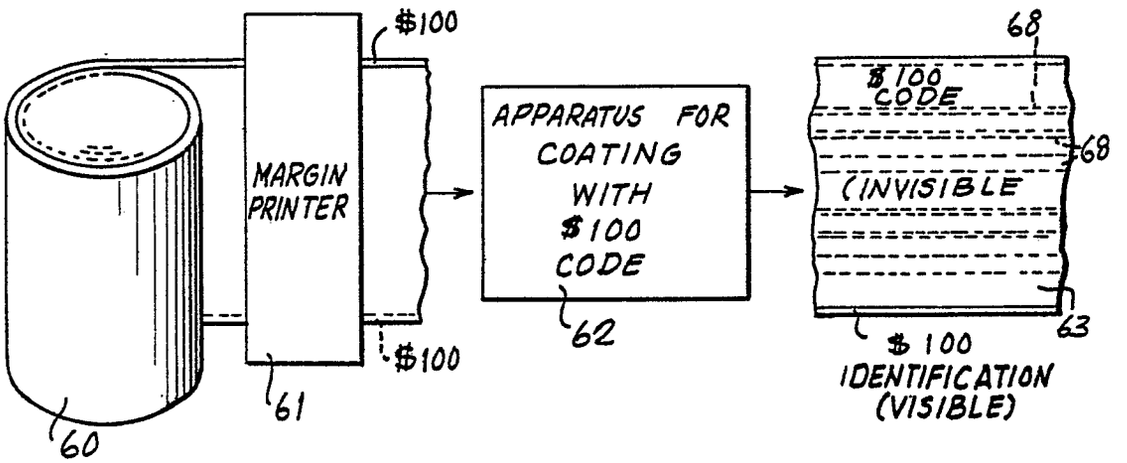
FIG. 12



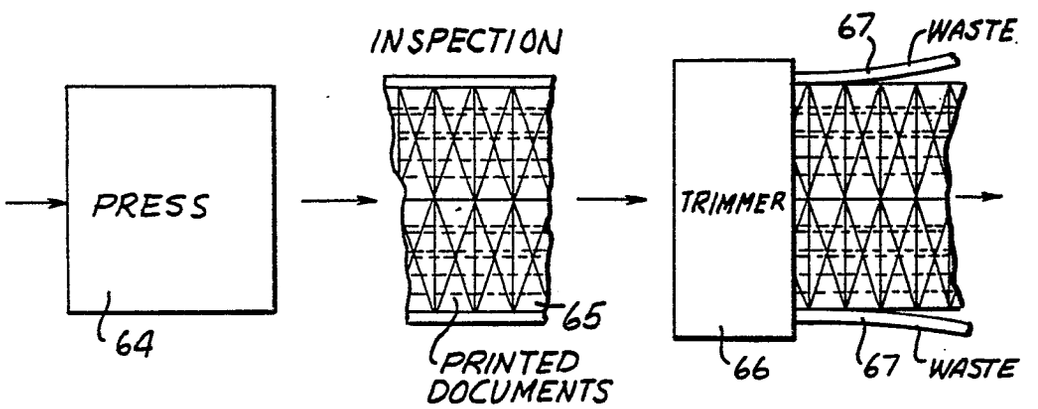


FIG. 13

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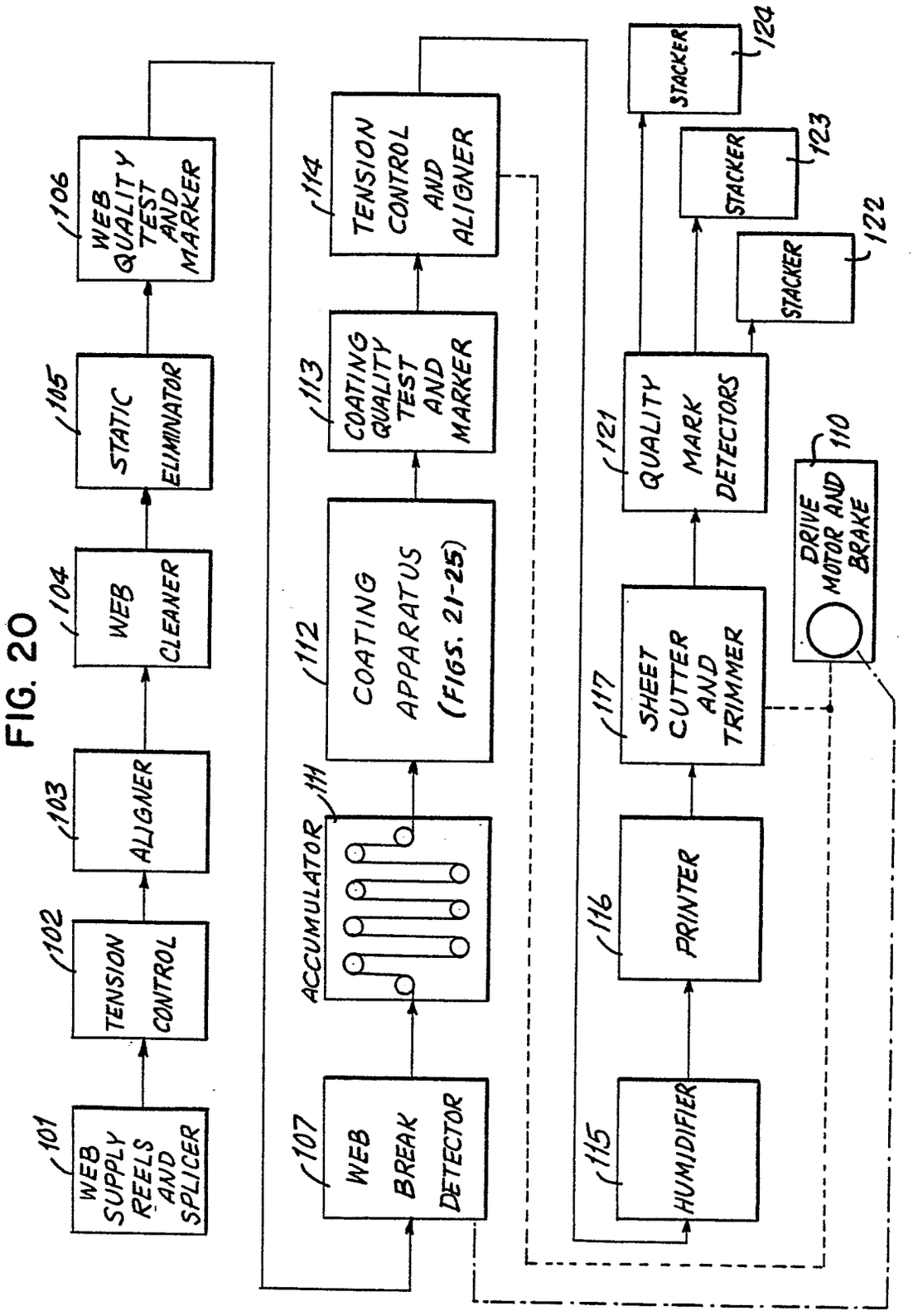
FIG. 20



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European Patent Office

Application number

EP 82 10 9704

EUROPEAN SEARCH REPORT

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Y	US-A-4 355 300 (H.J. WEBER) * Abstract; column 1, line 60 - column 2, line 3 *	1,2,6-10,13,14,26-30	D 21 H 5/10 G 07 D 7/00
Y	US-A-2 143 406 (S.B. CHAMBERLAIN) * Page 1, left-hand column, lines 25-49 *	1-3	
A	DE-A-2 001 944 (SIEMENS) * Claims; figures; page 4, paragraph 2 *	1,2,6-10,26	
A	CH-A- 541 440 (SODECO) * Claims; figures; column 1, lines 48-66 *	1,2,6-10,26-30	TECHNICAL FIELDS SEARCHED (Int. Cl. ³) G 07 D 7/00 G 07 F 7/08 G 06 K 7/08 G 06 K 1/12
A	FR-A-2 188 879 (DE LA RUE GIORI) * Claims; figures *	1,26-30	D 21 H 5/10
A	US-A-4 255 652 (H.J. WEBER) * Abstract; column 4, line 39 - column 5, line 23; figure 1 *	1,2,6-10,26-30	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	06-07-1983	DAVID J.Y.H.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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