# United States Patent [19]

**Bond et al.**

[11] **3,827,286**

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[54] **DEVICE FOR BLOOD SEDIMENTATION RATE ESTIMATION**


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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.** ..... **G01n 15/04,** G01n 33/16

[58] **Field of Search** ..... 73/61.4, 425.4 P, 425.6



[56] **References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 3,261,208 | 7/1966 | Fisher | 73/425.6 |
| 3,444,742 | 5/1969 | Ellis et al. | 73/425.6 |
| 3,572,552 | 3/1971 | Guinn | 73/425.6 X |
| 3,696,971 | 10/1972 | Maclin | 73/425.4 P X |

FOREIGN PATENTS OR APPLICATIONS

| | | | |
|---|---|---|---|
| 726,095 | 3/1955 | Great Britain | 73/61.4 |



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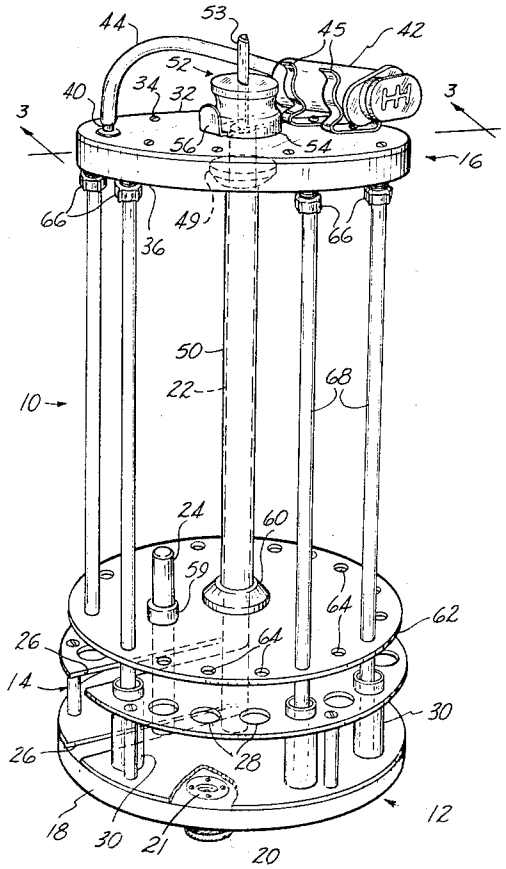
[57] **ABSTRACT**

A device for use in determining the sedimentation rate of blood samples having a stand, a rack removably mounted on the stand and adapted to retain a plurality of specimen holders for blood samples, and a manifold with a plurality of pipette holders adapted to each receive a pipette and establish through a common manifold communication of the pipettes with an apparatus for drawing a vacuum. The manifold can be carried by the stand in one position with the free end of the pipettes above the specimen holders and in a second position in which the free end of each pipette is lowered into its associated specimen holder.


**15 Claims, 5 Drawing Figures**



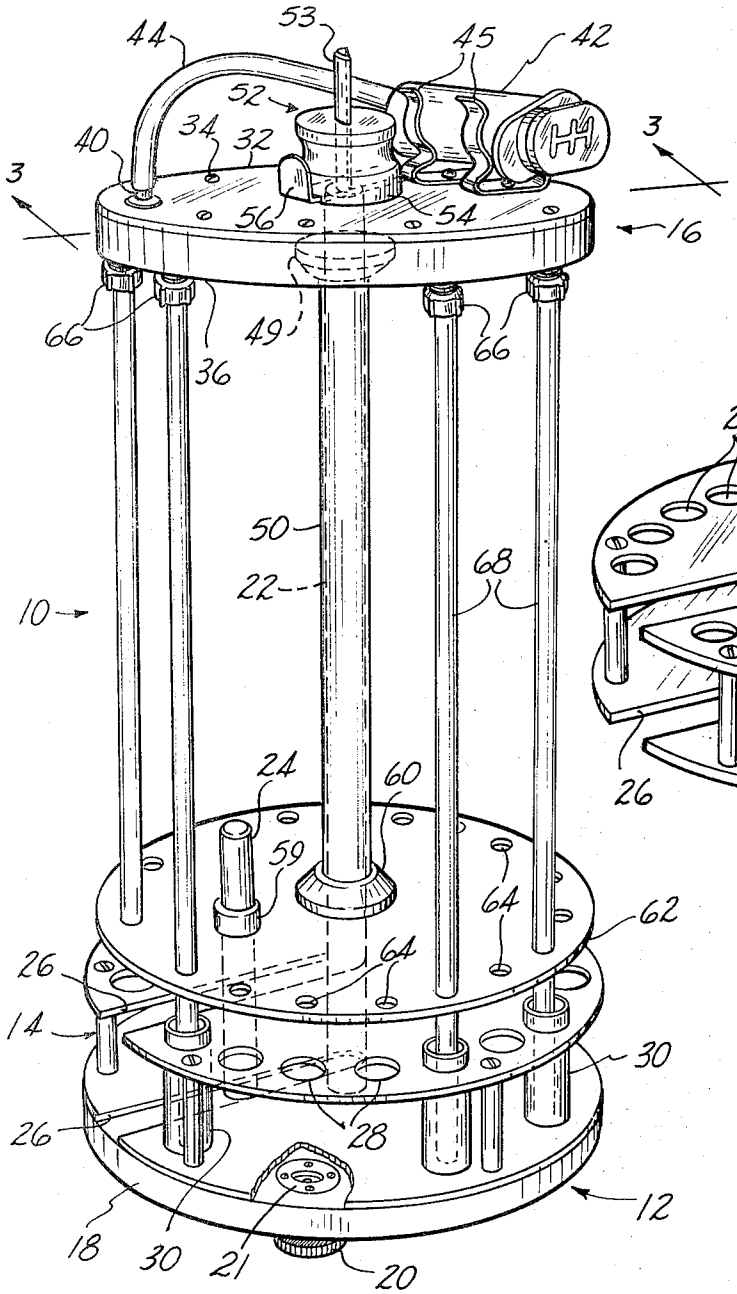

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Fig-1

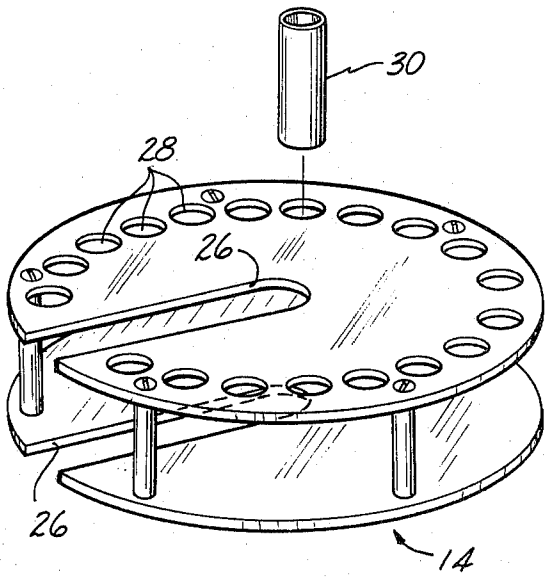
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Fig-2

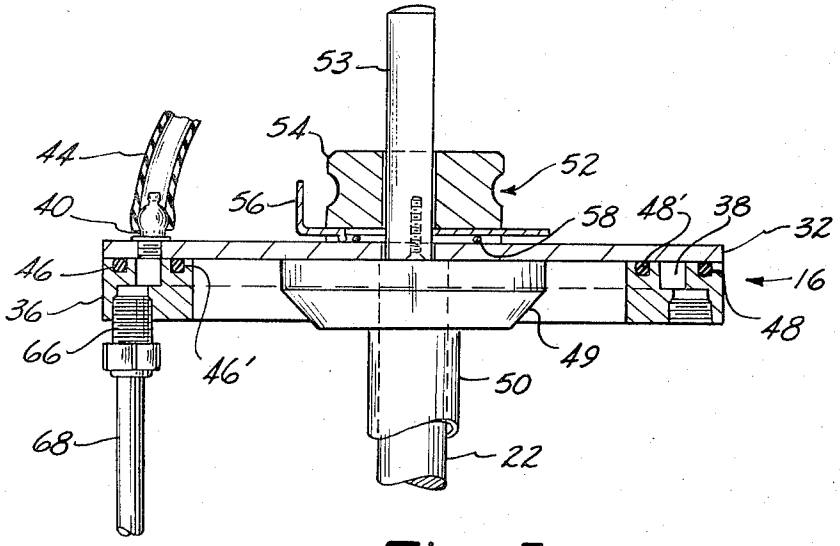


Fig - 3

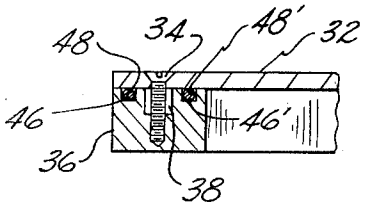


Fig - 4

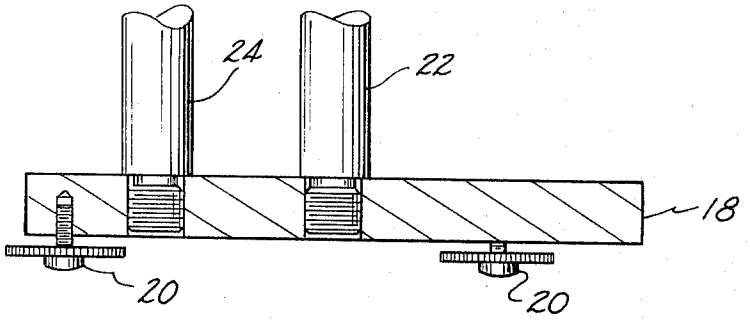


Fig - 5

# DEVICE FOR BLOOD SEDIMENTATION RATE ESTIMATION

This invention relates to devices used in sedimentation rate estimation and more particularly to devices used as diagnostic aids in the determination of erythrocyte sedimentation rates of blood samples.

It is a well-known practice in determining a blood sample erythrocyte sedimentation rate to employ a pipette into which a blood sample is sucked, the pipette then being supported vertically in a stand, and an estimation of the sedimentation rate taken by visual examination after a given interval. Devices for holding a plurality of such loaded pipettes are well known. However, such devices and techniques of sucking the blood sample into a pipette expose the laboratory technician to the risk of becoming infected by the blood sample and particularly to the risk of being infected with hepatitis. To avoid this sucking operation and the attending risk of becoming infected with hepatitis, it has been proposed that the pipette be filled by a displacement technique in which the pipette is inserted into a sample holder through a narrow aperture. However, this displacement technique does not provide accurate control of sample quantities and a plurality of such samples cannot be conveniently and rapidly processed and read to determine the erythrocyte sedimentation rate.

In general, this invention is embodied in a sedimentation rate estimation device which has a stand, a manifold having an evacuating port connected to a syringe or other means of drawing a vacuum, and a plurality of pipette holders each adapted to establish communication between the interior of said manifold and an inserted pipette. The stand is provided with a mounting rack for a plurality of specimen holders and an operating mechanism which can be set in one position to hold the manifold and its assembled pipettes above the specimen holders, and which can be moved to a second position in which the free end of each pipette is lowered into its associated specimen holder.

Objects of this invention are to provide a device for use in determining erythrocyte sedimentation rates of blood samples which eliminates the risk of an operator becoming infected by using the device, provides accurate control of sample quantities, and facilitates the rapid and convenient processing and reading of a plurality of blood samples.

These and other objects, features and advantages of this invention will be apparent from the following detailed description, appended claims and accompanying drawings in which:

FIG. **1** is a perspective view of a sedimentation rate estimation device embodying this invention.

FIG. **2** is a perspective view of a specimen holder rack of the device of FIG. **1.**

FIG. **3** is a sectional view on line **3—3** of FIG. **1** illustrating a manifold of the sedimentation rate estimation device.

FIG. **4** is a fragmentary sectional view of the manifold.

FIG. **5** is a fragmentary view in section of a stand of the sedimentation rate estimation device.

Referring in more detail to the drawings, FIG. **1** illustrates a device **10** embodying this invention with a stand **12**, a specimen holder rack **14** receivable thereon, and a manifold **16** releasably supported thereby.



Stand **10** has a base plate **18** provided with adjustable feet **20** and a bubble-type level indicator **21.** At the center of base plate **18** a spindle **22** is mounted which carries manifold **16.** Base plate **18** also has a locating pin **24** mounted thereon which serves to positively locate specimen rack **14** when the latter is positioned on base plate **18,** rack **14** having key slots **26** therein which the locating pin **24** engages. Around the periphery of rack **14** there are holes **28** to contain and locate individual specimen holders **30** of a conventional type. The holes **28** in rack **14** are individually numbered to facilitate identification of the respective samples.

As shown in FIGS. **1, 3** and **4,** manifold **16** has a cover plate **32** secured by screws **34** to a ring **36** with an annular manifold chamber **38** therein provided with an evacuating port **40** to which is connected a syringe **42** or other means of creating a vacuum by a hose **44.** Syringe **42** is releasably mounted on manifold **16** by spring steel clips **45** secured to cover plate **32.** An air-tight seal between plate **32** and ring **36** is provided by O-rings **46** and **46'** received in grooves **48** and **48'** in the ring. Cover plate **32** is fixed by a collar **49** to one end of a hollow cylinder **50** through which spindle **22** can pass. A spring-loaded latch mechanism **52** releasably retains manifold **16** on the reduced shank portion **53** on the top of spindle **22.** Latch mechanism **52** has a housing **54** fixed to the top of cover plate **32** which slidably receives therein a latch plate **56** yieldably biased by a spring **58** into frictional engagement with shank portion **53** of spindle **22.** Shank portion **53** has a D-shaped cross section and housing **54** has a correspondingly shaped aperture therethrough so that manifold **16** can only be lowered on spindle **22** when correctly aligned with base **12** and thus specimen rack **14** when received thereon. Either in addition to or in lieu of D-shaped shank portion **53** and correspondingly apertured housing **54,** a collar **59** is fixed to plate **62** of manifold **16** to align it with rack **14** by sliding over pin **24** when manifold **16** is in its lowered position. Pin **24** is of sufficient length to extend into collar **59** when manifold **16** is lowered and to clear the collar when the manifold is raised.

The lower end of the hollow supporting cylinder **50** is fixed by a collar **60** to a locating plate **62** with a plurality of holes **64** therein positioned to correspond with the holes **28** of specimen rack **14.** The lower face of manifold ring **36** is provided with a corresponding number of pipette holders **66** which are each designed to retain and seal an inserted pipette **68** therein with its central bore in communication with manifold chamber **38.** The holes **64** in locating plate **62** are also individually numbered to identify the pipettes **68** with their associated specimen holders **30** received in the correspondingly numbered holes **28** of specimen holder rack **14.**

To carry out an erythrocyte sedimentation rate estimation process, pipettes **68** are inserted in their holders **66,** to hang vertically through their associated holes **64** in plate **62,** and syringe **44** is set to the closed position. The specimen rack **14** is then loaded with sample holders **30** containing the individual blood samples and positioned on the base plate **12** in the attitude determined by locating pin **24.** The manifold **16** is then aligned with pin **24** and lowered by operation of latch mechanism **52** over the reduced shank portion **53** of the free end of spindle **22.** The shoulder at the lower end of the reduced shank portion of spindle **22** supports manifold

16 in the fully lowered position with each pipette 68 received within and adjacent to the bottom of its associated specimen holder 30. By gentle operation of syringe 44, blood samples can be drawn from specimen holders 30 into their associated pipettes, which are filled to a point slightly above their zero marks. Individual adjustment is then effected in a known manner, for example by bleeding in of air, to set the level of each specimen at its zero mark. The manifold 16 is then raised to its upper position and held there by releasing latch mechanism 52 so that the upper end of spindle 22 bears on the lower face of latch plate 56 thereby freeing manifold 16 to rotate on spindle 22. After a predetermined period, normally one hour, readings of the individual sedimentation levels can be taken visually. Manifold 16 is free to rotate on spindle 22 in the raised position to facilitate the reading process. Following recording of the readings, the complete manifold 16 with its pipettes in place can be lifted off stand 12 to facilitate cleansing. For example, a washing stand may be provided to hold the complete manifold 16 and a vacuum line connected to evacuation port 40 to draw water through the apparatus.

The embodiment shown holds twenty pipettes, and if the number of specimens to be checked is less than 20, water "blanks" or specimen holders 30 filled with water are placed in the vacant positions of specimen rack 14 to maintain the vacuum in manifold chamber 38.

The embodiment described minimizes the risk of infection and considerably reduces the time taken to carry out a sedimentation rate process, since the whole apparatus may be washed and dried ready for use within a few minutes of reading the results of a previous batch. The circular construction is economical in bench space, whilst enabling all reading to be taken from a single position by rotation of the manifold assembly. However, other types of stand and specimen racks may be used, for example, an aligned rack supporting a row of pipettes.

We claim:

1. A device for use in the determination of sedimentation rates of blood samples comprising a base, a rack for retaining a plurality of sample holders for blood samples in a generally circular configuration, said rack being adapted to be removably carried by said base, a pipette carrier with a manifold having a plurality of pipette holders arranged in a generally circular configuration and each adapted to seal an inserted pipette therein with the central bore of the pipette in communication with a manifold chamber in said manifold, support means on said base for removably suspending said pipette carrier including said manifold over said rack when carried by said base with each of said pipette holders positioned to overlie a corresponding sample holder retained in said rack when said rack is carried by said base, retention means operably associated with said pipette carrier and said support means for releasably retaining said pipette carrier including said manifold when suspended by said support means in a first position wherein the free ends of pipettes received in said pipette holders extend into sample holders received in said rack and in a second position spaced from said first position wherein the free ends of the pipettes do not extend into the sample holders received in said rack, said pipette carrier when in said second position being free to rotate with respect to said base on an axis generally parallel with the pipettes received in said holders and concentric with said generally circular configuration of said pipette holders, and an apparatus for drawing a vacuum operably coupled with said manifold chamber and adapted to create a partial vacuum on the pipettes received in said pipette holders.

2. The device of claim 1 which also comprises means for aligning each of the pipettes in said pipette holders with a corresponding sample holder received in said rack when said pipette carrier is moved from said second position and supported by said support means in said first position.

3. The device of claim 1 wherein said support means comprises a spindle extending generally vertically above said base and said pipette carrier also comprises a hollow cylinder fixedly connected thereto and adapted to telescope over said spindle.

4. The device of claim 1 wherein said apparatus for drawing a vacuum is carried by said pipette carrier.

5. The device of claim 4 wherein said apparatus for drawing a vacuum comprises a syringe adapted to be coupled with said manifold chamber.

6. The device of claim 3 wherein said apparatus for drawing a vacuum comprises a syringe adapted to be coupled with said manifold chamber, said syringe being carried by said pipette carrier.

7. The device of claim 3 wherein said manifold is fixedly carried adjacent one end of said hollow cylinder and said pipette carrier also comprises a locator plate extending generally radially of said hollow cylinder and being fixedly connected thereto adjacent the other end thereof, said locator plate having a plurality of holes therethrough with each hole being generally coaxial with one of said pipette holders of said manifold to slidably receive and position a pipette retained and sealed in one of said pipette holders.

8. The device of claim 1 wherein each of said pipette holders is in fluid communication with a common manifold chamber and each said pipette holder releasably engages and frictionally retains a pipette therein.

9. A device for use in the determination of sedimentation rates of blood samples comprising a base, a spindle carried by said base and extending generally vertically above said base, a rack for retaining a plurality of sample holders for blood samples in a generally circular configuration generally concentric with said spindle when said rack is received on said base, said rack being adapted to be removably carried by said base, a pipette carrier removably carried by said spindle above said rack when carried by said base, a plurality of pipette holders on said pipette carrier arranged to dispose a plurality of pipettes in a generally circular configuration generally concentric with said spindle when said pipette carrier is received thereon with the pipettes extending generally parallel to each other and said spindle and being generally aligned with said sample holders when said rack is received on said spindle, a manifold on said pipette carrier adapted to be connected at the upper end of the pipettes received in said holders for communication with the central bore of the pipettes, retention means operably associated with said pipette carrier and said spindle for releasably retaining said pipette carrier including said manifold in a first position on said spindle wherein the free lower ends of pipettes received in said pipette carrier extend into sample holders received in said rack and in a second position on said spindle spaced from said first position

wherein the free lower ends of the pipettes do not extend into the sample holders received in said rack.

**10.** The device of claim **9** which also comprises means for aligning each of the pipettes received in a pipette holder with a corresponding sample holder received in said rack when said pipette carrier is moved from said second position and supported by said spindle in said first position.

**11.** The device of claim **9** wherein said pipette carrier when in said second position is free to rotate on said spindle with respect to said base on an axis generally parallel with the pipettes received in said holders and generally concentric with the generally circular configuration of the pipettes.

**12.** The device of claim **9** wherein said pipette carrier also comprises a hollow cylinder fixedly connected thereto and adapted to telescope over said spindle.

**13.** The device of claim **9** which also comprises an apparatus for drawing a vacuum which is connected with said manifold and carried by said pipette carrier.

**14.** The device of claim **13** wherein said apparatus for drawing a vacuum comprises a syringe.

**15.** The device of claim **12** wherein said manifold is fixedly carried adjacent the upper end of said hollow cylinder and said pipette carrier also comprises a locator plate extending generally radially of said hollow cylinder and being fixedly connected thereto adjacent the lower end thereof, said locator plate having a plurality of holes therethrough each adapted to slidably receive a pipette adjacent the lower end thereof and position the lower ends of the pipettes in a generally circular configuration.

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