Oct. 18, 1966 F. J. RUDERSHAUSEN ETAL 3,279,826

CREDENTIAL

Filed May 27, 1964

Fig. 1.

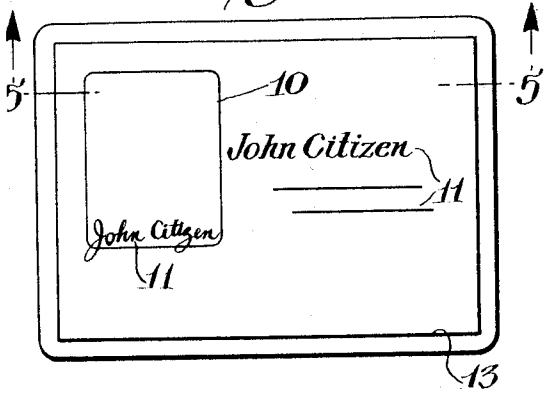


Fig. 2.

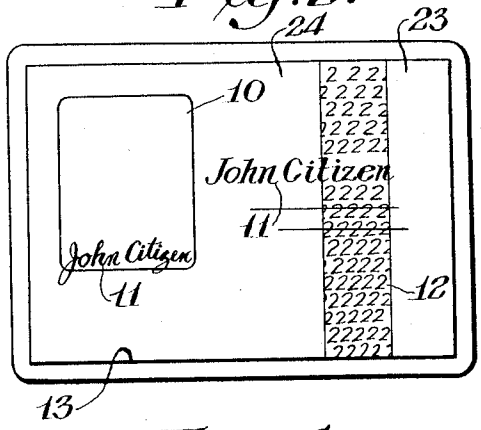


Fig. 3.

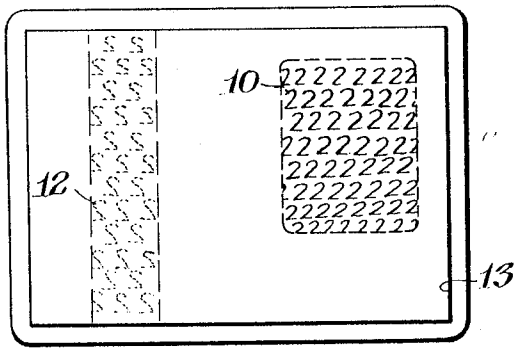


Fig. 4.

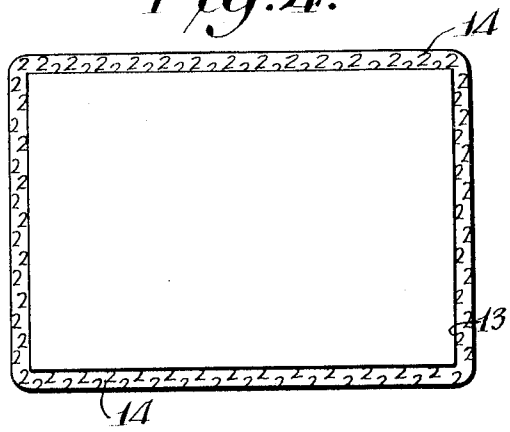
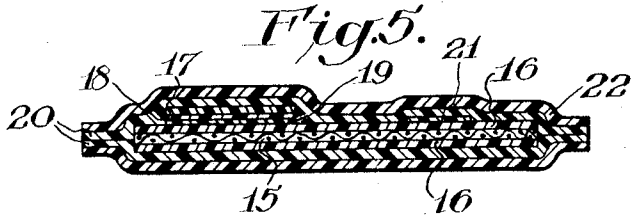


Fig. 5.



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3,279,826

CREDENTIAL

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This invention relates to the procedures and materials for identifying a given entity. More particularly, it relates to identification matter which is resistant to tampering.

With the vastly increasing amount of communication that is going on not only within a given country but within and among all of the countries of the world, there has arisen an increasing need for an identification card or credential or similar matter which can be carried by a given individual and be presented to the receiver with reasonable assurance to the receiver that the identification matter has not been altered and the one presenting the credential is indeed offering a proper entity to be identified. For instance, identification cards are being used in a wide variety of places as, for example, in the military services, industrial plant passes, check cashing and the like. Hithertofore, the identification credential has been capable of being skillfully altered by unauthorized persons. Photographs of the person in the identification credential have been carefully removed and replaced so that there is no way of checking the authenticity of a given pass or card. It is possible to take the identification cards of the prior art and deftly remove protecting laminated forms that surround a paper core without harming any of the printing or other matter on the paper core and then substituting for the removed laminated films other laminated films which may bear the same or the like identification marks that may have been printed into the film prior to its use in laminating. Of course, the party making the change will remove the photograph on the paper core and substitute his or someone elses prior to the relamination. In the past, in instances where the laminating films have had no identifying marks printed on them, it has been a relatively simple matter to cut through the laminating layer over the face of the photograph around the edge of the photograph and remove the image from the core. This done, a substitute photograph can be placed in the cut out portion of the credential and the assembly relaminated. Only by a meticulous examination can the substitution be detected. Thus, a higher degree of tamper resistance is urgently needed.

Accordingly, an objective of this invention is the provision of identification credentials which are for all practical purposes tamperproof. Another purpose of this invention is the provision of identification credentials in which the identification material is intimately bound into and with the protective films. A still further aim is the provision of a means within the identification credential by which the recipient of an offered identification card can quickly check on its authenticity. These and other objects will appear hereinafter.

The goals of this invention are accomplished by a combination of an inner portion, identification information, a fluorescent coating and an ultraviolet screening agent. The inner portion comprises a core which may be a photograph or similar identification material or a piece of cardboard or the like, or a combination of the two. The inner portion is preferably coated with a material that is receptive to typewriting, printing, pen signatures and the like and which, at the same time, is compatible or bondable with the film that is to surround the core in the laminating process. An invisible ink is used in making up certain identifiable features of the

credential. This, preferably, is an ultraviolet screening agent which is not visible under ordinary light but which is visible against a fluorescent background and which prevents ultraviolet rays from passing through it. This inhibitor or screen, being present only in certain places in the laminated assembly, allows ultraviolet rays to strike only those areas as are desired to be excited to show fluorescence of the fluorescent material and thus it appears itself in contrast. The manner in which the fluorescent material and the inhibitor or screen are placed in relation to each other offers a multitude of variations in identifiable patterns which, when viewed under ultraviolet light, assist in testing the authenticity of the credential in which they are used. It is an important feature for identification cards that the photograph be treated on the front or the back or both with a fluorescent material or that photographic material that is itself fluorescent be used.

As mentioned above, if an inner portion is used that is coated prior to lamination, the material with which the portion is coated is highly compatible or bondable with the surface of the laminating material placed in contact with it. With the identifying data placed on the surface of the coated portion, this data, in effect, becomes a part of the protective film during the fusion that takes place during the laminating process. By this means, if an attempt is made to remove the protective films from around said portion in order to substitute different identifying data, the one attempting to do so will destroy such data, for it is securely locked within the surrounding matrix composed of a fusion of said coating and the element of the laminating material placed in contact with it. Further, if any of the laminating material is removed from said portion, there will be removed with it the screening agent which is incorporated in the laminating material in the manufacturing process. Accordingly, any substituted laminating material lacking the ultraviolet screening agent or if having it but not placed in exactly the original pattern, would cause the altered credential to show a modified pattern from the original when viewed under ultraviolet light, thereby attesting to its altered nature. Should the one attempting to alter the credential decide merely to remove the original photograph and substitute another as described herein before, he would be similarly defeated, for should he not apply fluorescent material properly to the photograph or use the proper photographic material the omission would be immediately detected when the credential is viewed under ultraviolet light. But even if he did so apply the fluorescent material with the substitute laminating material he would use, lacking the screening agent in toto or in its originally distributed pattern, the photograph area of the altered credential would show a modified pattern from the original when viewed under ultraviolet light. Even though the rest of the credential may appear unaltered and genuine in normal light or under ultraviolet light, the altered pattern of the photograph area alone when viewed under ultraviolet light, would be sufficiently revealing to disclose alteration of the card.

Below follows a description of this invention particularized as to an identification card. It is to be understood, however, that the principles of this invention apply to documents other than such cards as, for example, to stock certificates, legal documents, passes and valuable papers of all kinds.

This invention will be further understood by reference to the description below and to the drawings in which:

FIGURE 1 is a plan or front view of an identification card within the principles of this invention as it appears under ordinary or normal light;

FIGURE 2 is the same view of the same card as it appears under ultraviolet light;

FIGURE 3 shows the back of the credential when under ultraviolet light;

FIGURE 4 shows the front or rear against a fluorescent shade or background with identifying data left off the inner portion for convenience; and

FIGURE 5 is a cross-sectional view of the assembly, ready for lamination, taken on line 5—5 of FIGURE 1.

Referring to the drawings, it can be seen in FIGURE 1 that a credential of this invention may comprise a place for identification **10** such as a photograph and identification information **11**, this being data of a variety of kinds such as a name, address, and the like. The credential as it appears under ordinary light seems to be no different than an ordinary identification card. However, when viewed under ultraviolet light, it takes on the appearance shown in FIGURE 2. There it can be seen that a frame **12** appears and within the frame there are numbers of the same kind, various kinds and the same sequence or various sequences, as desired. If desired, the signature of the person whose photograph appears at **11** can also be written at **12** to appear only under ultraviolet light. It is to be appreciated that the number sequence given at **12** and/or the signature of the owner of the card can appear at as many places as are desired. Thus, the location of the identifying data can be picked as best fits the needs, and it is possible to have the holder of the card sign in several places. Further, it is to be appreciated that under ultraviolet light examination the remaining portions of the credential do not show any additional marks because of the absence of the fluorescent coating/screen combination in those positions. The screening agent present in the form of the numbers 2 in the area **12** is on top of the fluorescent coating in that area and prevents the ultraviolet light rays from passing through it so that the numbers appear when the credential is examined under ultraviolet light. Thus, upon the activation of the ultraviolet rays the signatures and the material written or typed with the screening agent can be read. Also, it should be noted that the core **13** that is used, whether it is a photograph or a similar paper carrying identifying data or both, may be, for convenience, printed, uniformly or variously, with any desired number sequence or any other such identifying information so that at least one part of an inner portion will bear a known and given identification datum irrespective of where the screen material is placed. Thus, a wide variety of markings can be used. This is an advantage in certain locations, such as highly restrictive areas, where passes are changed, new ones being issued frequently making old ones obsolete.

In FIGURE 3, which shows how the device appears when the rear is examined under ultraviolet light, there are shown the numbers 2 in section **12** in the reverse. In the specific embodiment shown, the core **13** is transparent or translucent; were it opaque then the reverse figures would not show. In most credentials of this invention, however, the back will bear identifying data on it and if a photograph is involved, the photograph will have on the back thereof certain marks as part of the code. Thus, in FIGURE 3, the area **10** shows a plurality of numbers exemplifying how this might appear in one embodiment.

It is also to be appreciated that identification marks may be placed on the films that are to be used in the lamination. In this way data are built into the final assembly as an intimate part of the whole. For example, a film is printed with an invisible ultraviolet screening agent, the printing being over the entire surface or only at certain parts as desired. This printed film is then used in making the lamination, and since the fluorescent coating is only placed at certain strategic places, the said printed matter will appear when examination is made under ultraviolet light only where the screening agent is lying on top of a fluorescent surface. Therefore, in FIGS. 2 and 3 no numbers appear at the edges. However, if the card is placed on top of a fluorescent surface and then examined under ultraviolet light, the printed matter, such as the numbers 2, will appear at the edges

14, as shown in FIG. 4. For convenience, the central portion in FIG. 4, whether it be front or back, is shown in blank. Further, if a printed film is used on both sides in the laminated structure, then the edges **14** will normally show the printing in reverse, also. Also, it is to be understood that a coated section with screening agent thereon, such as section **12**, can be placed on the rear, too, so that correct, rather than reverse, numbers would appear at area **12** in FIGURE 3 just as they do at area **10** in that figure. Further, if the markings at the edges **14** are written using fluorescent material, then they will appear only when the examination is made with a background of screening agent between the edges and the ultraviolet light source.

From an examination of FIGURE 5, taken on line 5—5 of FIGURE 1, it can be seen that one core of the device of this invention, which is marked **13** comprises a central portion **15** which has been coated with a material **16**. The central or inner portion **15** may be composed of a wide variety of materials, such as paper, cardboard, aluminum, steel, glass, synthetic material such as a polyamide, polyethylene, "Mylar" and the like, or woven material such as fabrics of various kinds including glass, linen and the like. Thus, the inner portion comprises thin, transparent, translucent or opaque materials. In addition to convenience in size the thinness affords flexibility to the assembled credential. In choosing the particular material for the central portion, one will, of course, choose one that can be impregnated with the coating material **16** that is to be used. This material completely surrounds the inner portion, and when porous or fibrous cores are used, generally part of the coating material is actually forced into the upper surfaces of the central material **15** so that the coating becomes intimately bonded to the central portion **15**.

The core **15** may be the photographic paper or film on which the photograph in the identification card is contained, or it may be the document to be identified. Further, it is not necessary that it be unitary or span the entire width or length of the device. For example, the core may comprise a plurality of entities separated by sections containing only films laminated to each other. These areas can be made to contain the combinations of or any of the other elements of the assembly such as fluorescent coatings and/or screening agent, or they may be composed of only the laminated films.

In FIGURE 5, a greatly magnified cross-section, the space **10** is occupied by photograph **17** as shown. This generally is bonded to the coated core **15** so that it is embedded in or adhered to the surface of the coating material. If desired, the coating material **16** can be used to surround and coat the photograph. Generally, the coating material **16** is a polymeric material and it comprises any one of a large number of materials such as the following: polyethylene, polypropylene, paraffinic materials such as the waxes, polyvinyl chloride, polyamides, poly(ethyleneterephthalate), among others. These materials are heat-sealable, but if one desires to use a film which is not or so only at elevated temperatures, then he may coat it first with a heat-sealable material. For example, one may coat one side of a film, such as a polypropylene film, which has a high heat-sealing temperature, with a heat-sealable material and print on the other side using the fluorescent material and/or screening agent, and then use the heat-sealable material, which may be polyethylene, cellulose acetate, cellulose acetate butyrate or other similar materials, to bond the polypropylene film to another film that is heat-sealable or contains a heat-sealable coating. It will be appreciated that the coating material can be suspended in the usual well known aerosol bomb containers and made available for spraying any photograph or similar material that is bonded to the coated core. For example, a paper central portion **15** may be impregnated with polyethylene and following that impregnation the photograph **17** can be embedded in the

top surface or glued to the top surface following which action the coating material **16** can be sprayed all over the photograph **17** so that it is embedded also or covered by the transparent coating material **16**. It should be noted that a printing, signature and the other materials used in the identification data are then printed or written on the top surfaces of the coated material **16** or on top of the fluorescent material. Thus, the identification information need not be and preferably are not carried on the surface of the innermost core sheet **15**.

As can be seen in FIGURE 5, the photograph **17** has a layer **18** on its underside which may be a coating of fluorescent material and then a layer **19** of adhesive to bond the photograph to film **16**. The adhesive generally is a transparent substance, especially if what is desired is an embodiment, such as that shown in FIGURE 3 in which the code afforded by the screening agent and fluorescent material appears on the rear under ultraviolet light examination. In some instances the fluorescent material will of itself act as an adhesive, while in others the adhesive is entirely omitted since the encapsulation effected by the on-coming film **20** and heat-sealing step fix the photograph in place.

At the right of the photograph **17** is a layer **21** of a fluorescent material. This is a band of material coated on the top surface of the coated core. If desired it can be placed directly on the core **15**, and as pointed out above, the fluorescent material can be placed where desired. It will bear the screening agent, not shown, in the desired form as, for example, the numbers **2** shown in FIGURE 2, and band forms **12**.

As can be also seen in FIGURE 5 the outer film **22** that is used in making the final assembly can be an entirely different film, and generally it comprises a layer of poly(ethyleneterephthalate), being a polymer of ethyleneglycol and terephthalic acid and being commonly known as "Mylar," the product being obtainable from the E. I. duPont deNemours, Inc., and the term "Mylar" being its trademark. To this layer of "Mylar," designated as **22**, there is generally bonded a film of another polymer, usually polyethylene, this being designated as **20**, as mentioned, and having a chemical composition which is compatible with or bondable to the material used in the coating **16**. Generally, coating **16** will be polyethylene and film **20** will also be polyethylene. Therefore, in the bonding step to form the final assembly, the layer **20** will become an integral part of layer **16** so that any printed, written or other materials that are on the surface of layer **16** or layer **20** will be embedded in or become a part of, to a greater or lesser degree, and to varying degrees at different points, within the resultant composite. The cross-section in FIGURE 5 has purposely been shown with reference to an assembly in which the films have not been heat-sealed. Thus, layer **20** and layer **22** have been cross-hatched as two different bodies. Upon application of heat-sealing conditions, these layers meld or flow together and become unitary. While it is possible to construct the devices of this invention using only one material, as, for example, polyethylene, it is preferred to provide an outer coating which is tough and scratch resistant, such as "Mylar." Since such materials are generally not readily heat-sealed of themselves, practicality dictates the use of other materials with them to supply the heat-sealing characteristics that are needed. Lamination or heat-sealing is accomplished in any of the conventional methods. These involve merely application of sufficient heat and pressure to produce the welding or lamination.

As mentioned above, all of the printed or written material which appears under visible and/or under ultraviolet light after the lamination step is contained within the assembly. Any attempt to remove film **22** which is strongly bonded to inner envelope **20** which became integrally bonded with inner envelope **16** which in turn is held tightly in view of the embedding of material in the upper surfaces of the central portion **15** will result in a destruction of the assembly that makes it virtually impossible to reassemble the parts so that the tampering cannot be noted. For example, the hand written signature "John Citizen" will invariably be torn, stretched or distorted because the pressure used by the signer will vary from place to place and because the signature is no longer on one even, hard surface; it is in effect embedded within a material at different levels. Further, the party attempting to effect a change in the assembly will have no knowledge as to the key locations as to certain number sequences or numbers or other key identification material which will become visible on the ultraviolet light examination. Not knowing the key, he will be unable to supply the critical location of the ultraviolet light inhibitor.

The combination of the inner portion, the fluorescent coating and the ultraviolet light inhibitor affords an intimate sealing of a code which cannot be separated without disturbing the printing or writing on the coating over the core. The fluorescent imprint is done with an ink or a powder or similar marker. The compound used preferably has a very long life span and is, in effect, a permanent fluorescent material so that repeated exposure to ultraviolet rays do not diminish its luminescence. Fluorescent materials which may be used include beta-naphthol, novocaine, benzidine, p-phenylenediamine, sodium salicylate, aniline, antipyrin, rescorinol, barium platinocyanide, tungstates, among others. Also, the chemical that is used in the screen has a long life. It is generally one of many benzophenones sold by General Aniline and Film Corp., American Cyanamid Company and Monsanto Chemical Co. The compounds are generally pure benzophenones with only traces of inorganic salts. They are highly effective in very small amounts and do not darken on long exposure even to intense ultraviolet light. Useful ones include 2,4-dihydroxybenzophenone, 2-hydroxy-4-methoxybenzophenone, 2,2',4,4'-tetrahydroxybenzophenone, 2,2'-dihydroxy-4,4'-dimethoxybenzophenone and mixtures thereof, being sold under a known trademark, "Uvinul," and being solids, M.P. 60°–200° C. or more. Other compounds may also be used but the commercial availability and effectiveness of the named compounds makes them preferred.

The combination of the fluorescent material and screen affords a very wide range of variations. For example, the fluorescent material used to give the fluorescent imprint can be used in printing a wide variety of designs such as narrow, vertical, or horizontal stripes or any combination thereof and over all the identification article or only a selected part. The designs can be camouflaged, if desired, by using similar colors in background areas. Also, a given section, including the space for a seal or the signature, may be framed with a fluorescent material in any design. Finally, key numbers or designs may be put at any place, for example, in any one or more of the corners.

The above principles also apply to another embodiment of this invention in which the fluorescent material and the screening agent are used in a manner reverse to that described above. In this use, the fluorescent material is used to put down on the film or the core the numbers, the signatures or identifying data as desired and the screening agent is placed at all places except where the code is desired to appear when examination under ultraviolet light is made. Thus, in FIGURE 2, for example, the numbers **2** would be written using the fluorescent material and the areas on either side of area **12**, designated as **23** and **24**, would be covered with a coating of the screening agent.

From the above it can be seen that a credential of this invention is an assembly which embodies different kinds of identification matter variously and strategically placed within the assembly in a co-acting relationship the disturbance of which affords a ready recognition of the alteration. First, the innermost portion will contain some, if not all, of the identification data, and if any part of it is coated so that some of the coating is embedded in the

interstices of the core that coating will preferably bear on it identification matter, too, which also becomes intimately embedded and intricately fixed when the outer compatible coating is bonded. If there is no embedding in the top surfaces of the core or if the core does not become integral with the enveloping materials, then there are present enveloping materials containing identification data which enveloping materials become integral with other enveloping films so that the data becomes fixed at some finite distance from the entity enveloped. Secondly, the fluorescent and/or screening markings may be placed not only on various elements in the assembly but in different planes. For example, the marking may be placed on the picture side of the photograph or the verso or both, on an inner portion, on the top surface of any coating used for an inner portion and on either or both sides of the enveloping outer coating, or in various combinations of these placements. In a preferred embodiment of an identification card, a marking visible under ultraviolet light and preferably a signature of the one photographed, is written on the photograph. Similarly, the inhibitor or the screen may be variously placed in different planes in the assembly. This type of placement makes it most difficult for any one to take the assembly apart and put it together again without disturbing the code which is enclosed.

A large multiplicity of placements can be used to afford a code as desired. Thus, a user of credentials of this invention can change the code as desired. For example, in one given period of time, say a week, he may use a screen on one corner to permit the revealing of a first key word or number and the following week issue new passes in which a different key is revealed elsewhere when the assembly is examined under ultraviolet light. In this way imposters are "kept on the run."

In addition to the sturdy construction of the article and the extremely high degree of tamper resistance that it possesses, articles of this invention also have the advantage that they can be prepared or manufactured on existing equipment which equipment can be utilized without any alteration. Thus, the identification articles of this invention are available to the public at practically the same cost as the articles of the prior art.

While the invention has been disclosed herein in connection with certain embodiments and certain structural and procedural details, it is clear that changes, modifications or equivalents can be used by those skilled in the art; accordingly, such changes within the principles of this invention are intended to be included within the scope of the claims below.

We claim:

1. An identification credential comprising the following: (1) a fluorescent element; (2) a code containing markings such as words, symbols or the like which code comprises a screening element and (3) a body bearing identification data embedded in a transparent film, said screening element co-acting with said fluorescent element to afford visibility of said code for said identification credential, said screening element affording a material impervious to ultraviolet rays and said impervious material being invisible under ordinary light but visible when viewed under ultraviolet light against the fluorescent background afforded by the said fluorescent element.

2. A credential in accordance with claim **1** in which only element (2) of the first two named elements is contained in said transparent film, element (1) being a separate element.

3. A coded identification credential comprising a fluorescent element; in said credential an inner portion; around said portion a transparent film made of an organic polymeric material; and a code which contains markings such as words, symbols or the like which code comprises identification data embedded within said material and a substance which is invisible under ordinary light but which is a barrier to the passage of ultraviolet rays through it and is visible when viewed under ultraviolet light against the fluorescent background afforded by the said fluorescent element, said fluorescent element and said substance being positioned as to design and place relative to said credential to form said code as desired.

4. A coded identification credential comprising (1) an inner portion; (2) contained in said credential a fluorescent material; (3) enveloping said portion an inner transparent layer comprising an organic polymeric material; (4) contained in said credential identification data that comprises a code containing markings such as words, symbols or the like which code comprises a substance which is invisible in said credential under ordinary light but that is a barrier to the passage of ultraviolet light through it and is visible when viewed under ultraviolet light against the fluorescent background afforded by the said fluorescent material, said material and said substance being positioned as to design and place to form said code as desired; and (5) an outer transparent layer comprising an organic polymeric material compatible with the said inner layer (3).

5. A credential in accordance with claim **4** in which said substance is imbedded in a material that is formed upon integrally bonding together layer (3) and layer (5).

6. A coded identification credential comprising an inner portion containing a fluorescent material and being surrounded by a transparent coating; within said credential identification data indicating the identity of the entity to be identified; bonded to the said coating additional transparent material enveloping said inner portion which additional material comprises a material compatible with the first said coating; and within the resultant assembly an identification code containing markings such as words, symbols or the like which code comprises a barrier being an ultraviolet screening agent, said barrier being invisible in said credential under ordinary light but being visible under ultraviolet light against the fluorescent background afforded by the said fluorescent material.

7. For an identification credential, a code containing markings such as words, symbols or the like which code comprises, in combination, a fluorescent element and said markings as identification indicia which markings are made using an ultraviolet light screening agent, said agent being invisible in relationship to said credential under ordinary light but visible under ultraviolet light against the fluorescent background afforded by the said fluorescent element.

8. A code in accordance with claim **7** in which said screening agent is a benzophenone.

9. For an identification credential containing an innermost portion bearing identification data, a code containing markings such as words, symbols or the like which code comprises, in combination, (1) a fluorescent element and (2) said markings as identification indicia which markings are made using an ultraviolet light screening agent, at least one of said elements (1) and (2) being located at a finite distance from said innermost portion and said agent being invisible in relationship to said credential under ordinary light but visible under ultraviolet light against the fluorescent background afforded by the said fluorescent element.

10. A code in accordance with claim **9** which includes an ultraviolet light screening agent located in said credential separately and apart and not in relationship with any fluorescent element that may be contained within the credential but that is visible when said credential is examined against a fluorescent background.

11. An identification credential comprising a fluorescent material and the following elements: (1) an inner portion; (2) enveloping and bonded to said inner portion an inner, transparent layer comprising an organic polymeric film; (3) identifying data on the surface of said film which surface is farthest from said inner portion; (4) a code containing markings such as words, symbols or the like which code comprises an ultraviolet light screening

agent, said fluorescent material and said screening agent being in relationship to afford a visual view of said code when said credential is examined under ultraviolet light and said screening agent being invisible under ordinary light but visible under ultraviolet light against the fluorescent background afforded by said fluorescent material; and (5) enveloping all the said numbered elements an outer, transparent layer comprising an organic polymeric film.

12. A credential in accordance with claim **11** in which the said outer layer is heat-sealed to the said inner layer and identifying data is securely locked in the resultant matrix.

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LAWRENCE CHARLES, *Primary Examiner.*