Nov. 23, 1971 H. S. JONES ET AL 3,621,589

INDICIA CODING AND DECODING APPARATUS

Filed Dec. 3, 1968

FIG. 1.

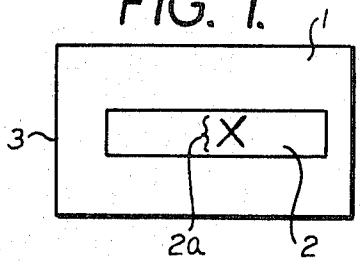



FIG. 2.

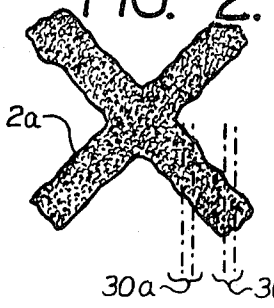



FIG. 3.

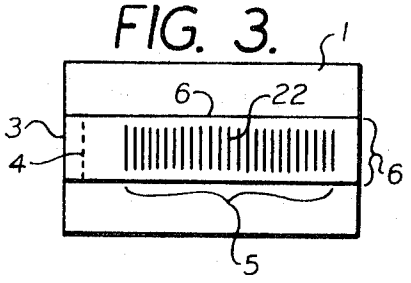



FIG. 4.

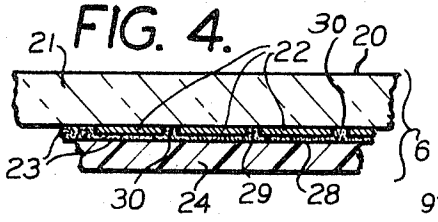



FIG. 5.

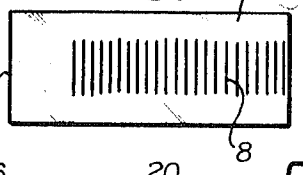



FIG. 6.

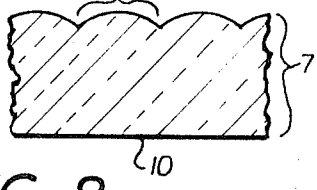



FIG. 7.

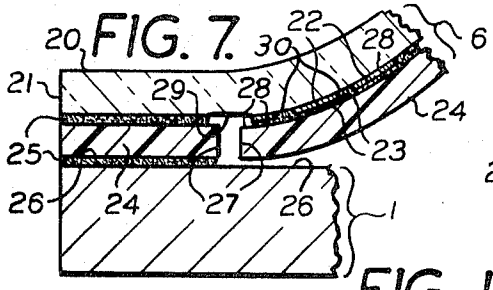



FIG. 8.

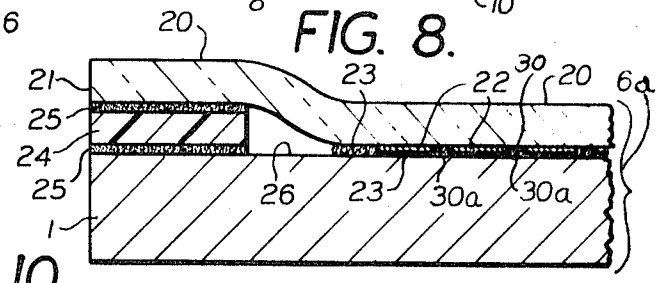



FIG 10.

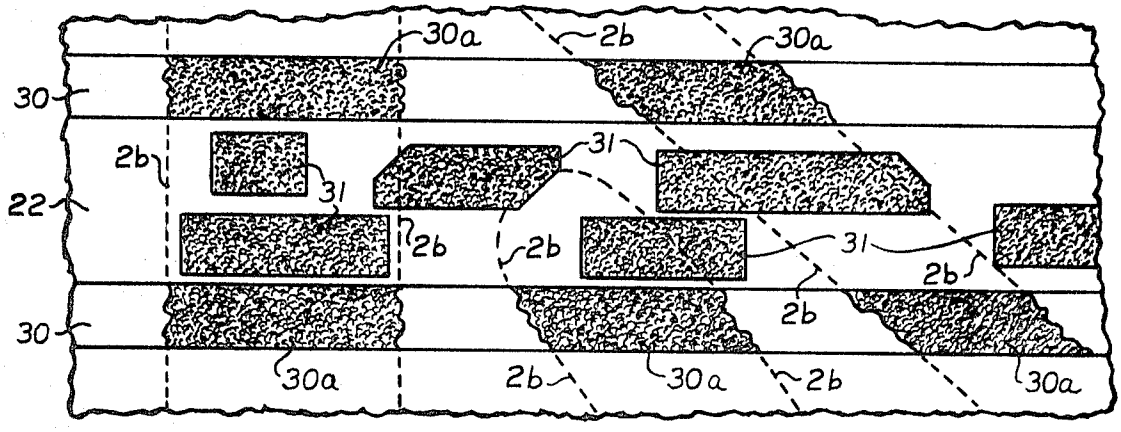



FIG. 9.

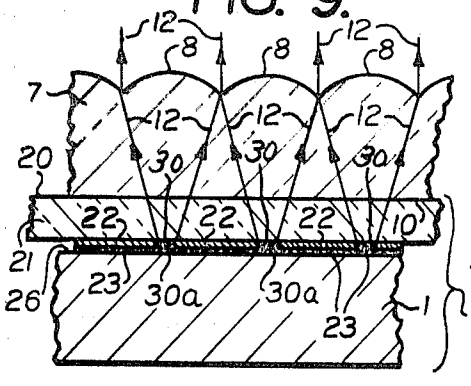



FIG. 11.

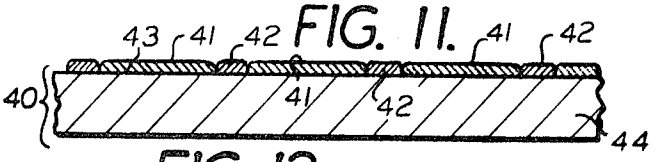
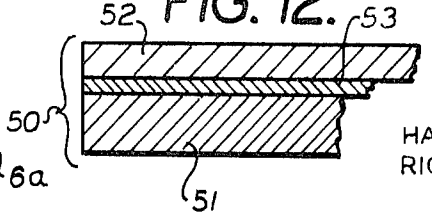



FIG. 12.




INVENTORS
HARRY S. JONES
RICHARD P. SPOHN

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3,621,589

# INDICIA CODING AND DECODING APPARATUS

Harry S. Jones, 50 Mavesink Drive, Monmouth Beach, N.J. 07750, and Richard P. Spohn, 108 Potter Road, Scarsdale, N.Y. 10583

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U.S. Cl. 35—2 6 Claims

## ABSTRACT OF THE DISCLOSURE

An information security system wherein a masking pattern is permanently added to either a signature or any larger written or printed matter or diagram thus coding and causing the material to be substantially unreadable and wherein an optical readout plate having a multiplicity of lenses arranged to match the masking pattern is used for decoding or readout purposes. The use of camouflaging marks on the masking pattern further reduces the possibility of readout without the optical readout plate.

This invention relates to the coding and decoding of written, printed or drawn information and more particularly to improved apparatus for information security.

The need for simpler means for the prevention of forgery is well-known. The extensive use of credit cards and the illegal use of lost or stolen cards has increased the urgency of solving this problem. In addition to the forgery problem, there is the need for a simple means for the coding of full written or printed pages or diagrams, together with correspondingly simple decoding or readout means.

Related art now uses either an ink or a writing background which fluoresces under ultra-violet ("black light") to achieve the above purpose. This method possesses the disadvantages that readout can be done easily only under such black light, which is not readily available. A black light source requires a special lamp that is potentially injurious to the eyes if used many times each working day. Such a light, while not expensive, does cost in the order of $5.00. Although this form of invisible signature is not readily readable without black light, it can be read by resourceful, technically-oriented persons using special types of visible lighting, heat, chemical treatment or other the ultra-violet light sometimes used for sanitary purposes in restrooms.

This invention provides a very simple and practical means for the solution of the above-described problem and does not require special lighting. Although it is described below in a form directly applicable to credit cards, it will be clear to those skilled in the art that this invention is also equally applicable to very large printed or written sheet, bank books, travelers checks, etc.

In essence, this invention may be described briefly as follows:

An otherwise conventional credit card of paper or plastic has attached to its top or signature side an additional sheet comprising a transparent film with an opaque masking pattern (most simply; a line grid) on the side facing the signature on the card. This side is also provided with an adhesive coating of the type used on transparent "Scotch" tape. To prevent premature sticking, a



third sheet, while is removable and disposable, is provided between the adhesive surface of the mask and the signature side of the card.

The credit card holder is instructed to sign his card in the samer manner as now conventionally done or the card is printed upon by lithography or otherwise. However, he is further instructed to remove the disposable cover over the adhesive side of the masting sheet and then to seal the adhesively-coated mask over his signature. When this is done, the masking sheet prevents his signature from being seen, read or copied. However, when a suitable transparent lenticular decoding or readout sheet having an appropriate light receiving aperture pattern is placed over the masked signature, and light is passed therethrough from a light source means, the original signature becomes clearly readable. These decoding sheets will only be available to those who honor credit cards and not available to unauthorized persons. As an additional security precaution, the masking pattern and matching decoding sheet may be changed each year, or as often as desired.

The above system possesses the great advantage that a photograph of the card holder is not necessary for security. Further, it permits readout in any readily-available visible light.

The card holder may use any type pen or pencil he desires to sign the card. When desired, the decoding sheets may be made part of or may be chained to the card-printing machines now in use, in order to minimize their theft by potential forgers.

Referring to the drawings:

FIG. 1 illustrates a typical paper or plastic credit card having the usual area for the owner's signature. For simplicity of illustration the owner's signature is shown in FIG. 1 is a letter "X" but may, of course, be any series of characters in any language whatever.

FIG. 2 shows an enlarged view of the above-mentioned letter "X."

FIG. 3 illustrates an assembly which is attached to the credit card.

FIG. 4 shows an enlarged fragmentary sectional view perpendicular to the plane of FIG. 3.

FIG. 5 shows one form of optical readout plate.

FIG. 6 shows an enlarged fragmentary sectional view of the optical readout plate shown in FIG. 5.

FIG. 7 shows an enlarged fragmentary sectional view perpendicular to the plane of FIG. 3.

FIG. 8 shows an enlarged fragmentary sectional view perpendicular to the plane of FIG. 3 after a disposable portion has been removed.

FIG. 9 is an enlarged fragmentary sectional view perpendicular to the plane of FIG. 3 showing the masked card with the optical readout plate in position for readout of the signature.

FIG. 10 is a greatly enlarged fragmentary plan view of a masking line containing camouflaging marks.

FIG. 11 is an enlarged fragmentary sectional view of an alternate masking system.

FIG. 12 is an enlarged fragmentary sectional view of a modification which provides an unmasked original or a copy of the masked information.

Referring now to the various figures, the invention may be described most effectively by starting at the time the cardholder activates his card. When he receives his card,

the cardholder is instructed to lift assembly **6** away from card **1**, a shown in FIG. 7 and to sign card **1** within space **2**, as shown in FIG. 1. He may use any type of pen or pencil he chooses. He is next instructed to peel off sheet **24** from masking sheet **21** which contains unpeelable opaque masking lines **22**, said sheet **21** being attached by transparent, viscous, adhesive material **23** to disposable peel-off sheet **24**. As shown in FIG. 3 and FIG. 4, assembly **6** may be constructed using materials similar to those employed in the commonly-known transparent "Scotch Tape." The adhesive **23** will then peel away from surface **28** of sheet **24** and remain adhered to side **29** of sheet **21** and masking lines **22**. The cardholder is finally instructed to seal the adhesive side **29** of masking sheet **21** over his signature **2***a* on card **1**. When this sealing operation has been performed, his signature will, for all practical purposes, become unreadable. The camouflage markings **31** shown in FIG. 10, and subsequently described, further reduce the readability of the masked signature.

Clearly, the surface texture of signaure area **2** and the charcteristics of adhesive **23** must be chosen so that if an attempt is made to remove sheet **21** from card **1**, the signature will be totally destroyed or rendered unreadable by disruption of the surface of signature area **2**.

Sheets **1**, **21** and **24** may be attached by adhesive material **25** over a suitable area such as shown between dotted line **4** and edge **3** in FIG. 3, or by any other suitable means. To facilitate removal and disposal of sheet **24** a separation or perforation **27** or any other suitable means may be provided in sheet **24** so that it may be removed from sheet **21** in assembly **6** and then sealed over sheet **1** to produce masked or coded signature card assembly **6***a* as shown in FIG. 8.

When the cardholder uses his card to charge a purchase of any kind, the signature on his card may very quickly be read or decoded and compared with the signature he has placed on the bill he wishes to charge by means of the optical readout or decoding plate **7** shown in FIG. 5 and FIG. 6. Such readout is accomplished by placing the transparent readout plate **7** in contact with the masked signature so that surface **10** of plate **7** faces surface **20** of card **21** as shown in FIG. 9 and so that lens elements **8** are parallel with opaque masking lines **22**. The width of such closely-adjacent lens elements **8** must also be substantially the same as the spacing between masking lines **22**. This parallel matching relationship between masking lines and cylindrical lenses may be accomplished by means of a parallel common flat surface or straight edge (not shown) against which both edge **3** of card **1** and edge **9** of readout plate **7** are held, or by any other suitable means.

To simplify this matching operation, the parallel masking lines and cylindrical lenses may be slightly out of parallel with the common straight edge so that when the readout plate is made to slide against the straight edge relative to the masking lines lateral phasing of the lens axes relative to the masking lines will be a fine adjustment. As illustrated in FIG. 3 and FIG. 5, with vertically-oriented masking lines and lens axes, the matching movement will be nearly vertical. However, when desired, the lines, lenses and matching movement all could be effectively horizontal, or at any angle between. It will be obvious that the nearer the direction of the parallel lines and lenses coincides with the direction of matching movement the finer the phasing adjustment will be, therefore necessitating that the cylindrical lenses **8** be longer than the masking lines **22**.

The optics of the readout system are illustrated in detail in FIG. 9. When masking lines **22** are sealed over the signature **2***a* written on surface **22** of card **1** as shown in FIG. 8 only strips **30***a* of the signature "X" as shown in FIG. 2 will be visible through the transparent strips **30** between adjacent masking lines **22**. However, when the curvatures of cylindrical lens elements **8** are chosen so that all external rays **12** from strips **30** or signature bits **30***a* will be substantially parallel then the space **30** between adjacent strips **22** will appear magnified and will fill the portion of each adjacent lens **8** over the signature when rays **12** are used to view the signature. It will be clear that if the spacing between transparent strips is made comparable with the width of line produced by a typical ball or quill-type pen the representation of the signature seen via readout plate **7** will appear quite adequately detailed. It will also be clear to those skilled in the optical art that by tilting the masked signature card asembly **6***a* covered by plate **7** about an axis parallel with masking lines **22** or lenses **8** the signature will be made to "flash" into view when the multiple line images of the viewer's eye or eyes are focused upon transparent strips **30** and signature bits **30***a*. The viewer will, of course, only utilize substantially parallel rays **12** even though signature strips **30***a* may be illuminated by ambient light rays entering lenses **8** from all possible directions.



Although the above-described system will be very difficult to read without the optical readout plate **7**, it might be possible for a highly-skilled person to decipher the signature without plate **7** after much painstaking effort, even though the opaque masking lines and the signature surface are made to have substantially the same color and surface texture on their facing surfaces. To further render such deciphering virtually impossible by making such effort many times greater and more time-consuming, the portions **30***a* of the signature visible through transparent spaces **30** may be camouflaged by marks **31** printed on the surface **29** and visible through the sheet **24** from the side thereof, as shown in FIG. 10. Marks **31** may be of one or more colors and randomly placed and of various shapes that are typical of actual signature bits **30***a*. Dotted lines **2***b* indicate the portions of the signature masked by lines **22**.

Since the readout plate **7** will reveal the signature only when it is properly aligned, the camouflaging marks will not be seen. However, when the plate and card are tilted to either side of the signature-reading position, only the camouflaging marks **31** will be visible. Since these marks will be arranged in a random pattern only a meaningless "salt and pepper" pattern will then be seen in readout plate **7**.

Although, for purposes of illustrative simplicity, a series of vertical masking lines and cylindrical lenses oriented parallel with these masking lines has been used in the foregoing description it will be clear to those skilled in the art that many design variations and improvements may be made without departing from the basic principles of this invention. For example:

(a) The masking grid lines and cylindrical lenses both may be situated at any pre-determined angle to edges **3** and **9** to facilitate signature readout by sliding the plate **7** vertically over card **1** using a common surface against which edges **3** and **9** are held.

(b) The lines and lenses may deviate from parallel.

(c) The lines and lenses may be substantially horizontal.

(d) The spacing of local groups of lines and matching lenses may vary relative to more remote areas.

(e) Assembly **6** may be attached at any edge of card **1**.

(f) The ratio of transparent to opaque masking line widths may vary.

(g) The lines and matching lenses may be correspondingly curved.

FIG. 11 illustrates a modified system which utilizes the same basic coding and decoding principles that are utilized in the system described above. In the FIG. 11 system a coating is applied to the signature side of the signature card assembly **40** by any suitable means such as by mechanical printing on surface **43** of card **44**. The coating **41** consists of material (such as starch, sugar or gelatin holding a suitable opaque pigment) which is readily soluble in water, or in other common liquids. Space is retained between various segments of soluble coating **41**

which space has printed therein any suitable insoluble material **42** that can easily be written upon. Both the soluble and insoluble material **41** and **42** respectively should, preferably, have substantially the same thickness or depth measured from the surface **43** so that when both surfaces are written or printed upon there will be no difficulty with the writing or printing process.

The cardholder is instructed to sign his card **40** in any usual manner over the area containing the soluble and insoluble lines **41** and **42** described above. He is then further instructed to wash and rinse the lined surface of the card in warm water, or in any other suitable solvent capable of removing lines **41**. Such washing will then remove the soluble lines **41** which will remove the greater portion of his signature and expose the card base while leaving lines **42** containing only bits of his signature. To further reduce the readability of the signature, camouflaging marks similar to marks **31** may be previously printed upon the base surface **43** over which the soluble lines **41** are printed, such camouflaging marks having the same function as described in the previously-described system and being similar to those illustrated in FIG. 10.

It will be clear that equivalent masking will be achieved by both systems described and that practical considerations will determine' which system is best for a specific use.

Although this invention has been described in connection with the coding and decoding of a simple signature, it is obvious that a full page of handwritten or printed material (or a drawing) may be coded and decoded by the means described. In order to accommodate the greater number of information bits involved the total number of opaque masking lines and the number of corresponding cylindrical lenses would, however, have to be increased.

Although cylindrical-type lenses are the simplest to align with a corresponding masking pattern, a dot or hole-type masking pattern could also be used in conjunction with a matching array of spherical-type lenses. Such a system of elements would provide increased security but would involve somewhat greater complexity of alignment of the readout or decoding plate relative to two axes rather than one axis, as herein described.

It will be clear that other means for effective masking and camouflage are possible by modification of the above-described means but that these modifications will utilize the overall principles taught in this specification.

It will be clear to those skilled in the art that if one or more copies of the unmasked signature are desired for any other purpose the card **1** (previously described) may be replaced by an assembly **50** as shown in FIG. 12 which is equivalent to any commonly-used alternate stack of paper and carbon paper. In assembly **50** a carbon paper sheet **53** and a writing paper sheet **52** may be attached to a sheet **51** which may be a cardboard or plastic sheet of substantial thickness or if desired may be another sheet of paper such as sheet **52**. It will be obvious that more than one copy may be made if additional paper and carbon assemblies are employed in the usual manner. It will also be obvious that the masked original, or a masked carbon copy, may be decoded by a decoding plate similar to plate **7** shown in FIG. 5. The components **51**, **52** and **53** of assembly **50** and the components of assembly **6** in FIG. 7 may be attached by any desired combination of adhesive and/or mechanical means over any desired portion of the areas of these assemblies and of the assembly **6**. In the above description of assembly **50** the term "carbon copy" is intended to include any other similar process wherein a copy is produced by deposit of material upon or removal of material from the copy surface as the original copy is inscribed.

It will be clear to those skilled in the art that when desired, assembly **40** shown in FIG. 11 may also be used either as the original copy surface or as the carbon copy surface. If used in lieu of the original copy sheet **52** then base sheet **44** of assembly **40** should, preferably, be sufficiently thin and flexible to permit a sharp copy to be impressed through it upon copy sheet **51**.

Although in the foregoing description of this invention the steps of writing, masking and readout are described as occurring in a time sequence, it will be clear that when desired all steps may occur simultaneously. For example, if a glass plate containing opaque masking lines with or without camouflaging marks were written upon with a suitable marking means such as crayon, preferably upon the side having masking lines, the written information could be simultaneously read through a readout plate properly placed adjacent to or against the masking plate. When desired pre-masked or pre-coded information ready for decoding by means of a readout plate may be printed in quantity.

Having thus described our invention we claim:

**1.** Method of rendering intelligible indicia unintelligible which comprises starting with a substrate having an indicia receptive portion on at least one major surface thereof and a separable assembly over at least said indicia receptive portion, which assembly comprises a masking sheet having alternately arranged transparent and opaque portions and a disposable peel-off sheet assembly adhesively adhered thereto; separating said assembly from said substrate; applying indicia to said indicia receptive portion of said substrate; peeling said disposable peel-off sheet from said assembly; laying said masking sheet over said indicia thereby obscuring at least about 50% of said indicia by the opaque portions of said masking sheet and leaving discontinuous bits of indicia visible through the transparent portions of said masking sheet; camouflaging said indicia by providing extraneous additional markings visible with said indicia; and adhesively securing said masking sheet substantially permanently to said substrate whereby rendering said indicia underneath said masking sheet unintelligible when viewed solely therethrough.

**2.** Method as claimed in claim **1**, wherein about 50% of said indicia is obscured by the opaque portions of said masking sheet.

**3.** Method as claimed in claim **1** including providing said camouflaging extraneous additional markings on at least the transparent portions of said masking sheet.

**4.** Method of converting the unintelligible, discontinuous bits of indicia on a substrate produced by the method of claim **1** into a facsimile of the original indicia appiled to said substrate underneath said masking sheet which comprises arraying a multiplicity of substantially transparent lenticulations into a pattern corresponding to the pattern of said transparent portions of said masking sheet; overlaying said arrayed lenticulations on said masking sheet; optically aligning said lenticulations with said transparent portions; viewing said discontinuous bits of indicia through said lenticulations; and optically enlarging said bits of indicia by said lenticulations to an extent sufficient to substantially facsimilate the original indicia.

**5.** Method as claimed in claim **4** wherein said transparent portions are substantially parallel and of equal width with respect to each other.

**6.** A composite assembly comprising a substrate with intelligible elongated indicia thereon; a masking sheet having alternate opaque and transparent portions; which transparent portions are arranged parallel with respect to each other, in a plane substantially parallel to the plane of said indicia and in a direction substantially normal to the elongated dimension of said indicia, said masking sheet being substantially permanently adhesively secured over said intelligible indicia such that said opaqque portions of said masking sheet obscure at least about 50% of said intelligible indicia, sufficient to render said indicia unintelligible and such that bits of said indicia are visible through the transparent portions of said masking sheet; and camouflaging extraneous data bits viewable through

said transparent portions, which camouflage bits render said indicia further unintelligible.


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ROBERT W. MICHELL, Primary Examiner

J. H. WOLFF, Assistant Examiner

U.S. Cl. X.R.

40—2.2; 283—6