Sept. 6, 1966 D. L. WILLIAMS ETAL 3,271,112

APPARATUS FOR LABORATORY TESTING

Filed Dec. 12, 1962 2 Sheets-Sheet 1

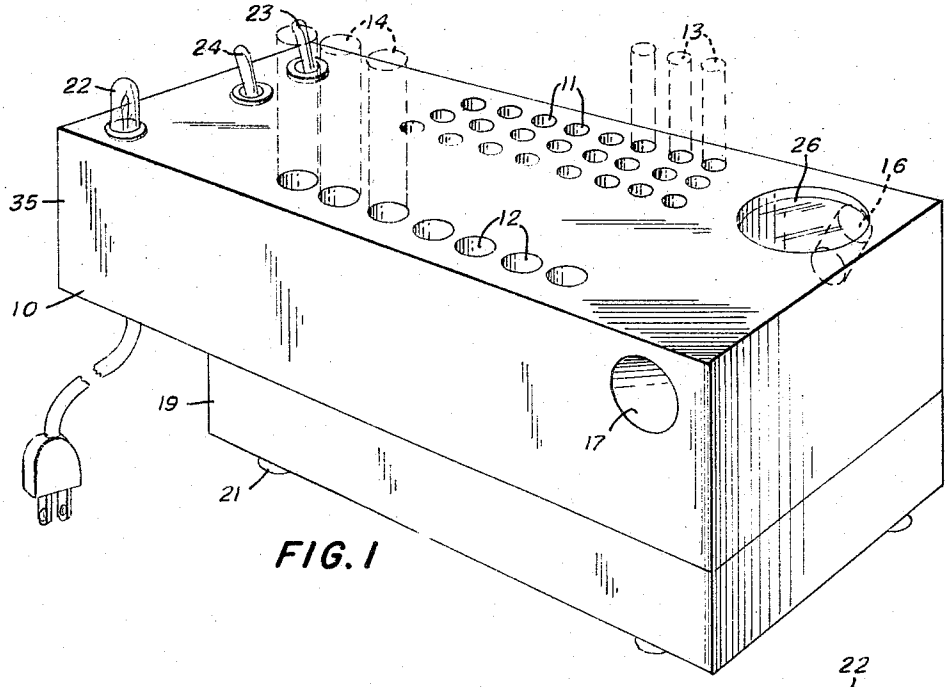


FIG. 1

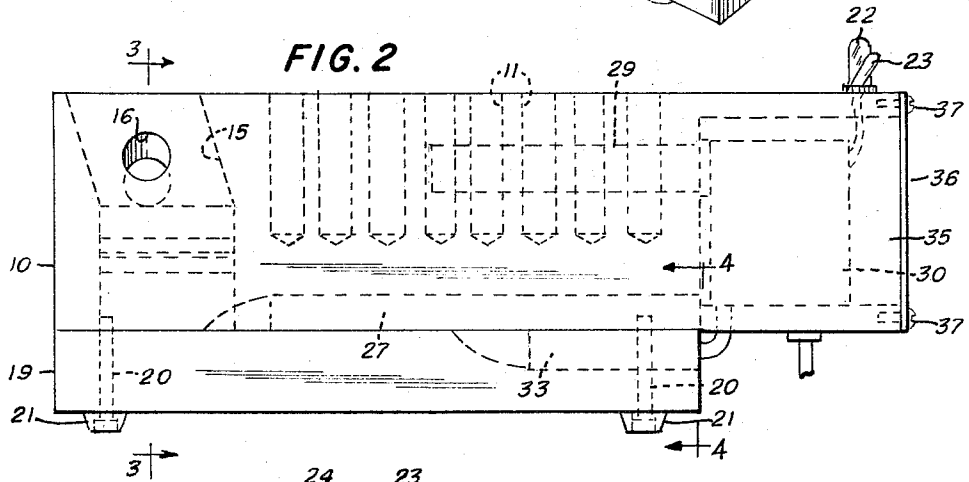


FIG. 2

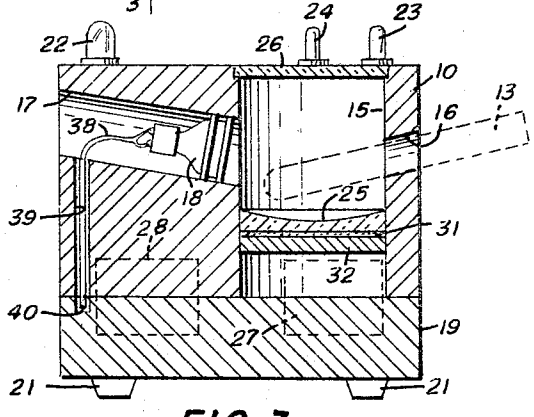


FIG. 3

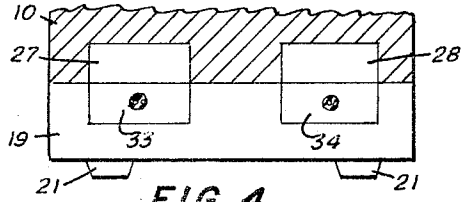


FIG. 4

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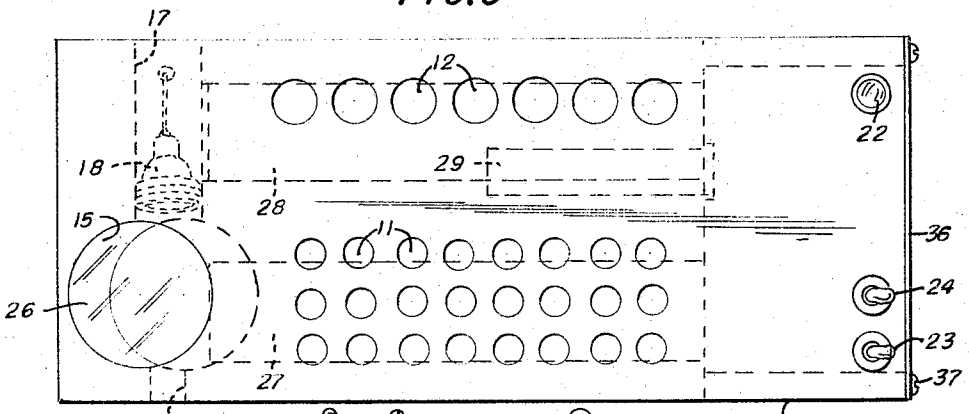
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APPARATUS FOR LABORATORY TESTING

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FIG. 5



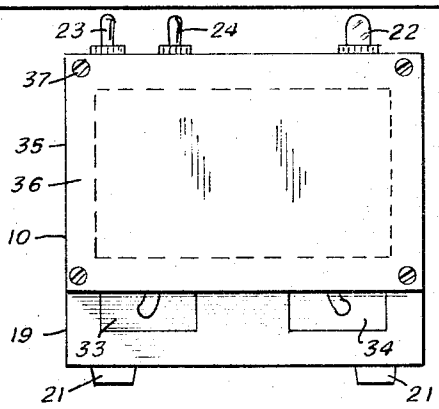


FIG. 6

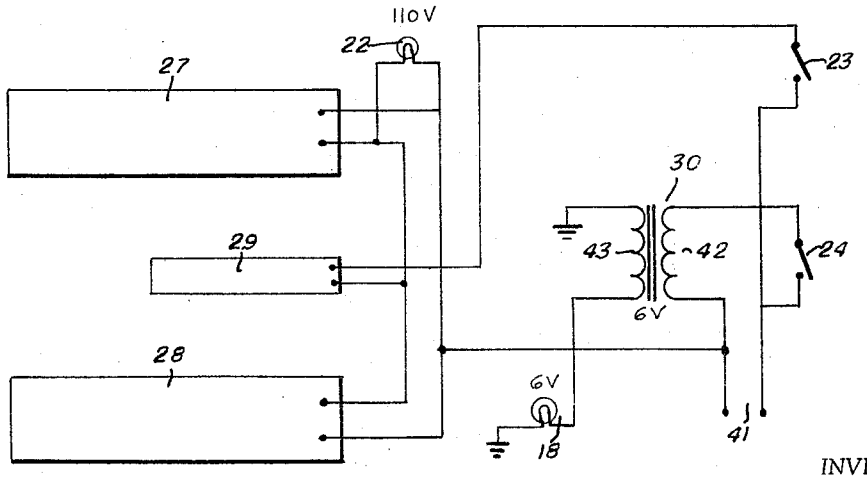


FIG. 7

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APPARATUS FOR LABORATORY TESTING

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5 Claims. (Cl. 23—253)

This invention relates in general to a method and apparatus for making laboratory tests and more particularly to a method and apparatus for use in blood plasma prothrombin determination.

In making blood plasma prothrombin determination, blood plasma is usually placed in a test tube and heated to a temperature between 37° C. and 38° C. and then various clotting reagents are placed in the blood plasma which create a clot formation. The time between the insertion of the clotting reagent and the clot formation determines the particular condition of the patent's blood. The timing must be accurate within two seconds. Maintenance of the blood plasma and clotting reagent at a constant temperature throughout the performance of this test is an important factor in the accuracy of the test.

Prior art devices employ a control heat water bath in which difficulty is encountered in accurately controlling the temperature and observing the mixture being tested.

The object of this invention is to provide a method and apparatus whereby the blood plasma and clotting solution can be maintained at a constant temperature throughout the test.

Another object of the invention is to provide a method and apparatus in which a magnified image of the mixed blood plasma and clotting solution may be observed for a more accurate determination of the clotting time.

Another object of this invention is to provide a laboratory apparatus which is simple in construction and easily accessible for multiple tests yet accurate in operation.

According to this invention the preheating and viewing chambers are made in a single block, the temperature of which is maintained constant to assure uniform heat throughout the test and the viewing chamber is provided with a magnifying mirror to allow a closer inspection of the mixture tested.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawing in which:

FIG. 1 shows a perspective view of the testing device according to this invention;

FIG. 2 is a side elevation of the testing device as appears when viewed from the rear side;

FIG. 3 is a cross-sectional view taken along line 3—3 of FIG. 3;

FIG. 4 is a fragmentary cross-sectional view taken along line 4—4 of FIG. 2;

FIG. 5 is a top plan view of the testing device;

FIG. 6 is a right hand end elevation view of the testing device of FIG. 5; and

FIG. 7 is an electric circuit diagram for control of the testing device.

Referring to FIG. 1 there is shown a block **10** preferably made of aluminum reduce weight but other metals having good heat conductive properties are also suitable. Block **10** has a plurality of test tube holders **11** and **12** made by providing holes therein to support a plurality of test tubes **13** and **14**, respectively. Test tubes **13** and **14** contain the materials to be tested which are preheated when placed in the respective test tube holders **11** and **12**.

Viewing chamber **15** is made by providing an inclined hole in block **10**. A test tube holder **16** for supporting the test tube within the viewing chamber is made by providing an inclined hole in block **10**. Light holder **17** containing a light **18** is made by providing an inclined hole in block **10**. Light **18** illuminates the mixture to be tested which is placed in viewing chamber **15**. Both test tube holder **16** and light holder **17** communicate with viewing chamber **15** as is illustrated in FIG. 3.

A base plate **19** is attached to block **10** by a plurality of bolts **20**. Rubber mountings **21** are held by bolts **20** and serve as a cushion between the testing device and laboratory table. Base plate **19** is made of the same material as block **10** to insure uniform heating. Base plate **19** is detachable from block **10** to allow mounting of terminal blocks **33** and **34** in base plate **19** and strip heaters **27** and **28** in block **10**. Strip heaters **27** and **28** extend along the lower portion of block **10** as noted in FIGS. 2 and 4.

Block **10** has a control box portion **35** for supporting some of the electrical components. Control box portion **35** can be an integral part block **10** as shown or an individual box fabricated from a material similar to that of block **10**. Control box portion **35** supports pilot light **22**, heater switch **23**, and light switch **24** as is shown in FIG. 1. Transformer **30** is mounted inside control box portion **35** as is shown in FIG. 2. A door **36** is secured by screws **37** or other suitable fasteners to enclose control box portion **35**.

Referring to FIG. 3, the viewing chamber **15** has a lens **26** of transparent material such as glass or plastic mounted across the top portion to contain the heat therein and accommodate visual inspection of the interior of viewing chamber. The lower portion of viewing chamber **15** is closed by a plug **32** made of steel which supports a layer of bedding compound **31**. Resting on bedding compound **31** is a mirror **25** of selected magnification. In a working model of the invention a mirror of approximately two magnifications was found suitable. In testing, the reaction is viewed in the mirror to allow a more careful inspection of the mixture. Light **18** is counted in light holder **17** and illuminates the mixture to be tested. Electrical cord **38** extends from light **18** through a vertical opening **39** in block **10** and then along a groove **40** in base plate **19** to control box portion **35**.

Thermostat **29** is placed in block **10** extending from control box portion **35** and is located between test tube holders **11** and **12** as shown in FIG. 5. This control location allows thermostat **29** to make an accurate determination of the temperature of the complete testing device and allows its removal through the control box door **36**.

FIG. 7 shows the electrical connections of the various electrical components mentioned above. Strip heaters **27** and **28** are electrically connected in parallel. This parallel combination is connected in series with thermostat **29** and heater switch **23** and then to power supply **41**. Power supply **41** is usually the conventional 110 volt 60 cycle alternating current supplied to medical laboratories but all of the electrical components can be modified to operate on the power supply available. A pilot light **22** is connected in parallel with strip heaters **27** and **28** to indicate when power is being supplied to the heaters. Upon closing of switch **23** the voltage of power supply **41** is applied to strip heaters **27** and **28** until thermostat **29** or switch **23** opens the circuit.

Electrical power to light **18** which illuminates the mixture to be tested in the viewing chamber **15** is supplied by power supply **41** through transformer **30**. Transformer **30** has a primary winding **42** and a secondary winding **43** which steps down the voltage. Light **18** is serially connected to secondary winding **43**. Light switch **24** is serially connected to primary winding **42** and the com-

bination connected to power supply **41** so that upon closure of switch **24** the entire voltage across power supply **41** is across primary winding **42**. When the power supply **41** is 110 volts the voltage which appears across secondary winding **43** is 6 volts which is used to power a 6 volt bulb of light **18**. It is apparent that upon closure of switch **24** light **18** will be actuated, thus lighting viewing chamber **15**.

The operation of the testing device to test for blood plasma prothrombin determination is as follows: Switches **23** and **24** are closed to heat block **10** and illuminate viewing chamber **15**, respectively. Selected amounts of blood plasma and a clotting solution are placed in test tubes **13** or **14** and then placed in holder **11** or **12** for preheating. Thermostat **29** maintains block **10** at the preselected temperature of 37° C., which is approximately body temperature, by opening and closing the electric circuit to power supply **41**. After the blood plasma and clotting solution have been sufficiently preheated a test tube containing blood plasma is placed in holder **16** where it can be observed through lens **26** and in the mirror **25**. Then the clotting solution is added to the blood plasma and the length of time it takes to clot is recorded. By having the viewing chamber **15** and test tube holder **11** a part of a single block **10**, uniform heating throughout the test is assured. Further, by being able to observe a magnified image of the mixture of blood plasma and clotting solution a more accurate time determination can be made. It is apparent that the structure is easily accessible and that once block **10** has heated to 37° C. many tests can be run in a short period of time.

Although we have described our invention with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and the numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and scope of the invention as hereinafter claimed.

We claim as our invention:

1. Apparatus for determining prothrombin time in blood plasma comprising a housing, means for heating said housing and maintaining it at a predetermined temperature, said housing being of material having a good heat conductivity characteristic whereby said housing has a uniform temperature, first container means for carrying blood plasma to be tested, storage means in said housing for said first container means whereby said blood plasma is preheated to said predetermined temperature prior to the measurement of prothrombin time, viewing chamber means substantially fully enclosed by said housing and adapted to receive at least a portion of said first container means, means for illuminating said viewing chamber, and means for viewing that portion of said first container which is inserted into said chamber, said viewing chamber being substantially closed to the ambient atmosphere and being maintained at said predetermined temperature whereby said prothrombin time may be accurately determined.

2. The apparatus of claim **1**, wherein said means for heating said housing and maintaining it at a predetermined temperature comprises electrical strip heaters mounted within said housing and thermostat means for controlling the flow of electricity thereto in accordance with the temperature of said housing.

3. The apparatus of claim **1**, wherein said first container means comprises a test tube, said storage means comprising at least one test tube holder extending into said housing.

4. The apparatus of claim **1**, wherein said viewing chamber means comprises an opening within said housing, at least a portion of said opening extending to one surface of said housing, said viewing chamber means further including means for supporting said first container means, transparent means for closing the portion of said opening which extends to said one surface of said housing, and mirror means within said viewing chamber means to accommodate visual inspection of said blood plasma during said determination of prothrombin time, said mirror being concave to provide magnification.

5. The apparatus of claim **1**, further including second container means for carrying solution to be added to said blood plasma when said prothrombin time is to be measured, said first and second container means comprising test tubes, and said storage means comprising a plurality of test tube holders extending into said housing.

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