

[54] **VERIFIABLE IDENTIFICATION DOCUMENT**  
[72] Inventors: **Gunnar Lindstrom; Gunde Schullstrom,**  
both of Linkoping, Sweden  
[73] Assignee: **Saab Aktiebolag, Linkoping, Sweden**  
[22] Filed: **June 24, 1969**  
[21] Appl. No.: **836,000**

[30] **Foreign Application Priority Data**  
June 24, 1968 Sweden.....8489/68  
[52] **U.S. Cl.**.....**235/61.12 M, 340/149 A**  
[51] **Int. Cl.**.....**G06k 7/08**  
[58] **Field of Search**.....**235/61.12, 61.114; 283/7, 8;**  
**194/4; 340/149 A**

[56] **References Cited**  
**UNITED STATES PATENTS**  
2,254,931 9/1941 Bryce .....235/61.12 M

2,914,746 11/1959 James .....340/149 A

**OTHER PUBLICATIONS**

Parry, F. C., "Identification Card," IBM Technical Disclosure Bulletin, Vol. 3, No. 6, Nov. 1960, p. 8.  
*Primary Examiner*—Maynard R. Wilbur  
*Assistant Examiner*—William W. Cochran  
*Attorney*—Ira Milton Jones

[57] **ABSTRACT**

A document used to assert a personal right has a randomized unique pattern of normally invisible but mechanically detectable material (e.g., finely divided ferromagnetic material) in a zone overlapping any visible indicia identifying the owner. The document is presented to a mechanical reader which scans the pattern along predetermined lines and records resultant output signals, along with an identifying record. Upon subsequent presentation, it is similarly scanned, for comparison with the recording to confirm its authenticity. Methods of producing appropriate patterns are disclosed.

**4 Claims, 12 Drawing Figures**

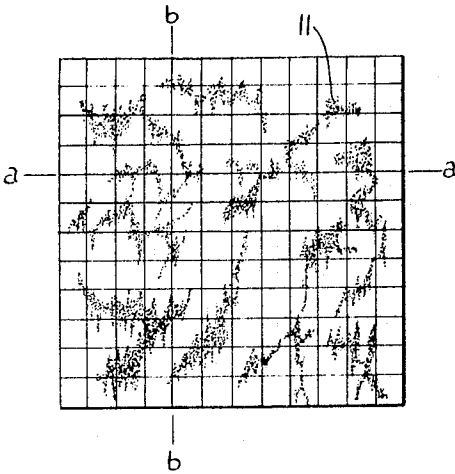


FIG. 1.

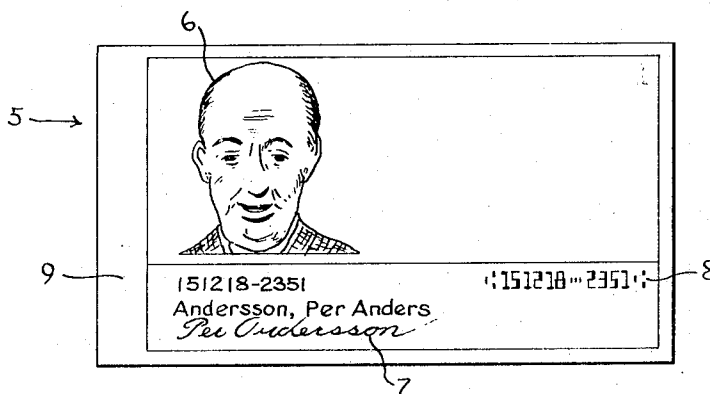


FIG. 3.

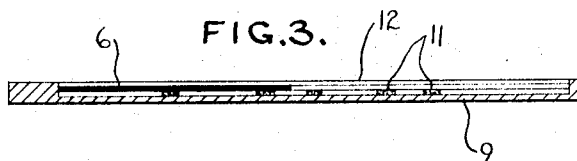


FIG. 2.

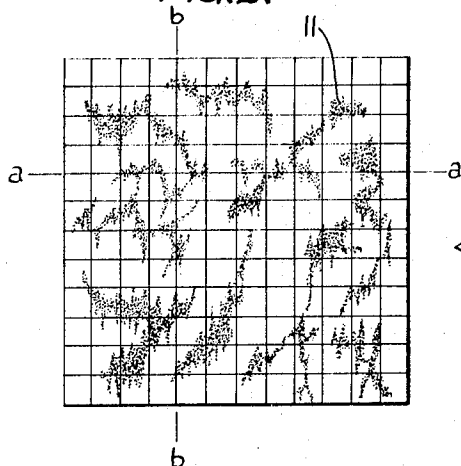
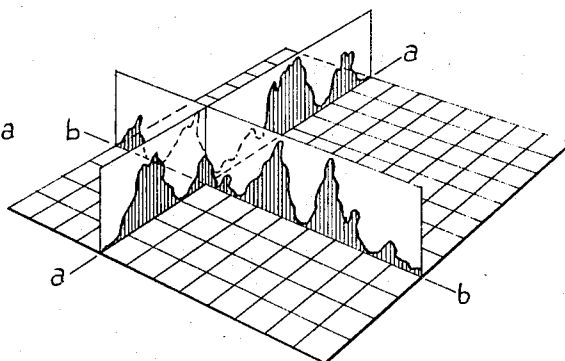


FIG. 4.



INVENTORS  
Gunnar Lindström  
Gunde Schullström  
BY *William Jones*  
ATTORNEY

FIG. 5.

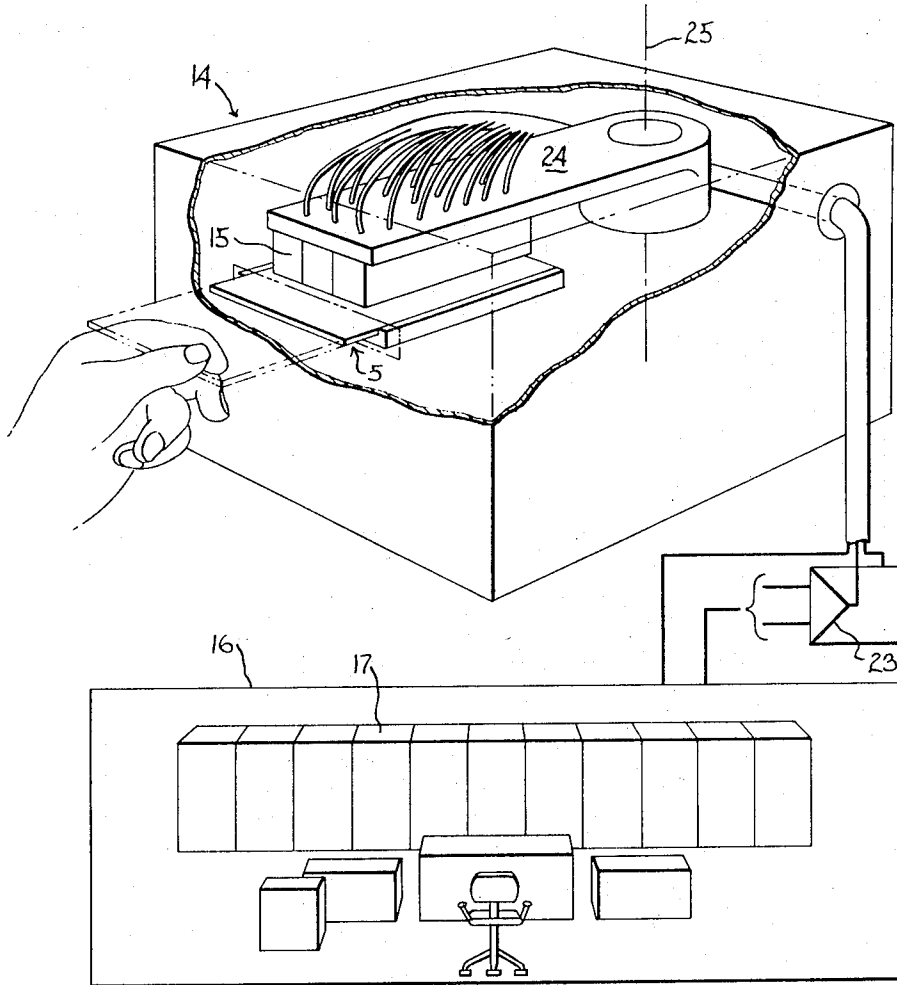


FIG. 6.

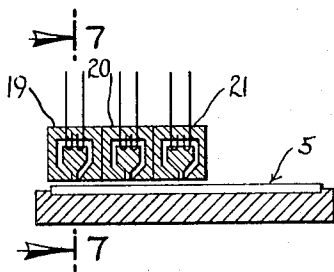
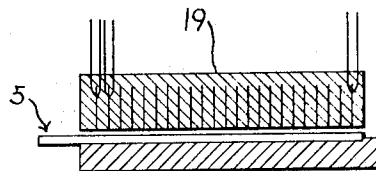


FIG. 7.



INVENTORS  
 Gunnar Lindström  
 Gunde Schullström  
 By *John Milton Jones*  
 ATTORNEY

FIG.8.

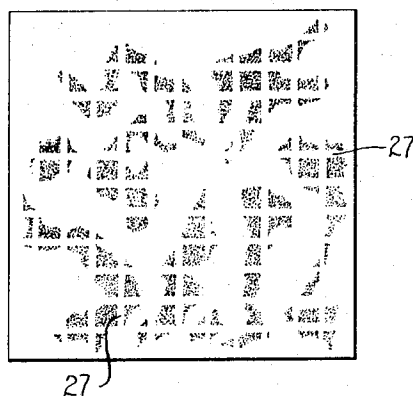


FIG.9.

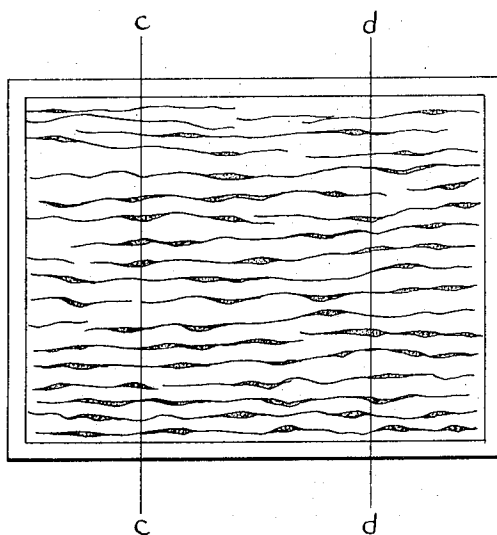
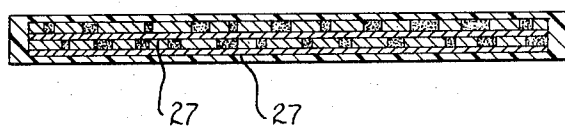


FIG.10.



INVENTORS

Gunnar Lindström

Gunde Schullström

By *John Milton Jones*  
ATTORNEY

FIG. 11.

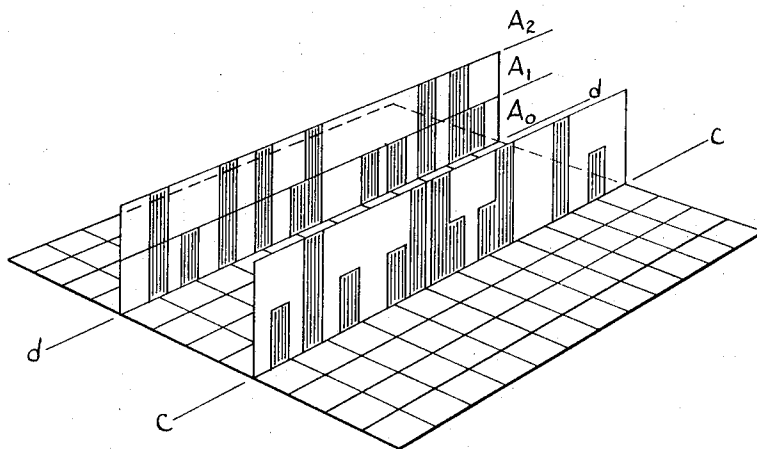
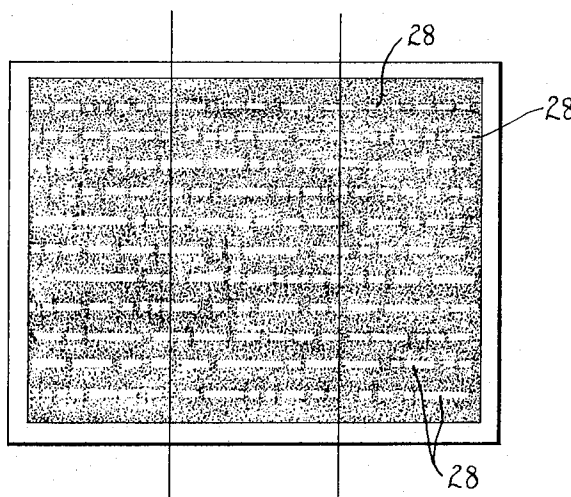


FIG. 12.



INVENTORS

Gunnar Lindström

Gunde Schullström

By *DeMott Jones*  
ATTORNEY

## VERIFIABLE IDENTIFICATION DOCUMENT

This invention relates to personal identification documents, such as drivers' licenses and credit cards, that are used by an individual to assert or confirm a personal right that he possesses; and the invention relates more particularly to a method of verifying an individual's entitlement to a personal right, an identification document that embodies means for verifying its authenticity, and the method of manufacturing such a document and verifying its authenticity.

Such documents as drivers' licenses, credit cards, bank account cards and passes of various kinds are much relied upon to confirm an individual's entitlement to a personal right that he has established.

However, the use of such documents always poses certain problems. In the first place, the document must identify the person to whom it properly belongs, so that it cannot be used by someone else who has acquired it without authorization. As a rule, therefore, such documents carry one or more readily visible items of personal identification such as a photograph of the owner, his signature, a description of him in terms of age, sex, height, coloration and the like, or one or more of his fingerprints. But even the presence of identification data on a document has heretofore afforded no real assurance that the person presenting it was the one authorized to use it, for such documents lent themselves more or less readily to forgery or alteration.

With these considerations in mind, it is a general object of the present invention to provide means for verifying the identity of an individual asserting a personal right, and for verifying his entitlement to that right, and more particularly to provide a document of the character described which contains invisible means for verifying its authenticity and which is therefore exceedingly difficult to forge or alter.

Another object of this invention is to provide a simple and inexpensive document of the character described that is readily verifiable as to authenticity.

It is also an object of this invention to provide a document of the character described which embodies invisible verification means of a type which can be readily recorded but is extremely difficult to duplicate, and which will be disturbed by any attempt at alteration of the document so that the spurious character of the document can be readily detected after any such attempt.

A further object of this invention is to provide means for obtaining verification of a document of the character described with both great rapidity and great accuracy, and without the need for reliance upon a human agent's evaluation of the authenticity of the document.

With these observations and objects in mind, the manner in which the invention achieves its purpose will be appreciated from the following description and the accompanying drawings. This disclosure is intended merely to exemplify the invention. The invention is not limited to the particular structure disclosed, and changes can be made therein which lie within the scope of the appended claims without departing from the invention.

The drawings illustrates several complete examples of physical embodiments of the invention constructed according to the best modes so far devised for the practical application of the principles thereof, and in which:

FIG. 1 illustrates the visible features of a document embodying the principles of this invention;

FIG. 2 is an enlarged view of a portion of the document shown in FIG. 1, showing the normally invisible random pattern of finely divided mechanically detectable material that characterizes the document of this invention;

FIG. 3 is a longitudinal sectional view through the document shown in FIG. 1, with thickness greatly exaggerated;

FIG. 4 is a three-dimensional graph representing output signals obtained from a mechanical reading device scanning across the pattern of FIG. 2 along the lines *a-a* and *b-b*;

FIG. 5 is a more or less diagrammatic perspective view of reading and recording apparatus that is used in verifying the genuineness of a document such as that shown in FIG. 2;

FIG. 6 is a vertical sectional view through the scanning head of the reader shown in FIG. 5;

FIG. 7 is a sectional view taken on the plane of the line 7-7 in FIG. 6;

FIG. 8 is a view generally similar to FIG. 2 but illustrating a modified form of pattern of mechanically detectable material;

FIG. 9 illustrates another modified form of pattern of mechanically detectable material;

FIG. 10 is a cross-sectional view, greatly exaggerated in thickness, of the document shown in FIG. 9;

FIG. 11 is a three dimensional graph representing output signals obtained from a mechanical reading device moved across the pattern of FIG. 9 along the lines *c-c* and *d-d*; and

FIG. 12 depicts another modified form of pattern of mechanically detectable material incorporated in a document embodying the principles of this invention.

Referring now to the accompanying drawings, the numeral 5 designates generally a document such as a driver's license which an individual carries on his person and presents whenever he has occasion to confirm or assert a right personal to him. The document 5 illustrated in FIG. 1 contains certain visible data that identify its rightful possessor, such as his photograph 6 and his signature 7, and it contains other visible data appropriate to its nature and purpose, such as a magnetically readable registration number 8.

A document having identifying indicia such as a photograph tends to confirm the identity of the person presenting it but does not confirm its own authenticity, since the document may be a forgery or may have been altered, as by replacing the photograph of its original owner with that of a person who has come into unauthorized possession of it. Therefore, to provide for confirmation that it is genuine, the document of the present invention has incorporated in it a finely divided material which is normally invisible but which is mechanically detectable (e.g., ferromagnetic material), arranged in a distinctive pattern across a zone of the document that includes its personal identification data.

The document illustrated in FIGS. 1-3 comprises a thin but relatively stiff base 9 of cardboard, sheet plastic or the like, to which is secured the photograph 6, which can be an ordinary print on paper-base material. Before the photograph is bonded to the base 9, there is applied to the predetermined area of the base that will include at least a substantial portion of the photograph a random scattering or distribution of finely divided ferromagnetic material 11, which can be made to adhere to the base by first covering the front surface of the base with a thin coating of a bonding agent. If the photograph is removed from the base and replaced with another, that portion of the pattern defining material that was beneath the original photograph will be removed at least in part, thus altering the pattern so that the spurious character of the document will appear when it is presented for verification, as explained hereinafter.

As an alternative to coating the pattern over the base and beneath the photograph, the pattern can be formed on a thin, transparent cover film 12 that is bonded flatwise across the front face of the base and over the photograph. Because the finely divided ferromagnetic material on the cover film 12 comprises only a thin, invisible layer, it does not interfere with examination of the photograph. Any attempt to remove the photograph with require that the film 12 be first removed, thus destroying or altering the pattern.

It will be apparent that the pattern of ferromagnetic material could be a composite one, provided by a coating on the front surface of the base, extending beneath the photograph, and another on a cover film overlying the base and the photograph.

Since the finely divided material that defines the pattern is randomly distributed, the pattern on each document will be unique in that it will differ from the patterns on all other documents issued by the same authority; for it will become apparent as the description proceeds that an almost infinite variety of patterns is available.

When the document has been prepared, the ferromagnetic material is magnetized in a reader 14 to which the document is presented and which comprises a magnetic reading head 15 and means for taking readings at predetermined stepwise intervals along parallel scan lines extending in one or more directions across the surface of the document. The reader detects different magnetic intensities in different parts of the pattern, in accordance with the density and distribution of the ferromagnetic material in the pattern, and it produces electrical output signals corresponding to these different magnetic densities, which output signals are transferred to a recorder 16 that can comprise the memory bank of a data processing computer 17. In the memory bank the output signals produce a record which is a coded representation of the pattern and which is readily accessible for future reference.

Into the memory bank or other record storage means there is also fed other information relating to the owner of the document, such as a registration number or the owner's name. For this purpose the magnetically readable registration number 8 on the document 5 is outside the zone of the pattern, so that it can be automatically read substantially simultaneously with scanning of the pattern, without interference from the ferromagnetic material defining the pattern, and can be recorded in association with the pattern record.

After recording, the document is demagnetized and is delivered to the person for whom it was prepared. When he subsequently presents the document to assert the right that it establishes, his identity will be confirmed by the photograph and other identification material on it, and the authenticity of the document can be verified by presenting it to a reader similar to the reader 14, connected with the memory bank 16 or otherwise associated with the record or a copy of the record to enable the pattern on the document to be compared with the record of it.

The reading head 15 of the reader 14 can comprise a bank of head elements arranged in groups of three, each group comprising (as illustrated in FIG. 6) a magnetizing head 19, a detecting head 20 and an erasing head 21; and the groups can be arranged in a row (as illustrated in FIG. 7) for taking readings along predetermined lines across the document. As shown in FIG. 5, the reading head 15 is carried on an arm 24 that is mounted the swing in an arc across the document, about the axis 25. As the arm swings, it carries the groups of heads across the surface of the document in concentric arcs, with any point on one of said arms being successively passes over by a magnetizing head, a detecting head and an erasing head.

The output signals from the several detecting heads are fed into the memory bank 16 through an amplifier 23.

In the event that a document embodying the principles of this invention is lost, the owner can promptly notify the issuing authority. The recording corresponding to it can then be immediately erased or destroyed, and a new and different document and record can be readily produced.

Certain types of documents preferably carry no identification of the person authorized to use them, as for example a bank account card that could be misused if it became lost and were found by an unscrupulous person who might use it if he knew the identity of its rightful owner. A document of that type, which is represented by FIGS. 9 and 12, can advantageously embody the principles of this invention, but the visible data on it would be such as would merely signify its nature or purpose for the owner's convenience, without disclosing his identity. The significant information on such a document would be that contained in a unique pattern of mechanically detectable but invisible material, in accordance with this invention.

In presenting such a document, its owner would not have to show it to any agent of the bank or other issuing authority, since the visible indicia on it would not be especially significant, but, instead, he would present it to a detecting device like the reader 14, and would establish his identity as the person entitled to use it by supplying to the reading machine or an

associated device a coded symbol (name, word or number) known only to him and recorded along with the pattern record. The proper association of the pattern output from the reading device with the coded symbol supplied by the document holder would thus confirm both his identity and the authenticity of the document.

FIG. 4 represents the output signals that would issue from a reader as it scanned the pattern shown in FIG. 2 along the lines  $a-a$  and  $b-b$ . For accurate reading of such a diffuse pattern, which produces relatively small and gradual variations in the output signal, the reader and recorder must both be of good quality. Furthermore, the recorded codification of the pattern must be of such character that deviations within certain prescribed tolerance limits will be accepted, in order to allow for tolerance and deviations in the various reading devices to which the document may be presented from time to time. The amplifier 23 for each reading device can be adjusted to compensate to some extent for individual differences in the reader.

However, various expedients can be employed to produce a pattern having more sharply defined contrasts, so that the reading device is not called upon to discriminate closely and can therefore have larger tolerances. For example, the pattern can be interrupted by well-defined lines of discontinuity 27, as illustrated in FIG. 8. These lines can be formed by scoring or scraping the coatings of ferromagnetic material and binder on the base 5 or cover film 12, or by scattering the ferromagnetic film onto the coating of binder through a screen of appropriate mesh that closely overlies the binder. With this type of pattern the output signal from the reader will have sharp, stepwise changes whenever a line is crossed in the course of scanning, thus affording a recording that has well defined characteristics corresponding to the lines and varying values for the areas of material between the lines.

A pattern which lends itself to very definite discrimination is illustrated in FIG. 9 and consists of more or less jagged lines of ferromagnetic material. Preferably such a pattern is formed on each of two pattern carriers 27 that are flatwise fastened together with their lines extending generally transversely to one another.

One of the pattern carriers 27 can comprise the base 9 and the other can be a cover film 12 overlying the base. However, the preferred method of forming such a pattern is to apply a coating of crackle lacquer or the like to a very thin sheet of aluminum of an aluminum alloy having a nonuniform grain structure, and then tension the sheet in one direction to cause cracks to develop in the lacquer, which cracks extend generally parallel to one another but are irregular and nonuniform and thus define a unique random pattern. The finely divided ferromagnetic material, mixed in a fluid binding agent, is applied to the lacquered surface, and a magnet is placed below the sheet to draw the material down into the cracks. The excess material is then wiped off the sheet and the binder is allowed to harden, after which a pair of card-size pattern carriers are cut from the sheet and bonded together with their lines transverse to one another to form a card which can be embedded in plastic.

In the document made by the method just described, wherein the magnetic material occupies only the cracks near the surface of each pattern carrier, the jagged lines of magnetic material are at two different levels, and therefore the finished document produces output signals at three different levels, as indicated by FIG. 11, which depicts and signals produced in scanning along the lines  $c-c$  and  $d-d$  in FIG. 9. The lowest signal level  $A_0$  will occur in the zones where neither of the pattern carriers directly beneath a reading head has a crack; intermediate level signals  $A_1$  will occur when there is only one thickness of ferromagnetic material beneath the head; and signals of a high level  $A_2$  will be produced where lines of ferromagnetic material cross one another beneath the head to afford a double thickness of material.

In the embodiment of the invention illustrated in FIG. 12, a unique pattern has been produced by feeding a sheet of pat-

tern carrier material, having a more or less uniform coating of ferromagnetic material mixed in a binder, beneath a group of spaced-apart styli that are individually and randomly actuated by a data processing computer, to produce a pattern of parallel scratches 28 that are interrupted at irregular random intervals. As with the FIG. 9 embodiment of the invention, individual pattern carriers can be cut from the sheet thus processed, superimposed upon one another, and embedded in plastic to form documents.

It will be appreciated that finely divided ferromagnetic material is only one example of an invisible but mechanically detectable material suitable for employment in connection with the present invention. It is possible to use, instead, materials having electrical resistance or capacitance characteristics, or a fluorescent or other photoresponsive material; and in such cases the reader will of course be adapted to respond to the particular type of material used.

From the foregoing description taken with the accompanying drawings it will be apparent that this invention provides a method of identifying an individual and confirming his entitlement to a personal right, a readily verified personal document for confirming an individual's entitlement to a personal right, and a simple and inexpensive method of manufacturing such a document.

What is claimed as our invention is:

1. A document of the type intended to be carried by an individual and presented to verify or assert a right personal to him, said document being characterized by:  
finely divided ferromagnetic material in a scattered random pattern of nonuniform density concealed in a predetermined zone of the document, so that after the ferromag-

netic material is magnetized by subjecting it to a magnetic field which is of uniform intensity in all portions of said zone, motion of a magnetic detector relative to the document across said zone will produce a variable but repeatable output which, when recorded, comprises a coded representation of the pattern to which subsequent reference can be made for verifying authenticity of the document.

2. A document of the type intended to be carried by an individual and presented to verify or assert a right personal to him, said document being of the type having finely divided magnetized ferromagnetic material concealed in a predetermined zone thereof that presents a distinctive pattern of magnetization to mechanical detector means by which the document can be verified, said document being characterized by:

the ferromagnetic material being distributed in said zone in a scattered random pattern of nonuniformly varying densities of such material.

3. The document of claim 2, further characterized by:

the ferromagnetic material being sandwiched between layers of other material that define the surfaces of the document, so that the presence of the ferromagnetic material is normally concealed by such other material, and so that any attempt at alteration of the pattern of distribution of the ferromagnetic material requires defacement of the document.

4. The document of claim 2, further characterized by:

visible indicia identifying the authorized possessor of the document in a zone overlapping said predetermined zone.

\* \* \* \* \*