United States Patent [19]

Parent et al.

[11] **3,819,505**

[45] **June 25, 1974**

[54] **TESTING APPARATUS**

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[73] Assignee: **Becton, Dickinson and Company**, East Rutherford, N.J.

[22] Filed: **Mar. 9, 1972**

[21] Appl. No.: **233,079**

[52] **U.S. Cl.** ..... **204/299**, 204/180 G

[51] **Int. Cl.** **B01k 5/00**

[58] **Field of Search** ..... 204/180 G, 299

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Primary Examiner—John H. Mack
Assistant Examiner—A. C. Prescott
Attorney, Agent, or Firm—Kane, Dalsimer, Kane, Sullivan and Kurucz

[57] **ABSTRACT**

A unit for retaining a disposable electrophoresis test kit adapted for detecting the presence of hepatitis associated antigen and the like includes a base, means for illuminating said test kit spaced within said base, a work platform for supporting the test kit, wherein the platform has at least one pair of electrodes oppositely disposed thereon and connected to said base for generating an electric potential across said test kit; a removable cover connected to said base for enclosing said unit, said cover having a transparent viewing port spaced therein for observing said test kit and an electrical circuit in said unit for supplying power to said illuminating means and said electrodes.

5 Claims, 13 Drawing Figures

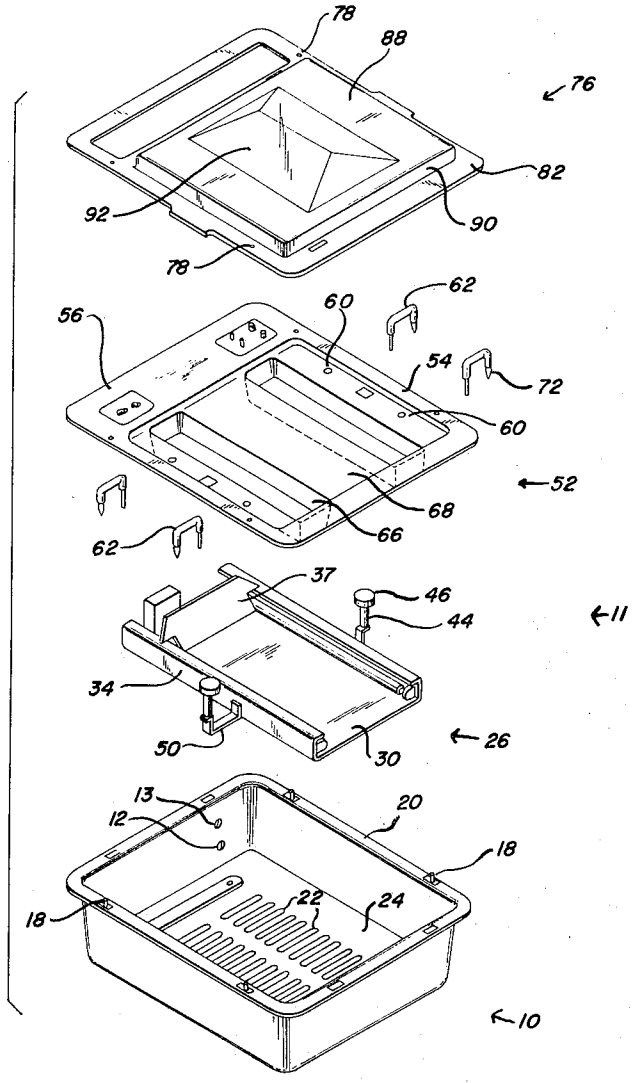
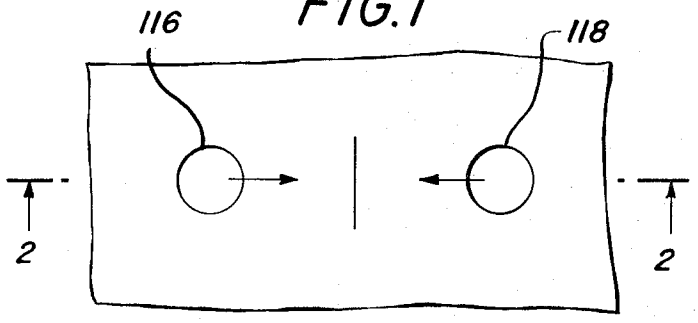


FIG. 1



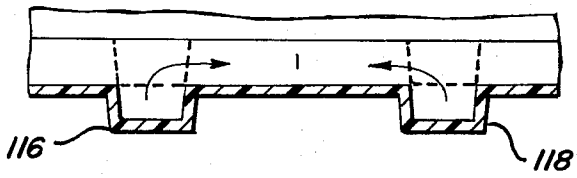
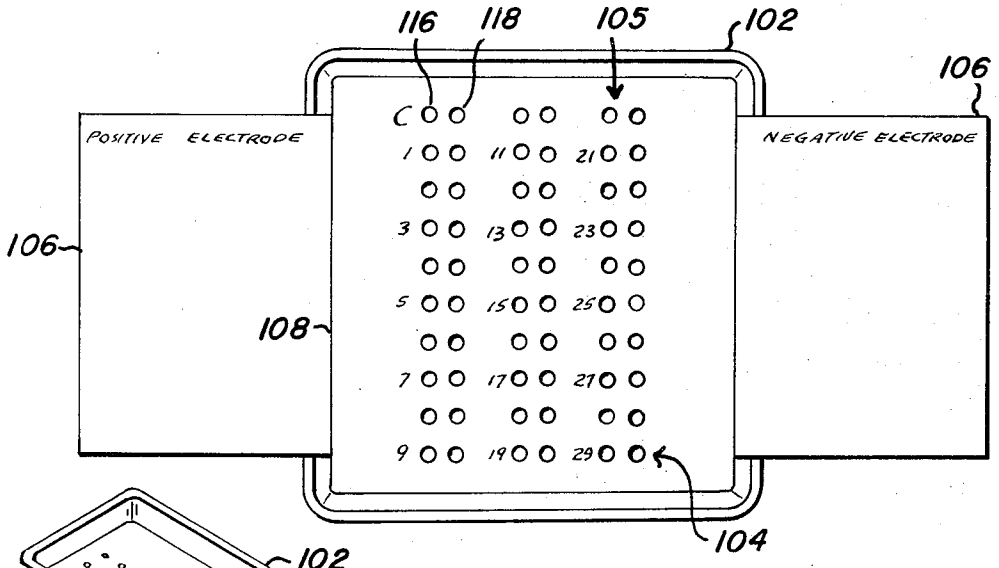


FIG. 2

FIG. 3



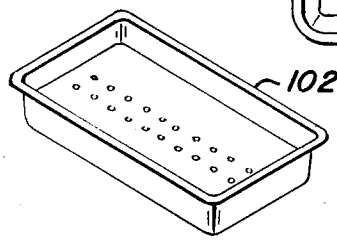


FIG. 4

FIG. 5

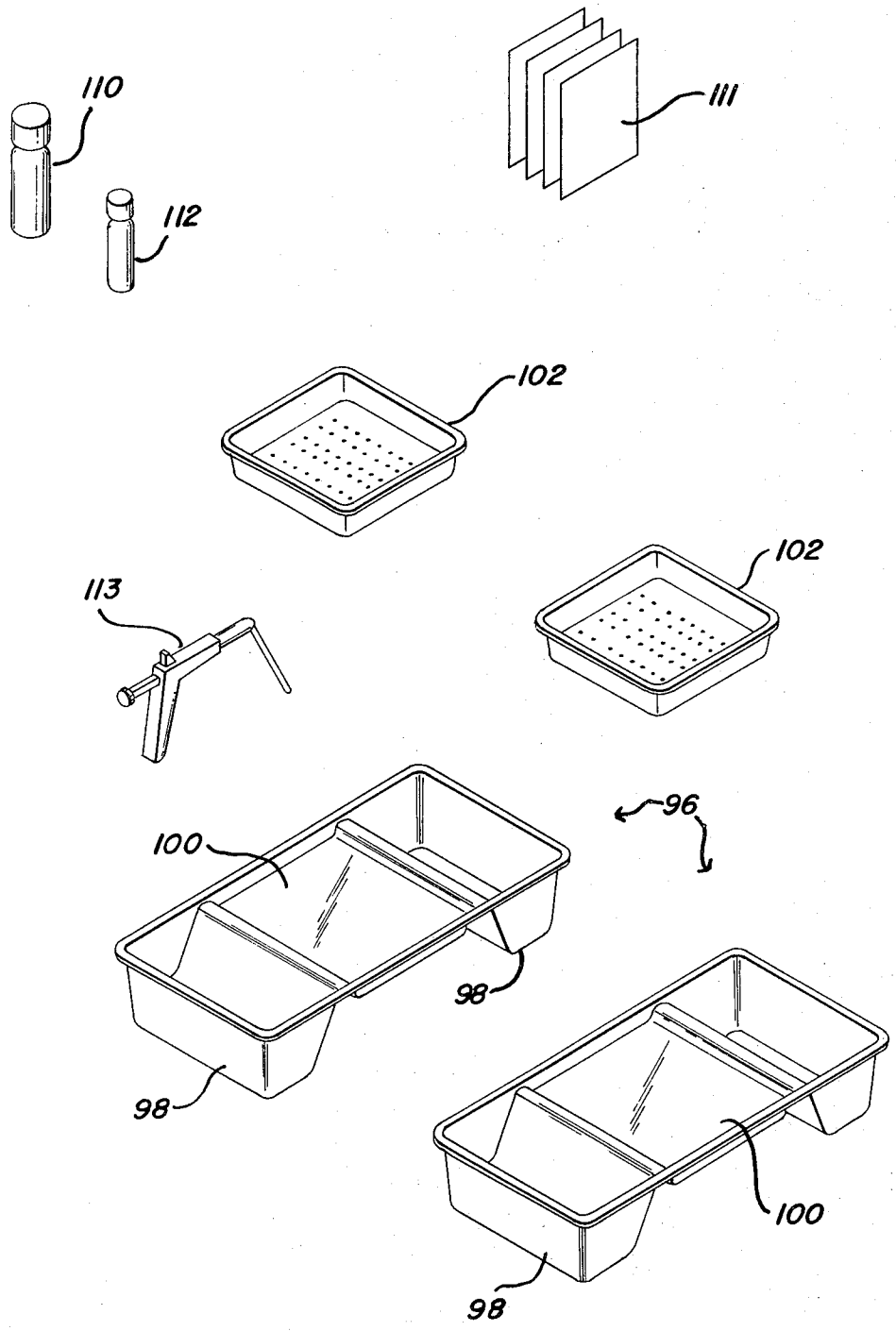


FIG. 6

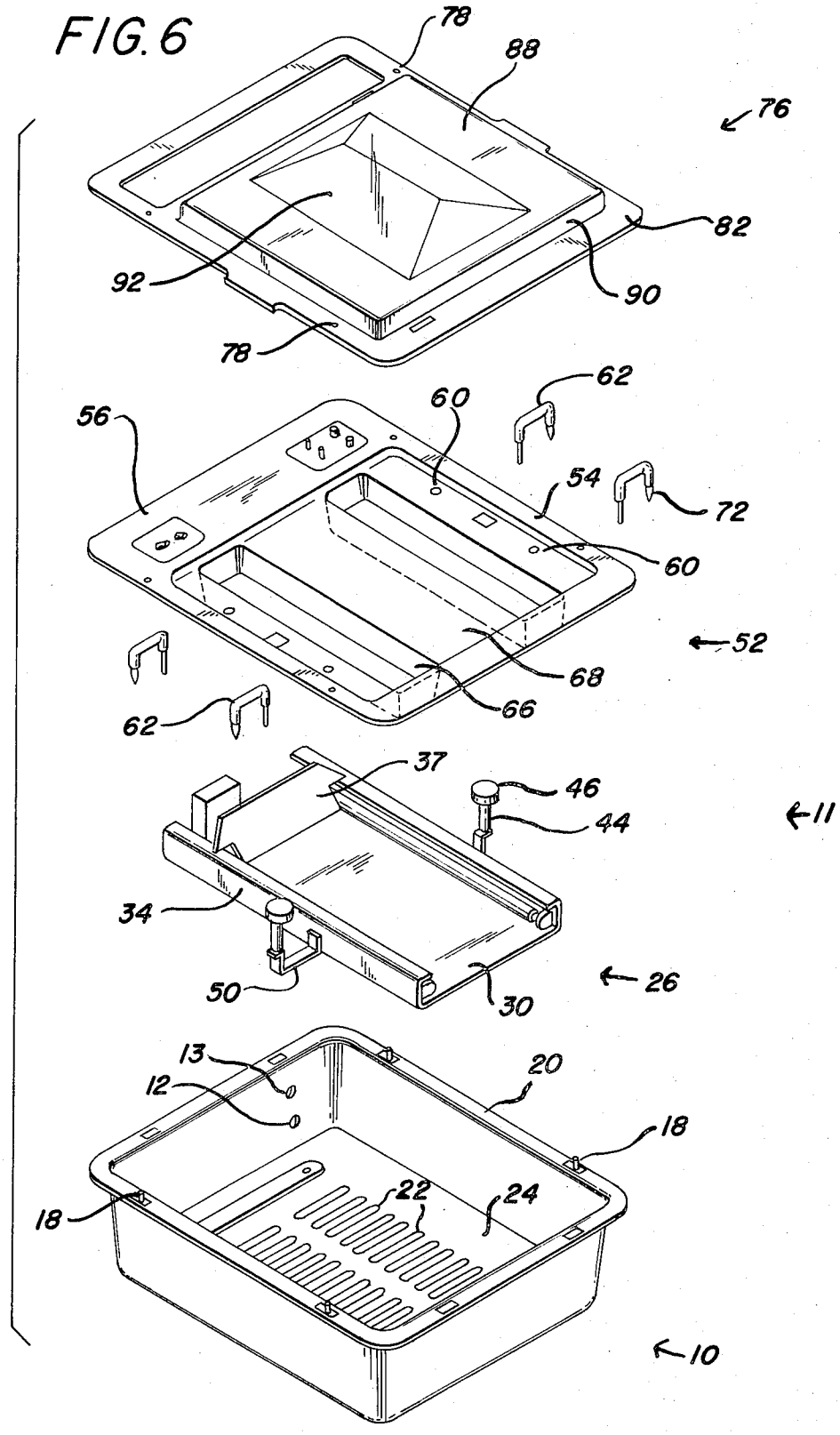

78
88
76
82
92
90
78
62
60
56
54
72
60
52
68
62
66
37
46
44
11
34
26
50
30
13
20
12
18
18
22
24
10

FIG. 7

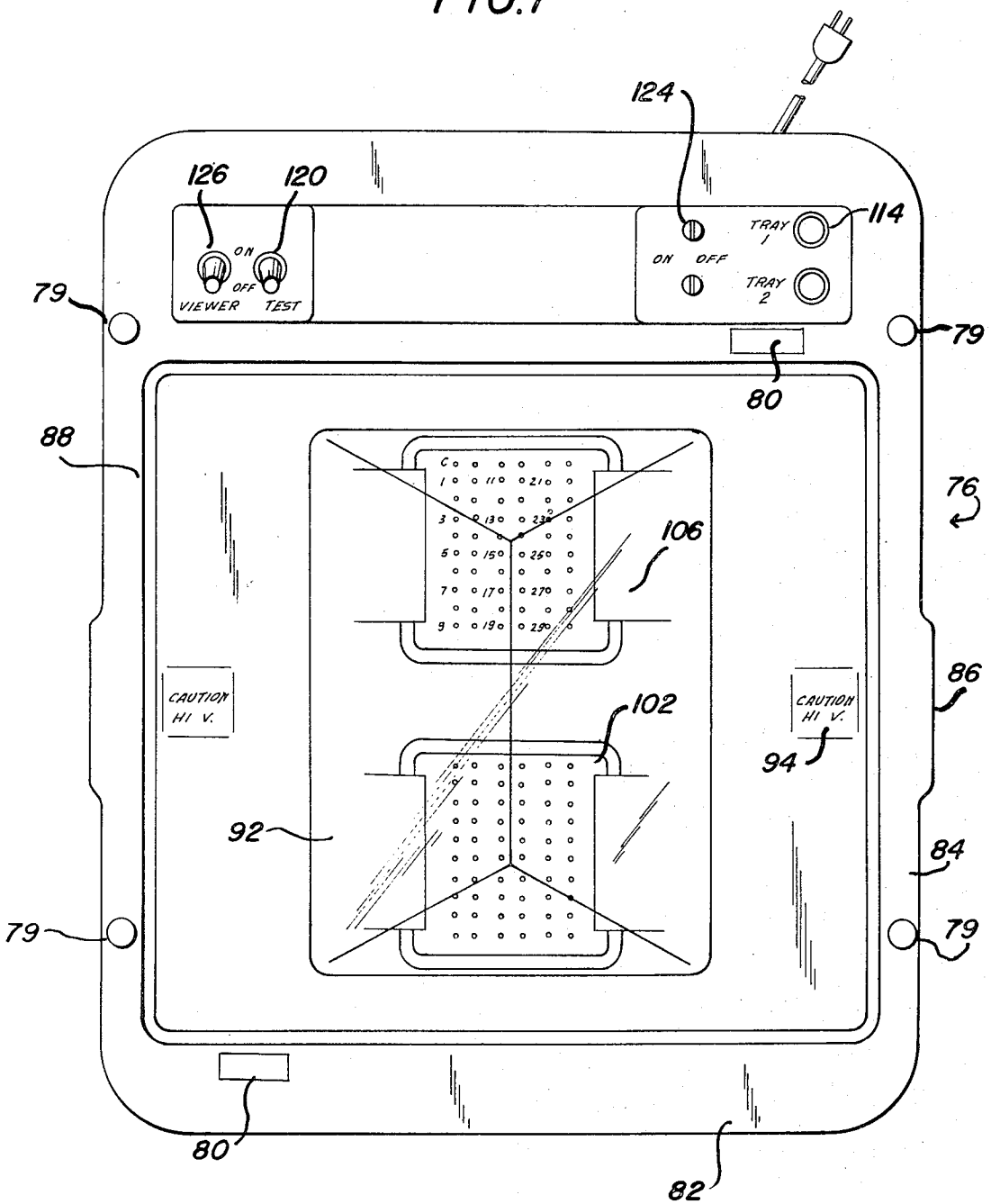

124
126
120
ON
OFF
VIEWER
TEST
ON
OFF
TRAY 1
TRAY 2
114
79
79
80
88
76
106
CAUTION HI V.
CAUTION HI V.
102
86
94
92
84
79
79
80
82

FIG. 8

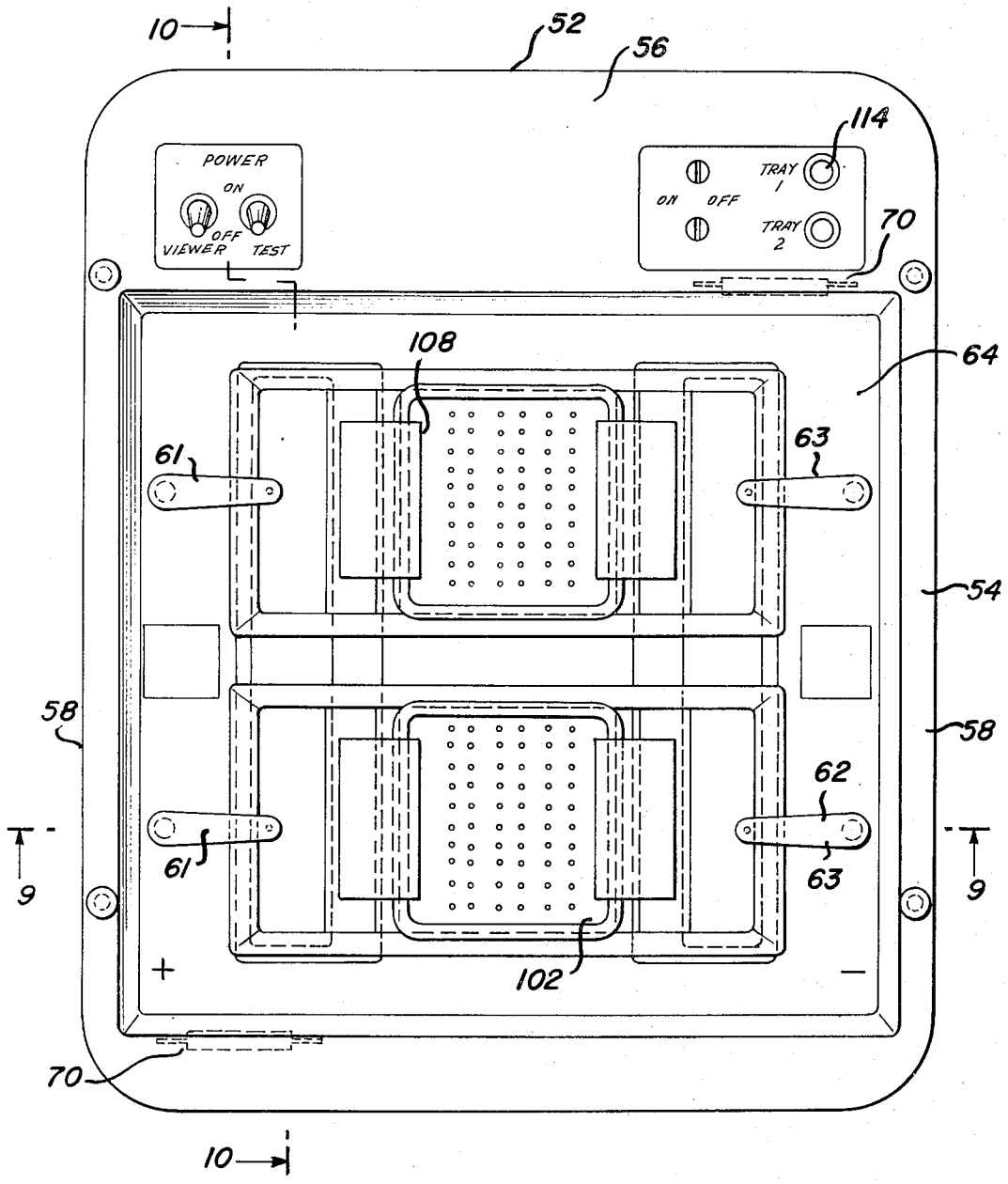

10
52
56
114
POWER
ON
OFF
VIEWER
TEST
ON
OFF
TRAY 1
TRAY 2
70
64
108
61
63
54
58
58
62
61
63
9
9
+
−
102
70
10

FIG. 9

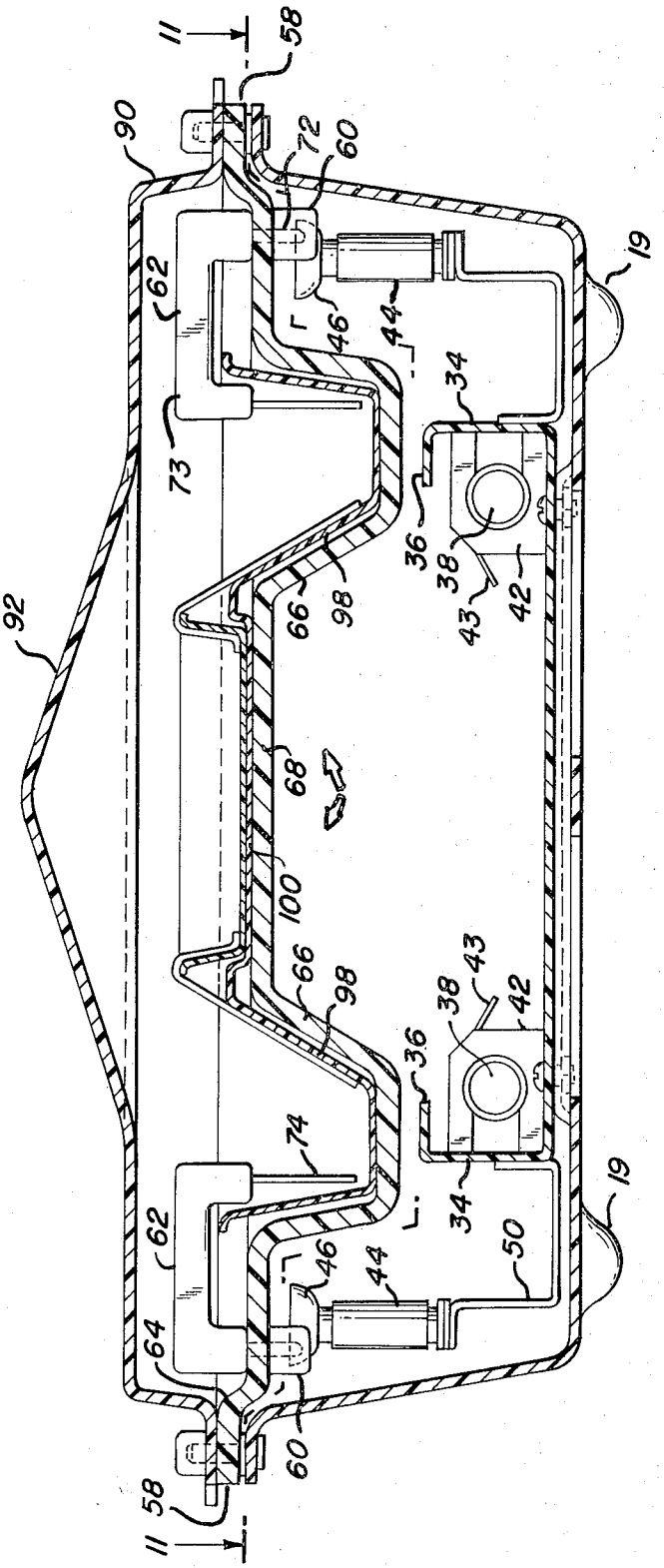


FIG. 10

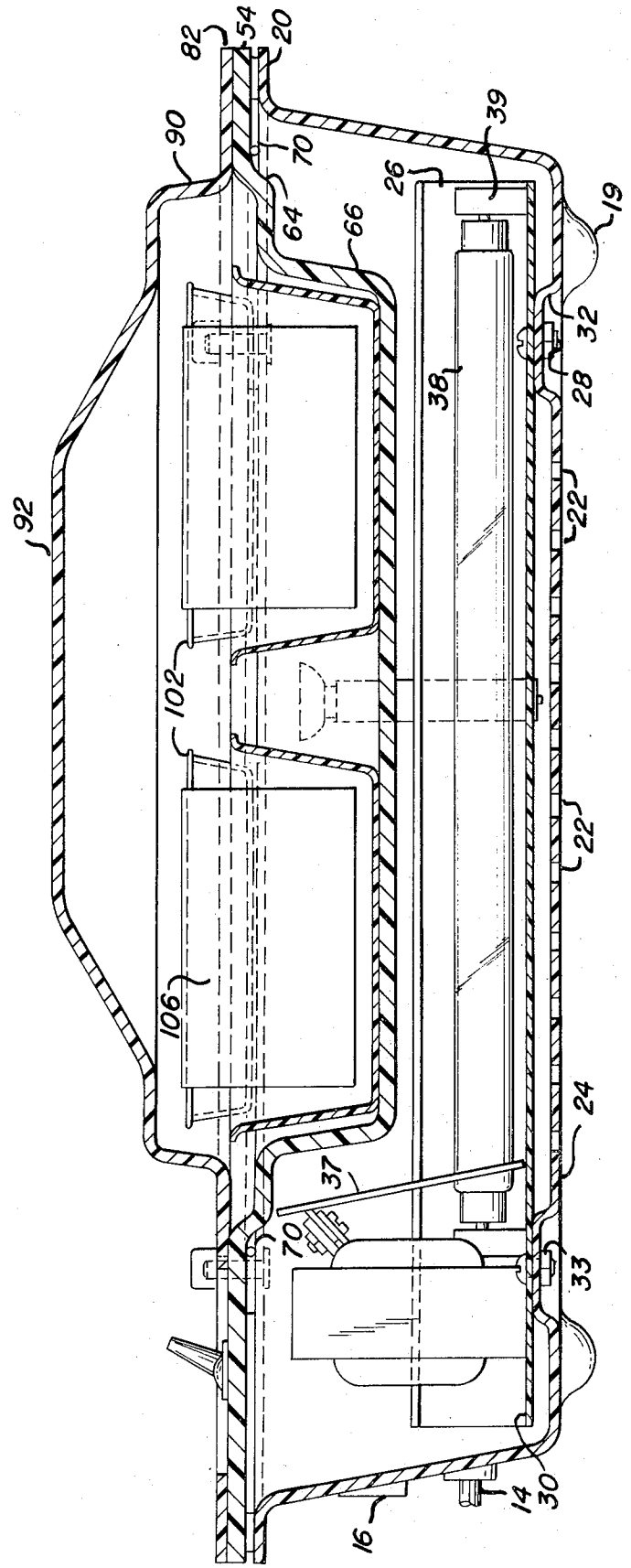

82
54
20
90
70
39
26
19
64
66
32
38
28
92
22
102
22
106
24
37
70
33
14
30
16

FIG. 11

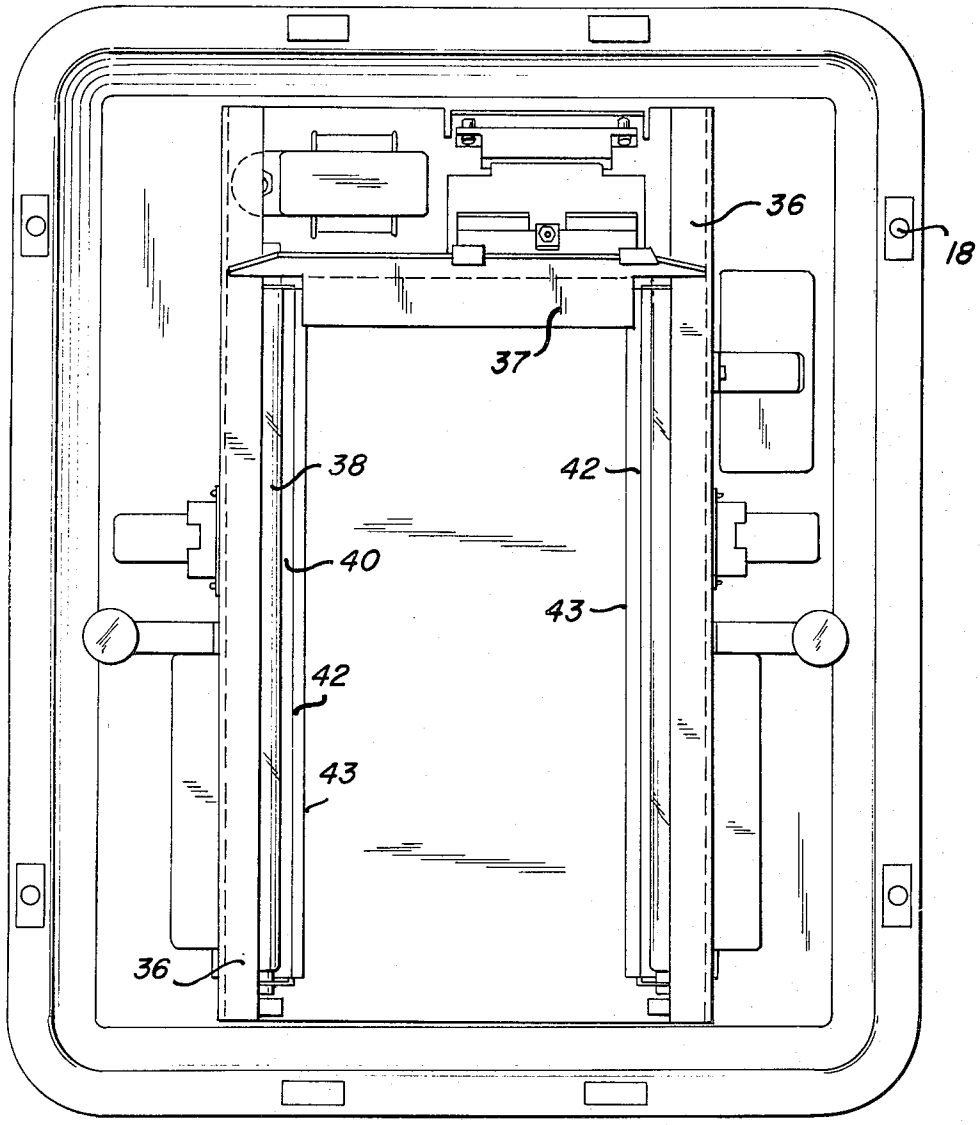
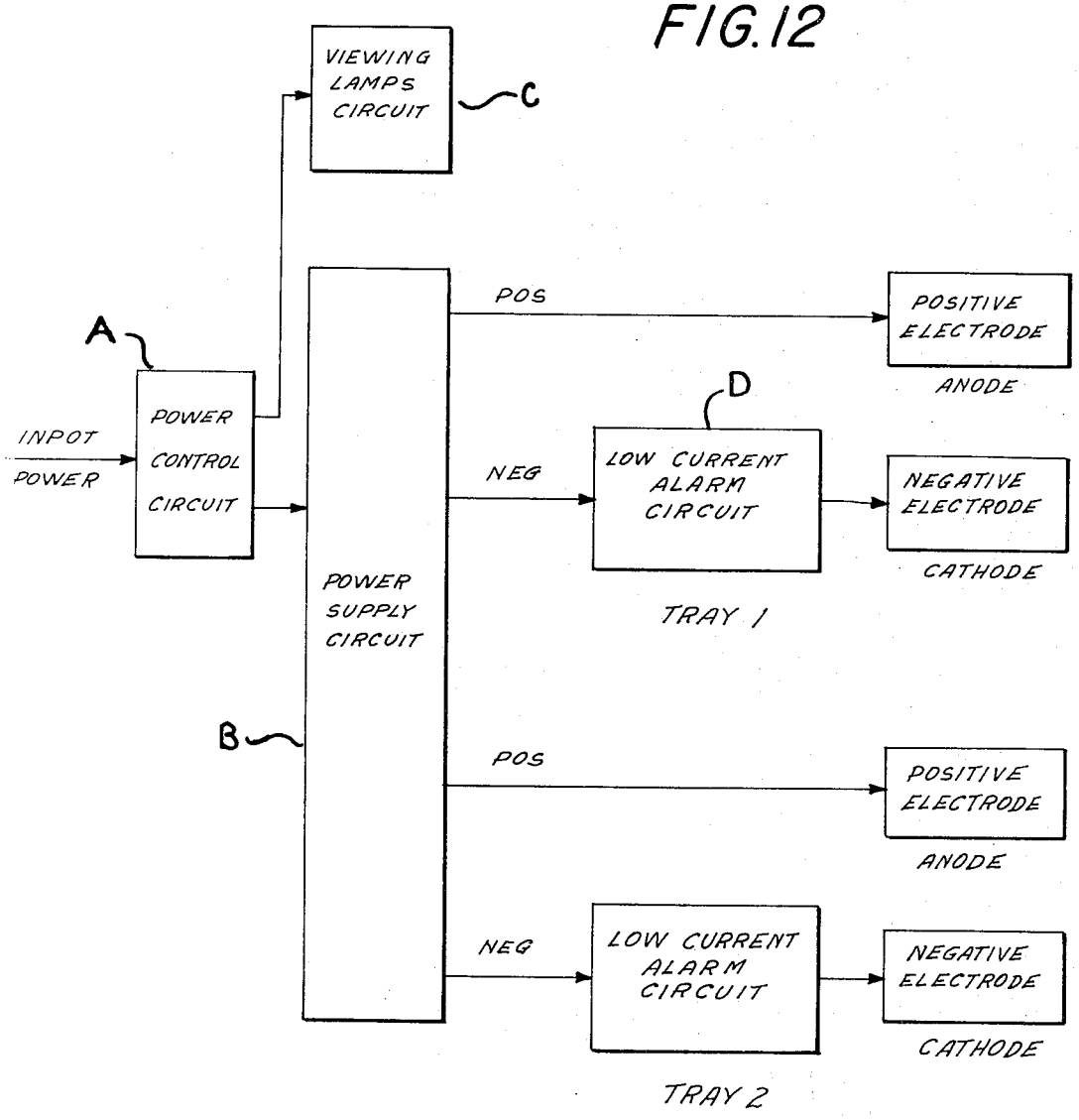


FIG. 12


VIEWING LAMPS CIRCUIT
C
A
INPOT POWER
POWER CONTROL CIRCUIT
POWER SUPPLY CIRCUIT
B
POS
POSITIVE ELECTRODE
ANODE
D
NEG
LOW CURRENT ALARM CIRCUIT
NEGATIVE ELECTRODE
CATHODE
TRAY 1
POS
POSITIVE ELECTRODE
ANODE
NEG
LOW CURRENT ALARM CIRCUIT
NEGATIVE ELECTRODE
CATHODE
TRAY 2

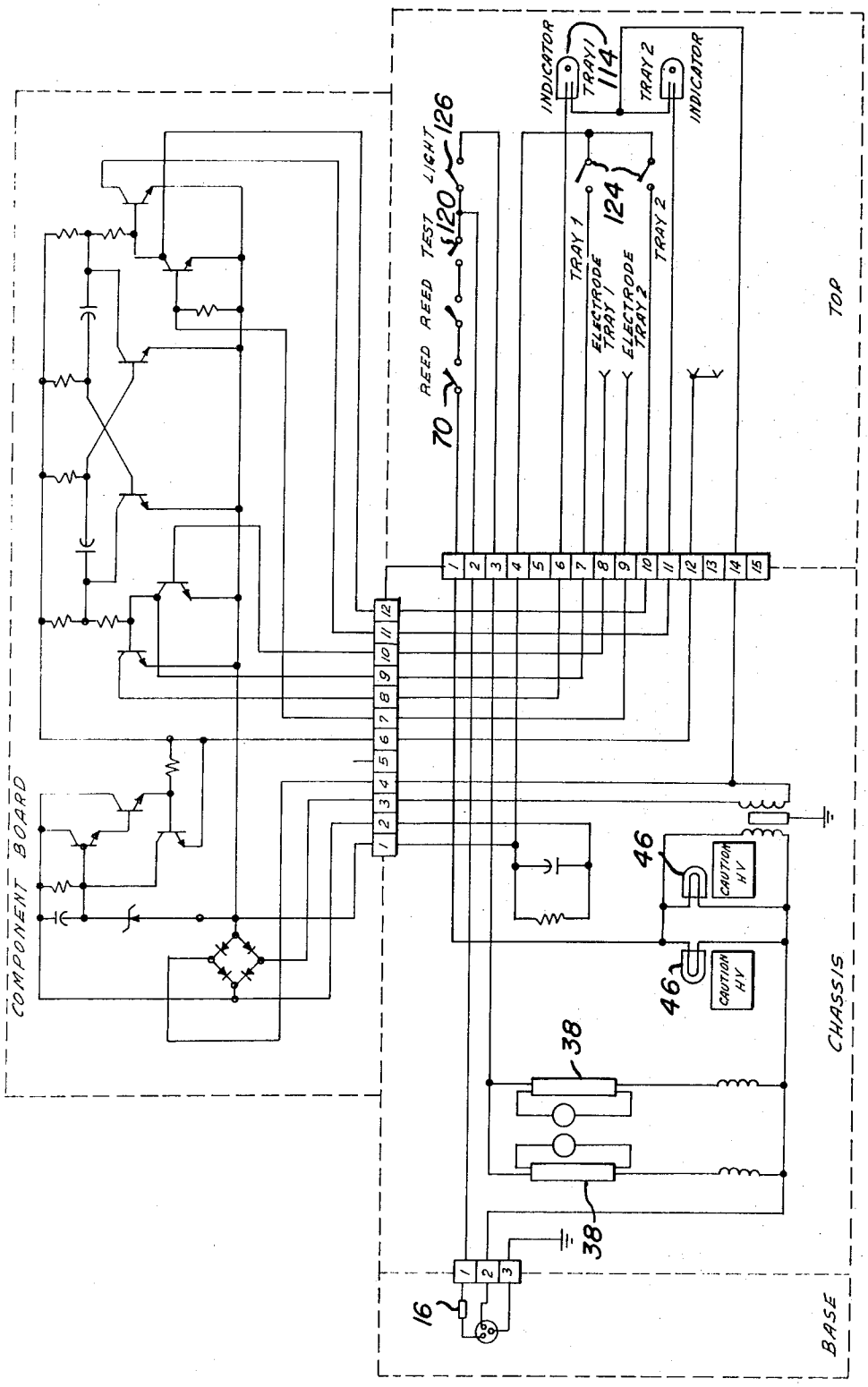

INDICATOR
TRAY 1
114
TRAY 2
INDICATOR
LIGHT
126
TEST
120
REED
REED
70
TRAY 1
ELECTRODE
TRAY 1
124
ELECTRODE
TRAY 2
TRAY 2
TOP
COMPONENT BOARD
46
CAUTION
H.V.
46
CAUTION
H.V.
38
38
CHASSIS
16
BASE

FIG. 13

TESTING APPARATUS

BACKGROUND OF THE INVENTION

The invention relates to a system for detecting the presence of hepatitis associated antigen and other immunological procedures and, in particular, it relates to a compact power supply and viewing test unit employed with a disposable test kit for screening multiple blood or serum samples for hepatitis associated antigen.

Electrophoresis has now become a well-established biochemical method for analyzing complex biological substances and has acquired scientific approval for use in clinical laboratory analyses in the study of normal and abnormal soluble and/or insoluble, animal and plant fluid constituents, particularly as they relate to the diagnosis and treatment of disease. In spite of the acceptance of this method as a biochemical method of analysis and protection its use has been restricted by the complexities of interpreting the electrophoretic patterns and by the limitations arising from the apparatus available in accomplishing this method. Conventional electrophoretic separation units and test systems are illustrated in U.S. Pat. Nos. 3,407,133; 3,432,414; 3,479,265 and application Ser. No. 300,341, now U.S. Pat. No. 3,788,210, referred to in the U.S. Pat. No. 3,479,265.

Consequently, effective use of the electrophoretic method has primarily been restricted to experts trained in interpreting and overcoming the complexities referred to hereinabove. The use of involved and intricate apparatus has resulted in many deficiencies. Such deficiencies include: inaccuracies arising from the application of dyes, such as fluorescent labels to render the separated portions visible and the necessity for intricate optical scanning means or radio isotopic scanning means and the like. The problem is particularly acute in the case of blood banks which are faced with a problem of screening hundreds of donors for viral or bacterial diseases employing relatively untrained personnel and sometimes under difficult field conditions. No practical system for screening potential blood donors has been developed up to now which is adapted to be used with relatively untrained personnel. With the prevalance of hepatitis in modern society, the need to develop such a mass detection system has become acute.

It is, therefore, a primary object of the present invention to provide a system for rapidly testing and detecting multiple samples of blood for the presence of a particular bacteria or virus antigen.

It is another object of the present invention to provide a unit for generating an electrical potential across a disposable electrophoresis test kit and for illuminating the kit within the unit to observe test results.

It is yet another object to provide a screening apparatus for detecting hepatitis-associated antigen in blood plasma or serum adapted for repeated use with high reproducibility and accuracy.

Other objects and advantages will become apparent from the following discussion:

SUMMARY OF THE INVENTION

These and other objects are met in a unit for retaining a disposable electrophoresis test kit adapted to detect the presence of hepatitis associated antigen or the like which includes a base; means for illuminating said test kit spaced within said base; a work platform for supporting said test kit, said platform having at least one pair of electrodes oppositely disposed thereon and connected to said base for generating an electrical potential across said test kit; a removable cover connected to said base for enclosing said unit, said cover having a transparent viewing port for observing said test kit and an electrical circuit in said unit for supplying power to said illuminating means and said electrodes.

A disposable test kit adapted for use with the aforesaid unit includes a buffer tray hving a pair of spaced apart reservoirs for retaining an electrophoresis buffer solution and a recessed platform spaced between the reservoirs for retaining a gel coated test plate. The test plate has a plurality of pairs of spaced apart test wells, and at opposite ends thereof, an unfoldable wick having one end thereof embedded in said gel for electrically connecting the test plate with the buffer solution in said tray reservoir.

It has been found that when a blood specimen containing hepatitis associated antigen is placed in one test well on the test plate and second well of the test pair is filled with hepatitis associated antibody, then upon electrophoresis of the test plate in the unit of the invention, a visible precipitin line forms between the well pairs, thereby indicating the presence of hepatitis associated antigen. The line may be visible to the naked eye on close examination, but is rendered completely visible by the use of illuminating means, such as fluorescent lights and the like. The unit is adapted to readily test over **50** individual blood specimens for bacteria or virus associated antigen and, particularly, hepatitis associated antigen, also known as Australia antigen. No dyes are employed, no intricate optical scanning means are employed and relatively unsophisticated technicians can easily employ the test unit of the invention in blood banks with highly reproducible results.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings illustrate an embodiment of the invention in which:

FIG. **1** is a fragmentary enlarged top plan view showing the formation of a precipitin line on a disposable test plate of the invention;

FIG. **2** is a fragmentary, enlarged vertical sectional view of the test plate taken along line **2—2** of FIG. **1**;

FIG. **3** is a top plan view of the test plate with a pair of wicks extending therefrom;

FIG. **4** is a perspective view of an alternate test plate;

FIG. **5** is a perspective view of a disposable test kit which may be employed with the power and illumination unit of the invention;

FIG. **6** is an exploded view of the power and illumination unit;

FIG. **7** is a top plan view of the power and illumination unit containing a pair of test plates;

FIG. **8** is a top plan view of the unit in FIG. **7** with the cover removed;

FIG. **9** is a vertical cross-sectional view of the power and illumination unit containing an electrophoresis test kit taken along line **9—9** of FIG. **8**;

FIG. **10** is a vertical cross-sectional view taken along line **10—10** of FIG. **8**;

FIG. 11 is a horizontal cross-sectional view taken along line 11—11 of FIG. 9;

FIG. 12 is a functional block diagram of the electrical circuitry of the power and illumination unit; and

FIG. 13 is a wiring diagram of the various circuits for the power and illumination unit.

DESCRIPTION OF PREFERRED EMBODIMENTS

Turning now to FIGS. 6 and 10 there is illustrated a power and illumination unit for housing a disposable electrophoresis test kit. The unit 11 includes base 10. Base 10 is preferably a rectilinear bin with an inlet orifice 12 for receiving power cord 14. A second orifice 13 is spaced above power cord orifice 12 and is adapted to receive a line fuse 16. A first and second pair of threaded studs 18 project upwardly from top flange 20 of base 10.

Base 10 has a plurality of slots 22 in its floor 24 in order to permit circulation of air through the base to prevent overheating of the unit during operation of the electrical components and lamps. To support the base of supporting leg 19 is located adjacent each corner of the base underside.

As seen in FIGS. 6, 9, 10 and 11, chassis 26 is mounted to the floor 24 of base 10 by means of floor mounting screws 28 extending through the floor 30 of chassis 26. As shown in FIG. 10, the screws also extend through shoulders 32 of base floor 24 and are removably mounted thereto by means of nuts 33.

Chassis 26 contains the illuminating and power elements for unit 11 housing the disposable test kit. For this purpose chassis 26 has a pair of integral, upstanding walls 34 connected to opposite sides of the chassis floor 30 and terminating in a pair of opposed flanges 36 extending toward each other in parallel relationship with chassis floor 30.

As seen in FIGS. 9 and 10 a fluorescent lamp 38 is mounted along the respective side edges of the chassis co-extensive with each of said flanges 36. At either end of each fluorescent lamp is a lamp socket 39. Each socket is mounted to the floor of said chassis 30.

In order to control the direction and intensity of light emitted by each of the fluorescent lamps 38, a light diffuser 40 is mounted adjacent each fluorescent lamp. As seen in FIGS. 9 and 11, each diffuser has a vertical wall portion 42 which is co-extensive in length with the spaced adjacent to each fluorescent lamp. The height of wall 42 is less than the diameter of the fluorescent lamp. The wall serves to block the passage of light emanating from the lamp in a horizontal direction across the unit and upwardly to about a 20° arc. An angular flange 43 extends downwardly from lamp diffuser wall 42 and serves to reflect any diffused light to a central upper portion of the unit. Flanges 36 prevent rear light passage.

Turning now to FIGS. 6 and 9 there are illustrated a pair of high voltage warning lights 46 which cooperate with a cover actuated safety interlock system to remind the operator that electric circuits are active immediately below the cover when the unit is in operation. The electrical connections between the high voltage lamps 46 and the safety interlock system is described hereinafter. High voltage warning lamps 46 are set in sockets 44. Each socket is connected by mounting bracket 50 to chassis wall 34.

As illustrated in FIGS. 6 and 8–10 working platform 52 is co-extensive with the base of the unit and covers chassis 26. The working platform serves to support the disposable test plate apparatus and electrodes and also houses the electrical components for initiating and monitoring the electrophoresis testing. Platform 52 is preferably formed from a single piece of transparent acrylic plastic, suitably vacuum formed. The working platform includes a peripheral mounting shoulder portion 54 co-extensive with top flange 20 of base 10. The rear portion 56 of shoulder 54 contains the controls which operate the viewing and testing apparatus.

Adjacent the side shoulders 58 of the working platform are a pair of spaced apart banana jacks 60 for receiving electrode pairs 62 of the electrophoresis test kit.

As shown in FIG. 9 the central stage 64 of the work platform is stepped below the side and front shoulders 54, 58. The central stage of the unitary work platform contains a pair of opposed rectangular elongated troughs 66 extending from the front to the back of the central stage. A generally rectangular central plateau 68 extends between the opposed troughs.

As illustrated in FIGS. 8 and 10, a pair of conventional reed safety interlocks 70 are connected, respectively, immediately beneath the front and rear shoulders of the work platform. The safety interlocks are adapted to cooperate with a pair of magnets located in the unit cover to insure that the unit is in the off position when the cover is removed from the unit.

At least one pair of removable electrodes 62 are provided for the unit. Each electrode has a banana plug 72 at one end adapted to fit into a banana jack 60 in the work platform. The body 73 of the electrode is in the shape of an inverted U terminating at the other end in an elongated metallic probe 74 adapted to penetrate trough 66 near its bottom.

It is preferred that central stage 64 be transparent in order to permit light from the fluorescent lamps to pass through the stage and illuminate an electrophoresis testing apparatus mounted on the stage. The cones of light emitted from the fluorescent lamps 38 are directed by the diffuser 40 to intersect immediately below work platform central plateau 68 and form a reinforced beam extending upwardly and outwardly therefrom in a cone shaped configuration so as to provide maximum illumination to the central plateau.

Turning now to FIG. 7, removable unit cover 76 is formed from a unitary piece of chemically resistant acrylic plastic. The portion that covers the central stage 64 is shaped in such a manner that condensate which forms from the underside of the cover during a test will not drip onto the counterelectrophoresis plates. Four holes 78 penetrate the cover to permit the guide studs 18 protruding from base 10 to capture the cover. Four cap nuts lock the cover to the work platform and base to form a completely aligned unit.

A pair of magnets 80 are embedded in the cover and are adapted to interact with the high voltage interlock switches 70 to complete the power circuit for the unit. As illustrated in the functional block diagram in FIG. 12 and the circuit diagram in FIG. 13 the reed interlock switches form a part of the power control circuit and, if not properly closed by the magnets in the unit cover 76, the unit is not energized. This prevents an operator from suffering accidental electric shocks should he insert his fingers into the unit during testing with the cover removed.

As seen in FIGS. 6, 7, 9 and 10 cover 76 has a mounting rim portion 82 which is generally co-extensive with the front, side and rear shoulder portion of working platform 52. Along each side edge 84 of the cover is a lifting wing 86 to permit an operator to remove the cover. Central stage 54 of work platform 52 is enclosed by a generally rectangular raised portion 88 of cover 76. The vertical walls 90 of raised portion 88 extend above work platform 52 sufficiently to clear electrodes 62.

To provide a surface which will direct condensate from the central portion of the cover to the trough section 66 of the work areas a peaked roof or hip roof 92 is provided on the cover generally co-extensive with the work area central plateau 68 and extending, on each side, above the trough 66 of the work platform. In order to permit an operator to view central plateau 68, which carries an electrophoresis test plate during operation, it is necessary that the peaked roof 92 be transparent. As shown in FIG. 7 it is also preferable that a pair of opposed squares 94 on the raised portion 88 of the cover be transparent. The squares are aligned above warning lamps 46.

While adapted for various testing purposes the aforedescribed apparatus is preferably employed in combination with a disposable electrophoresis test kit. While such kits have been proposed heretofore, as in U.S. Pat. No. 3,407,133, the following kit is preferred. The test kit includes a rigid, preferably plastic buffer tray 96 as illustrated in FIGS. 5 and 9. Buffer tray 96 includes a pair of opposed elongated buffer reservoirs 98 spaced apart by a central recessed depression 100. Tray reservoirs 98 are adapted to be received within work platform troughs 66. Depression 100 rests on platform central plateau 68.

As shown in FIGS. 3–5, the power unit and viewer 11 is adapted to receive and test one or two buffer trays. A disposable test plate 102 of complimentary configuration with depression 100 of tray 96 is preferably provided with a precast layer of conventional agarose gel adapted for electrophoresis work. The bottom of the plate is covered with a thin layer of agarose gel and a plurality of opposed pairs of test wells 104 are precut into the gel. Alternatively, the opposed pairs of test wells 104 can be precut into the test plate which is then covered with a thin layer of agarose gel. Each row 105 of opposed test wells is in parallel alignment, in use with buffer tray reservoirs 98.

Each test plate is equipped with an opposed pair of electrophoresis test wicks 106. A side edge 108 of each wick is embedded within the agarose gel. Prior to use each wick is tightly rolled for storage purposes. Each wick is sufficiently long to extend, when unfolded, substantially to the bottom of each tray reservoir 98, as shown in FIG. 9.

Included with the electrophoresis test kit are premeasured quantities of hepatitis associated antibody 110 and hepatitis associated antigen 112. A supply of premeasured solid buffer 111 is provided. The preferred buffer is a mixture of sodium barbital, diethylbarbituric acid and thimerosal (1:25,000). In order to deposit the antigen and antibody into a pair of opposed test wells of the test plate an automatic pipette 113 with a disposable tip is provided. The preferred automatic pipette in the HEPASCREEN Automatic Pipette distributed by SPECTRA BIOLOGICALS, a division of Becton, Dickinson and Company.

Turning now to FIGS. 12 and 13 the counterelectrophoresis power unit and viewer 11 includes a power control circuit A. The power control circuit protects the power and viewer unit against line surges on the input power and internal circuit overloads, controls the application of power to the viewing lamps and power supply circuits, provides for interruption of the power to the power supply circuit B when the top cover 76 is removed from the unit and indicates when power is being applied to the power supply circuit. The viewing lamps circuit C provides illumination for viewing the counterelectrophoresis test plates 102 and interpreting the test results. The viewing lamps circuit consists of two parallel connected conventional fluorescent lamp circuits electrically connected to lamp switch 126.

The power supply circuit B converts the AC input power to filtered, regulated 180 volts DC power for electrophoresis testing using suitable rectifiers. It also isolates this input power from the output to lessen the danger of electrical shock. The power supply positive output is connected to the positive electrode 61. The negative output is connected through the low current alarm circuits to the negative electrodes 63.

Each position on the work platform adapted to engage a disposable buffer tray has a separate low current alarm circuit D. The circuit monitors the current from the power supply B through the test plate 102. If the current is low (below about 16 micro amps) the low current alarm lamp 114 (as illustrated in FIG. 8) associated with the tray position being monitored, will flash.

As shown in FIG. 12 the electrodes, both positive and negative, provide the electrical conduit for conducting current from the supply output through the buffer solution, wicks, and counterelectrophoresis test plate 102.

FIG. 13 shows the circuit diagram for the electrical components of the unit and the general location for the electrical components. The power control circuit includes line fuse 16 to protect against input power overloads and circuit overloads. Test power switch 120 controls power application to caution lamps 46 and power supply circuits. Reed switches 70 interrupt power to circuit B when cover 76 is removed. Power control circuit A also includes lamps 46 to indicate power is being supplied to circuit B.

In order to operate the unit the solid buffer 111 is solubilized in water and the resulting solution is dispensed to the opposed reservoirs 98 of the buffer tray. Next, the cover is removed from the power and viewing unit by disengaging the cap nuts 79. The positive and negative electrodes 61, 63 are removed from the unit by pulling straight up on the electrode body 62.

Next, the disposable buffer tray 96 is installed in the troughs 66 of the work platform. The positive and negative electrodes are then inserted into their respective jacks in the unit.

Wicks 106 for the positive and negative electrode, as seen in FIG. 3, are unfolded from test plate 102. About 0.02 milliliters of hepatitis associated antibody is pipetted using the automatic pipette into the left hand well 116 of each pair of test wells as shown in FIG. 1. Next about 0.02 milliliters of control hepatitis associated antigen is pipetted into the right hand well 118 of the control pair. Finally about 0.02 milliliter of test samples are pipetted into the right wells 118 of each test pair. A

separate pipette tip is employed for dispensing each test sample.

Next, test plate **102** is placed in the central depression **100** of buffer tray **96.** The keyed wick labeled "positive electrode" is immersed in the buffer tray adjacent the positive electrode **61.** For test purposes it is necessary that the hepatitis associated antibody be placed in the test well of the pair closest to the positive electrode. The test sample is placed in the well closest to the negative electrode **63.**

The other wick labeled "negative electrode" is then immersed in the tray adjacent the negative electrode **63.** The cover is replaced on the power and viewing unit and the unit is now ready for testing. The unit is energized by closing the test power switch **120.** Closing the switch energizes the power control circuit and the warning lamps **46.**

In order to confirm that sufficient current is passing through the circuit formed by the positive and negative electrodes the respective buffer solutions in the buffer troughs, the wicks and test plate, indicator lamp **114** is provided for each testing portion. For testing the tray switch **124** is moved to the closed position thereby completing the testing circuit. During testing the unit is preferably at room temperature to achieve optimum reaction conditions. The unit is operated for about 2 hours of continuous testing.

In order to read the unit and determine whether the specified sample contained hepatitis associated antigen, lamp switch **126** is closed completing the circuit through the fluorescent lamps **38.** Strongly positive test samples will form distinctive illuminated precipitin lines within 30 minutes. The full 2 hour test period is employed to insure the detection of extremely low titered hepatitis associated antigen positives.

Prior to illuminating the test plate after the testing period is completed, all switches are turned to the off or opened position. The cover is removed from the power and testing unit **11.** The viewer power switch **126** is then closed thereby actuating the fluorescent lamps. The test plate is examined for precipitin lines. A typical precipitin line is illustrated in FIG. **1.** For comparision purposes a precipitin line should appear between the control antigen and antibody, indicating that the system has functioned properly.

Upon completion of test plate evaluation the viewing switch **126** is opened and the buffer tray and test plate are removed from the unit and preferably autoclaved.

Generally, impact resistant rigid materials are employed for the unit. The cover, base and work area are preferably formed from chemically resistant, high impact KYDEX brand acrylic plastic. The disposable buffer tray is preferably formed from clear polyvinyl chloride. In order to provide a bench mark on the buffer trays to indicate that the proper amount of buffer solution is present in each, a molded step (not shown) may be formed at the inner top edge of each buffer tray reservoir at the appropriate level.

As indicated in FIG. **11** baffle **37** is employed to separate heat sensitive electrical components mounted on the chassis from the fluorescent lamps. Chassis **26** is preferably formed from aluminum. Electrodes **62** are preferably formed from LEXAN brand polycarbonate plastic.

The unit has been licensed by the Division of Biologics Standards for hepatitis associated antibody. The following theory of operation has been postulated. The agarose gel formation causes the antigen molecule in the test wells to become negatively charged and the antibody molecules to be nearly neutral. An electric field is established across the plate between the wicks when the plate is placed in the test unit and the test power activated. The resulting electrophoretic force accelerates the movement of the negatively charged antigen molecules and they converge with the antibody molecules in less time then if acted upon by only a diffusive force. The nearly neutral antibody molecule is moved toward the antigen by electro-osmosis.

Additionally, the electrophoretic force causes migration of hydrogen ions. The buffer solution acts as a reservoir of hydrogen ions to maintain the pH in the agarose gel so that the antigen remains charged throughout the test. The charge on the antigen, a macromolecule, is influenced by the concentration of hydrogen ions.

During testing the electrical resistance inherent in the agarose gel causes the gel to heat and limits the voltage difference that can be applied across the test plate. In the illustrated unit the voltage difference across the plate is about 25 volts. The test plate is about 7.5 centimeters wide. Monitoring the current across the test plate provides verification that the correct voltage difference is being applied across the plate. The low current indicator lights signal when the current drops below that needed to provide satisfactory test results.

Among the advantages provided by the counterelectrophoresis power and viewer unit are the peaked cover or hip rooftype cover which provides a controlled environment for optimum reaction conditions and prevents condensed liquid (heated by the fluorescent lamps or the like) from dripping onto the test plates. The cover actuated safety interlock switches interrupt the voltage when the cover is removed thus protecting the user from accidental contact with high voltage. The built-in viewing lamps provide light at proper angle and intensity for interpreting test results. The infection risk to laboratory personnel is minimized by eliminating the need for handling the test plates to view the test results. Further, a second test plate can be added even while a first test is being run without effecting results. The disposable test kit including the buffer tray and test plate with prefolded wicks eliminates contamination problems.

A workable electrophoresis unit is 14 ¼ inches wide by 17 inches long by 5 ¾ inches high. It will be obvious to those skilled in the art that various modifications may be made the specific embodiments described herein. While particular embodiments have been discussed it will be understood that the invention is not limited thereto and that it is contemplated to cover any such modifications in the appended claims as fall within the true spirit and scope of the invention.

Wherefor we claim:

1. Unit for retaining a disposable electrophoresis test kit adapted to detect the presence of hepatitis associated antigen or the like comprising:

a. a base;

b. means for illuminating said test kit spaced within said base;

c. a work platform for supporting said test kit, said platform having at least one pair of electrodes oppositely disposed thereon and connected to said

base for generating an electrical potential across said test kit;

d. a removable cover connected to said base for enclosing said unit, said cover having a transparent viewing port for observing said test kit;

e. an electrical circuit in said unit for supplying power to said illuminating means and said electrodes;

f. said work platform having a spaced apart elongated troughs in parallel relation and said cover has a hip roof portion substantially enclosing said troughs; and

g. said means for illuminating said test kit including a pair of opposed lights mounted beneath said work platform and means for intercepting predetermined portions of light emitted from said lights such that the space between said troughs is highlighted to facilitate visual reception thereof.

2. The invention in accordance with claim **1** including at least one safety interlock switch for opening and closing said electrical circuit and one magnet for each said interlock switch mounted in said cover for actuating said switch and closing said electrical circuit, said interlock switch being normally opened.

3. The invention in accordance with claim **1** in combination with a disposable test kit, said kit including a buffer tray having a pair of spaced apart reservoirs, each reservoir adapted to seat in one of said opposed troughs, a recessed platform spaced between said reservoirs and an agarose gel coated test plate having a plurality of pairs of spaced apart test wells and, at opposite ends of said plate, an unfoldable wick having one end thereof embedded in said gel wherein said test plate is received in said recessed platform on said buffer tray.

4. A unit for retaining a disposable electrophoresis test kit adapted to detect the presence of hepatitis associated antigen or the like comprising:

a. a rectilinear bin having air vents therein;

b. a chassis mounted within said bin, said chassis having mounted thereon a pair of parallelly opposed fluorescent lamps;

c. means for intercepting the light emitted from each said lamp to provide an illuminating arc of at least about 80° from the vertical directed upwardly toward the central portion of said bin;

d. a work platform mounted on said bin above said chassis, said work platform having a pair of elongated rectangular troughs, each trough spaced above one of said fluorescent lamps;

e. at least one pair of electrodes removably mounted on said platform, one of said electrodes associated with each trough and extending substantially to the bottom of said trough;

f. at least one magnetically actuated interlock switch mounted on said platform;

g. a removable cover for said work platform, said cover having a transparent hip roof portion spaced above said troughs and one magnet connected to said cover for each said interlock switch adapted to close said interlock switch upon engagement;

h. an electrical circuit in said unit for supplying power to said illuminating means and electrodes, wherein each said interlock switch electrically connected to said circuit and is adapted to open said circuit when in the normally open position and to close said circuit when actuated by said magnet; and

i. a circuit electrically connected to each of said electrodes for monitoring the current passing through said electrodes and for signaling when said current falls below a predetermined level necessary for electrophoresis.

5. Unit for retaining a disposable electrophoresis test kit adapted to detect the presence of hepatitis associated antigen or the like comprising:

a. a base;

b. means for illuminating said test kit spaced within said base;

c. a work platform for supporting said test kit, said platform having at least one pair of electrodes oppositely disposed thereon and connected to said base for generating an electrical potential across said test kit;

d. a removable cover connected to said base for enclosing said unit, said cover having a transparent viewing port for observing said test kit;

e. an electrical circuit in said unit for supplying power to said illuminating means and said electrodes; and

f. a circuit electrically connected to each of said electrodes for monitoring the current passing through said electrodes and for signaling when said current falls below a predetermined level necessary for electrophoresis.

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