United States Patent

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[54] **CHEMISTRY ENCODING**
8 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **225/1,** 35/48, 40/310, 83/522, 83/553, 225/93, 234/122, 234/131
[51] **Int. Cl.** **G06k 1/12,** G06k 5/02, G06k 19/00
[50] **Field of Search** 83/13, 522, 553; 234/122, 131; 225/93, 1; 30/358; 40/310, 324; 116/121, 130, 136; 35/48

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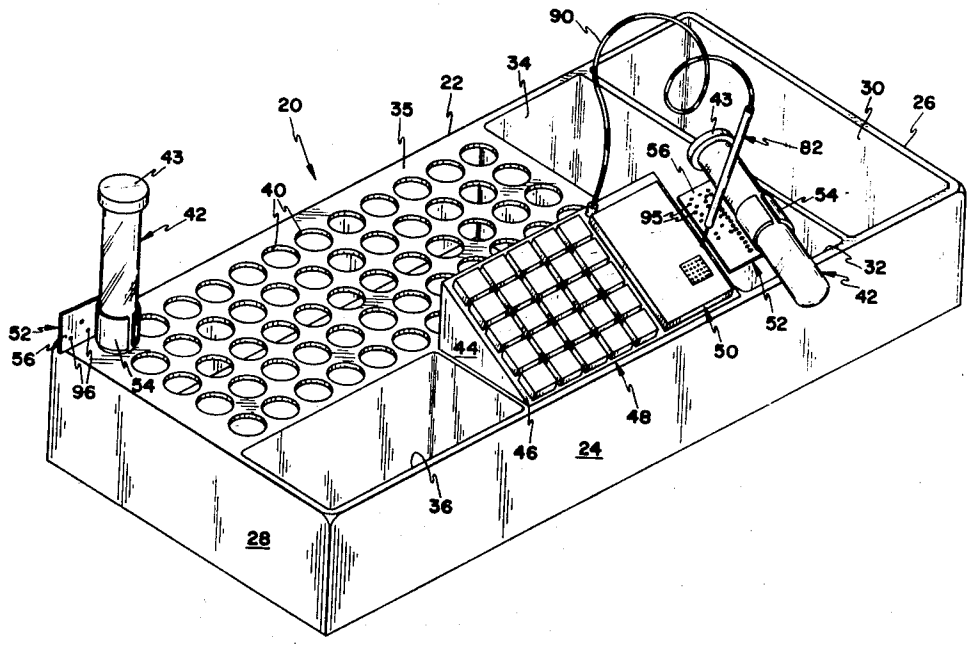
ABSTRACT: Method and apparatus for encoding chemistry information on an identification device used to identify containers of biological matter such as blood samples, the apparatus including superimposed dies each having a plurality of rows of apertures, the apertures of one die being in alignment with the apertures of the other die, the dies being spaced one from another to receive the identification device between the dies. A stylus, having a tip for penetrating the identification device, is selectively inserted through the aligned apertures in the two dies thereby perforating (encoding) the device at one or more predetermined sites. Each perforation represents a chemical test or a set of tests to be performed on the biological matter in the container. A verifier is provided so that when the stylus perforates the device at a given site, an electrical circuit is completed to illuminate a corresponding portion of a display panel for optical indication to the operator of the true nature of the encoding which has taken place.



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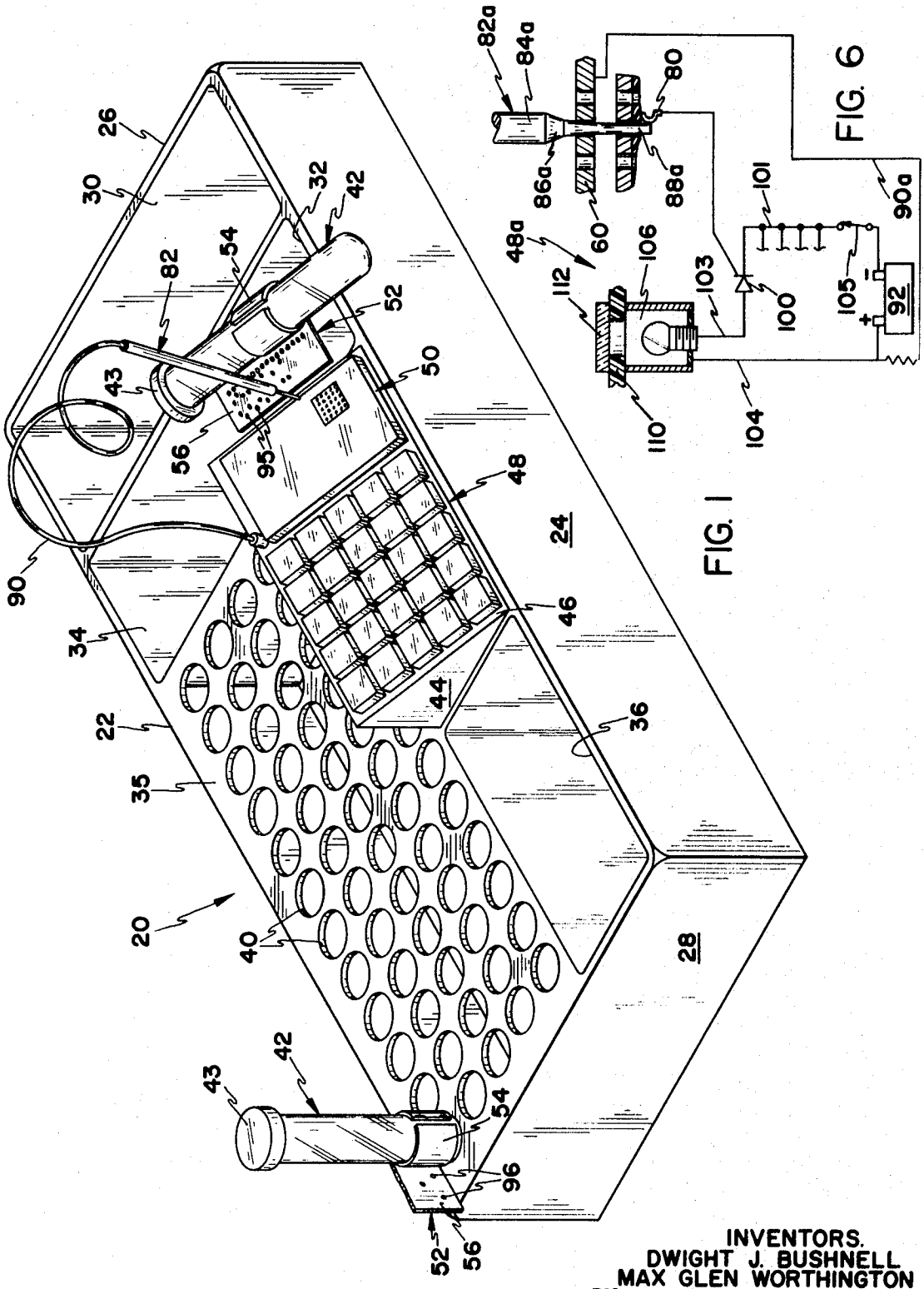

FIG. 1

FIG. 6

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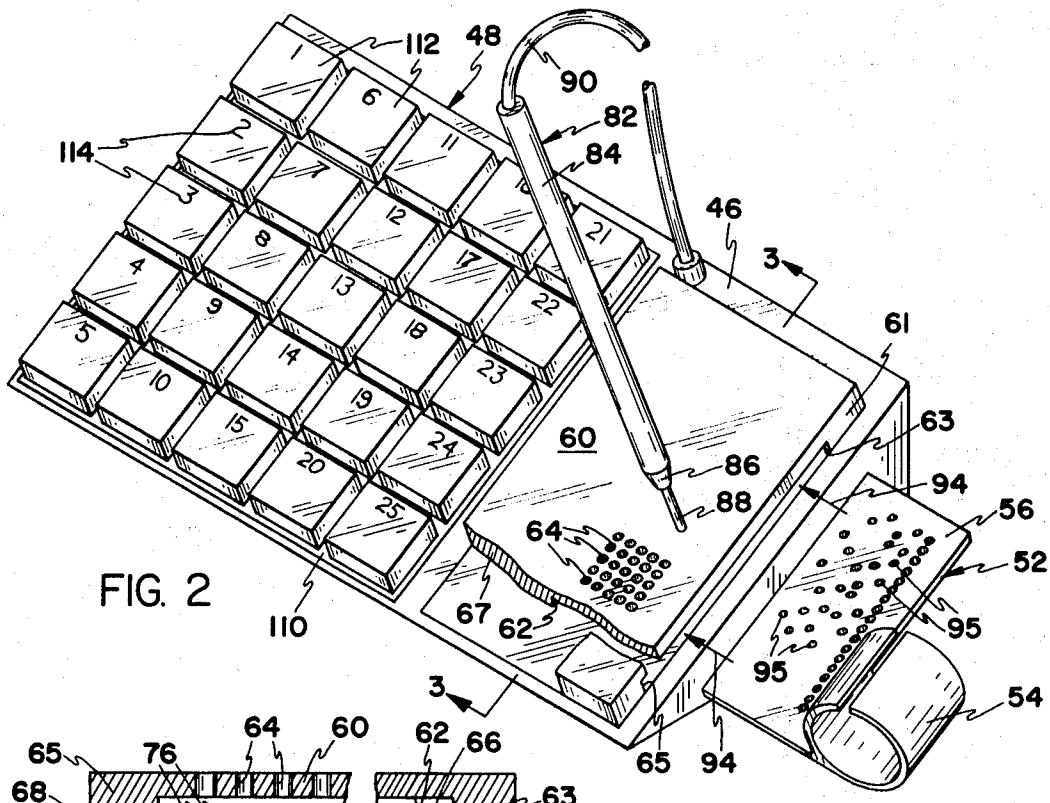

FIG. 2

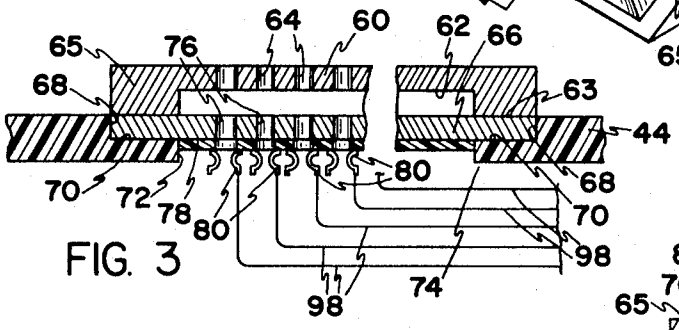

FIG. 3

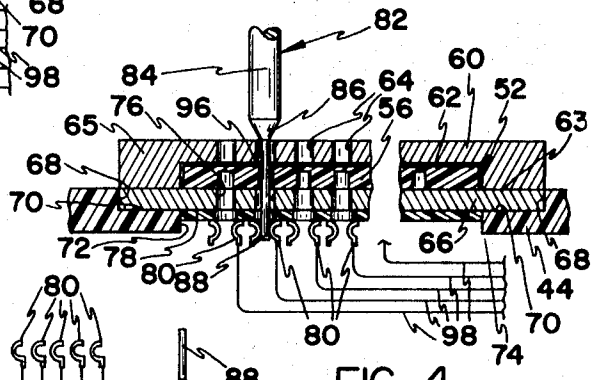

FIG. 4

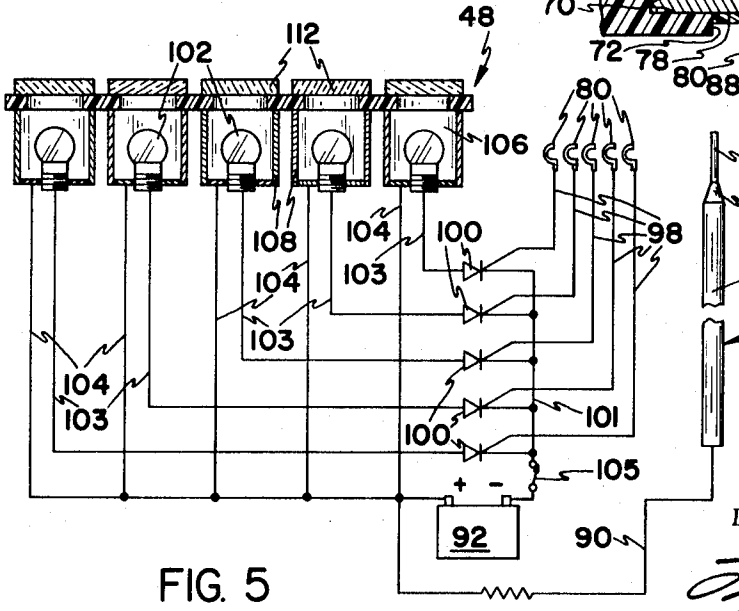

FIG. 5

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CHEMISTRY ENCODING

BACKGROUND

1. Field of the Invention

The invention relates generally to chemistry selection and particularly to apparatus and methods for permanently encoding chemistry information on an identification device and for verifying the accuracy of the encoded information.

2. The Prior Art

It is well known in hospital procedures that much care is required to carefully supervise the critically important identification of specimens and samples taken from patients for such purposes as laboratory analysis and the like. Also, it is critically important to ensure that the proper identification remains on all reports resulting from clinical determinations conducted upon the specimens and samples. No less important is the need for proper identification of prescribing and administering medication to patients.

For example, frequently a physician will prescribe one or more clinical tests to be run or conducted upon a blood sample. To effectuate the prescription, the physician will handwrite the order on a request slip which will be delivered to a laboratory. Thereafter, a blood sample is collected from the patient for whom the physician ordered the laboratory tests and the name of the person is handwritten upon the blood collection tube. Later, when the blood collection tube is returned to the laboratory for analysis, the patient's name and the particular blood test or tests must be copied onto a report form. After the analysis is completed, the results of the analysis are copied onto the report form.

The described recording and reporting procedures are extremely time consuming and substantial risk exists that the blood samples, the results of the tests, and the names of patients may be comingled resulting in improper treatment or lack of treatment to some patients, with the attending risk of injury or loss of life.

BRIEF SUMMARY AND OBJECTS OF THE INVENTION

The present invention includes method and apparatus which provide for encoding chemistry information on an identification device associated with a receptacle containing biological matter to be tested, the chemistry information identifying clinical determinations ordered by a physician. Also, a verifying method and apparatus are provided to indicate the manner in which the identification device has been encoded.

It is a primary object of the present invention to provide novel apparatus and method for encoding chemistry information upon an identification device.

It is another principal object of the present invention to provide novel apparatus and method for verifying information encoded upon an identification device.

These and other objects and features of the present invention will become more fully apparent from the following description and appended claims taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective representation of a presently preferred apparatus according to this invention;

FIG. 2 is an enlarged perspective representation of the encoder and verification display panel of the apparatus of FIG. 1;

FIG. 3 is a cross section taken along line 3—3 of FIG. 2;

FIG. 4 is a cross section similar to the cross section of FIG. 3 also illustrating the manner in which the identification device is perforated;

FIG. 5 is a circuit diagram of the verifier concerning the manner in which the display panel is selectively illuminated to identify the specific sites which are perforated or encoded; and

FIG. 6 is a modified circuit diagram similar in most respects to the circuit diagram of FIG. 5.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

While the instant invention has many applications, the presently preferred embodiment will be described hereafter in connection with the encoding of identification devices, each attached to a blood sample tube, with information pertaining to clinical laboratory procedures to be performed under authority granted by a physician. Throughout this specification, like numerals designate like parts.

General

Referring now to FIG. 1, a console, generally designated 20, has parallel sides 22 and 24 and parallel ends 26 and 28 which are joined together to form an erect rectangle. The console 20 has a bottom (not shown) and a plurality of compartments 30, 32, 34, and 36 which open to the exterior of the console at the top surface 38. The compartments are convenient receptacles for blood collection tubes, order forms and storage of auxiliary equipment and supplies. Also, the console is provided with a plurality of aligned spaced apertures 40 in the top panel 38 of a tray, which apertures are sized so as to receive conventional blood collection tubes 42. Thus, the top panel 38 in conjunction with the console 20 define a tube rack. Each blood collection tube is illustrated as being provided with a rubber stopper 43, as is conventional, to prevent loss or contamination of the blood within the tube.

The console 20 comprises a wedge-shaped platform 42 which slopes downwardly toward the front side 24 of the console. The exposed inclined surface 46 of the platform 44 presents the display panel of a code verifier, generally designated 48, and an encoder, generally designated 50.

The encoder 50 operates on identification devices 52 which are illustrated as being removably attached to blood collection tubes 42. Each identification device 52 is preferably of one-piece construction comprising a split collar 54 and a laterally projecting encoded and encodable plate 56. The device 52 is preferably made of frangible material such as plastic with a relatively low shear resistance, and, if desired, may have a plurality of weakened or recessed encodable sites 58 (see FIG. 4) which are useful for a purpose hereinafter more fully described. In the preferred orientation, a blood collection tube 42 is inserted into the collar 54 in press-fit relation so that the longitudinal axis of the plate 56 is parallel to but offset from the axis of the tube 42.

The Encoder

Referring now to FIGS. 2–4, the encoder 50 will be more fully described. The encoder 50 comprises an upper mask, punch or die plate 60 which, as illustrated in FIG. 3, has a central recess 62 fabricated at its underside. The recess 62 opens at the right edge 61 as shown in the FIGS. and longitudinally traverses between shoulders 63 and 65 of the die plate 60. The recess 62 also terminates at concealed shoulder 67 of the die plate 60.

The die plate 60 is preferably formed of hardened metal and is screwed, bolted or otherwise rigidly secured adjacent the shoulders 63 and 65 to the sloping surface 46 of the platform 44. The die plate 60 has a plurality of rows of bores 64 each of which passes completely through the thickness of the die plate and opens at the recess 62. The arrangement and spacing of the bores 64 correspond to the arrangement and spacing of the encodable sites at a selected portion of the plate 56. As can be appreciated by reference to FIG. 2, the bores 64 are shown as being grouped closely together at one location which leaves a substantial portion of the die plate 60 without bores. Thus, a given plate 56 of a device 52 may be encoded with desired identification data, such as patient identification, medication identification, dosage and the like as at 95, before or after the plate 56 is encoded with chemistry information by the encoder 50. Obviously, any identification information encoded upon the plate 56 would be at locations other than the encodable sites in the plate 56 reserved for chemistry information.

The recess 62 between the die plates is sized to readily receive and properly position the plate 56 below the die 60.

As best shown in FIGS. 3 and 4, the die plate 60 is superimposed over a lower mask, punch or die plate 66 and separated therefrom by the recess 62. The lower die plate 66 is situated within a rectangular opening 68 of a stepped passageway in the platform 44, the passageway presenting an upwardly directed shoulder 70 and comprising a lower opening 72 leaving the underside of the die plate 66 exposed to the hollow interior 74 of the platform 44. The die plate 66 rests upon the shoulders 70 and is secured thereto by screws or in any other satisfactory way.

The die 66 has a plurality of bores 76 each of which is axially aligned and in registry with one bore 64 of the die plate 60. The bores 76 open at the underside 78 of the die plate 66 and electrical contacts schematically shown at 80 are disposed near the bottom of each bore 76, for a purpose which will be hereinafter more fully described.

Referring again to FIG. 2, the encoder 50 also comprises a stylus 82 which includes a handle 84 tapering conically at 86 and terminating in a punching tip 88. For reasons to be subsequently more completely described, the tip 88 of the stylus 82 is connected by an electrical conductor 90 to an electrical power source 92 (see FIG. 5). The conductor 90 is preferably insulated to prevent a short circuit.

Having described the encoder 50, the method of encoding chemistry information in a plate 56 utilizing the encoder 50 will now be described. The plate 56 may either be encoded while attached at the collar 54 to a tube 42, as shown in FIG. 1, or encoded when not attached to the tube 42, as shown in FIG. 2. In either event, the plate 56 is inserted by rectilinear translation into the recess 62 between the die plates 60 and 66 in the direction of arrow 94 and utilizing the orientation illustrated in FIG. 2. The plate 56 is forced as far as possible into the recess 62 causing the encodable sites 58 to be aligned with axially disposed bores 64 and 76.

The person encoding the plate 56 will identify the bores 64 which correspond to the clinical determinations which a physician has prescribed to be conducted on a blood sample associated with the plate 56.

When the particular bore or bores 64 have been selected by the operator in keeping with the physician's order, the stylus 82 is positioned so that the tip 88 is successively inserted into the selected bores 64. As the stylus is forced downward through each selected bore 64, the aligned frangible site 58 will be punched out of the plate 56, displaced through the aligned bore in the die plate 66 and deposited in the cavity 74 of the console 20. Each punched site then becomes a perforation 96. The particular locations of the perforations 96 (FIGS. 1 and 4) represent particular chemical tests or other determinations to be conducted in the laboratory upon the blood sample identified by the encoded plate 56.

Verifying the code

With continued reference to FIG. 4, it can be observed that when the stylus 82 perforates a frangible site from the plate 56, the tip 88 of the stylus will touch the adjacent contact 80. As previously mentioned, the tip 88 of the stylus is electrically energized from a power source 92 (FIG. 5) such as a battery. Electrical energy from the positive terminal of the power source 92 will pass through the contact 80 immediately beneath the perforation and be conducted through the associated line 98 to the gate of one silicon-controlled rectifier (SCR) 100. When the one SCR 100 is so energized, state is altered allowing electrical energy in line 101 to reach an associated conventional electric light bulb 102. The light bulb 102, which is connected by the associated line 103 to the energized SCR 100 and by the associated line 104 to the negative terminal of the power source, is thereby illuminated. All lights so illuminated will remain "on" until the normally open switch 105, which is closed during the encoding of a plate 56, disconnects the power source from the illuminated lights. When the switch 105 so disconnects the power source, the previously energized SCR's 100 return to their original "off" state. Preferably, the switch 105 is exposed at the recess 62 between the die plates so that the switch is inherently closed by insertion of the plate 56 into the recess 62 and is inherently open by removal of the plate 56 by the recess 62.

Each light bulb 102 is disposed in a separate compartment 106 having opaque walls 108 to prevent light from one bulb 102 from being transferred into an adjacent compartment 106. Each compartment 106 is mounted upon a common display panel 110 (see FIGS. 2 and 5) which is divided into rectangular segments 112. The rectangular segments 112 are equal in number to the bores 64 in the die plate 60 and to the chemistry-encodable sites in the plate 56. Also, the relative positions and individual indicia of each rectangular segment 112 corresponds to the respective positions of the encodable sites for chemistry information in the plate 56.

The rectangular segments 112 are preferably formed of translucent material and are disposed in alignment with corresponding compartments 106. Thus, when the stylus 82 perforates a site in the plate 56, the location of the perforation will be visually communicated to the operator by illumination of the light bulb 102 in the rectangular segment 112 which corresponds in position to the location of the last-mentioned perforation in the plate 56. If desired, each of the rectangular segments 112 may carry indicia 114 corresponding to the identity of the frangible sites available in the plate 56. The indicia 114 may take the form of numerals, words and/or the like representative of the clinical determinations authorized by the physician.

With reference to FIG. 6, the circuit 48*a* is identical in all respects to the previously described circuit 48 where common numerals are used. However, the stylus 82*a*, comprising a handle 84*a*, a taper 86*a* and an electrically conductive tip 88*a*, is not electrically energized. Instead, electrical energy from the positive terminal of the source 92 passes through the line 90*a* to the die plate 60, which is electrically insulated from the contacts 80. Thus, when the tip 88*a* of the stylus penetrates the plate 56, it will serve as an electrical conductor of energy between the plate 60 and the juxtaposed contact 80 turning the associated SCR 100 and light "on," in the manner hereinbefore described.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is, therefore, to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. In a method of encoding an identification blank having a predetermined length and width, the steps of:
   - situating the identification blank in alignment with an array of apertures in mask means so that a solid encodable site is adjacent each aperture;
   - displacing stylus means through selected ones of the apertures;
   - encoding each encodable site adjacent the apertures through which the stylus means are displaced by causing the stylus means to impress information representation upon the blank;
   - supplying electrical power to the stylus means;
   - completing an electrical circuit through the stylus means as each information representation is impressed upon the blank; and
   - confirming by electrical signal through the circuit when and where encoding has taken place.

2. In a method of the type defined in claim 1 wherein said confirming step comprises visually verifying which of the encodable sites in the blank have been encoded by illuminating with said electric signals selected ones of an array of indicators corresponding in arrangement to the array of apertures in the mask means.

3. An encoder for encoding an information device, the encoder comprising:

mask means comprising a matrix of apertures and a chamber adapted to receive the identification device, the chamber having a common ingress and egress opening;

stylus means adapted to be displaced through selected apertures in the mask means and to encode the identification device at sites adjacent each selected aperture; and

electrical circuit means completed by penetration of said stylus through said apertures to provide a signal indicating which of said sites has been encoded.

4. An encoder-verifier comprising:

stylus means;

encoding means including identification device-receiving mask means exposing only an array of encodable sites to the stylus means whereby selective displacement of the stylus means through the mask means causes information representations to be impressed upon the device at predetermined sites;

electrical power source means;

electrical switch means disposed adjacent the mask means and electrical circuitry in communication with the electrical switch means to close a circuit as the identification device is encoded at each site;

an array of indicators corresponding to the pattern of exposed encodable sites and in communication with the circuitry whereby each indicator corresponding in relative location where an information representation is impressed is energized upon the closing of a circuit to confirm the location of each site receiving an information representation.

5. In a method of encoding a container with a sample of biological material therein;

providing a container having an identification device with an array of encodable sites;

disposing the device adjacent a mask having a matrix of apertures each exposing one encodable site;

bringing a stylus into registry with at least a selected one of the aligned apertures and punching a hole in the adjacent exposed site;

verifying at a remote display the existence and location of the punched hole at said last-mentioned site while the device remains in the defined position.

6. Apparatus for defining clinical tests to be performed on biological matter disposed in a container;

a frangible blank united to the sample container;

die means having a plurality of spaced apertures and cavity means to receive the blank in alignment with the apertures, each aperture corresponding to at least one clinical determination to be made in relation to the biological matter;

stylus means comprising (a) tip means to be placed in registry with selected apertures and to penetrate the blank at sites aligned with said selected apertures to create perforations selectively in the blank and (b) means for actuating a remote display to verify the location of each penetration made in the blank.

7. In a method of correlating clinical determinations to be made upon biological matter with the patient from whom the biological matter was obtained, to reduce the probability of error and save time, comprising:

providing a container housing the biological matter having an identification portion bearing indicia identifying the patient and presenting an encodable area;

placing the encodable area of the identification portion at an encoding station thereby exposing an array of encodable sites in the encodable area;

encoding selected ones of the sites representative of the clinical determinations to be performed;

physically completing electrical circuits causing electrical signals corresponding to the sites so encoded to be generated whereby the accuracy or inaccuracy of the preceding step may be determined.

8. An encoder-verifier of the type defined in claim 4 wherein said electrical circuitry comprises (a) first circuit means joining the power source means to the switch means at least while a site is encoded to close a circuit and (b) second circuit means for holding the mentioned circuit closed even though the stylus means is removed after said site has been encoded.

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