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MICROHEMATOCRIT AND SEDIMENTATION READER

Filed May 4, 1955

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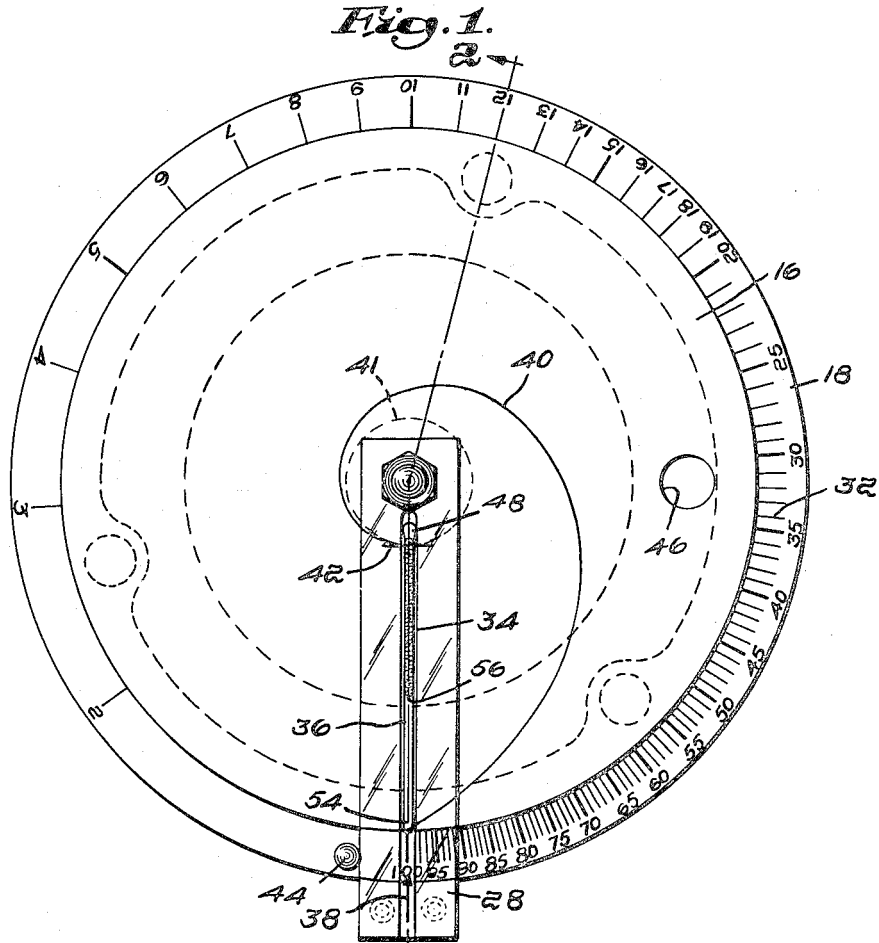
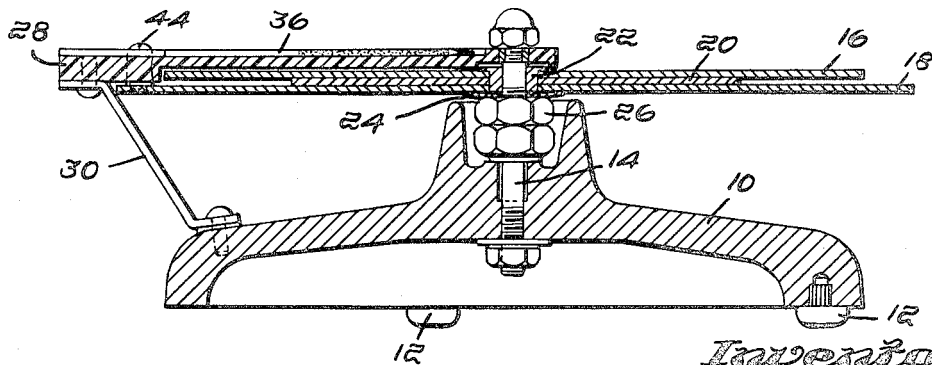


Fig. 2.



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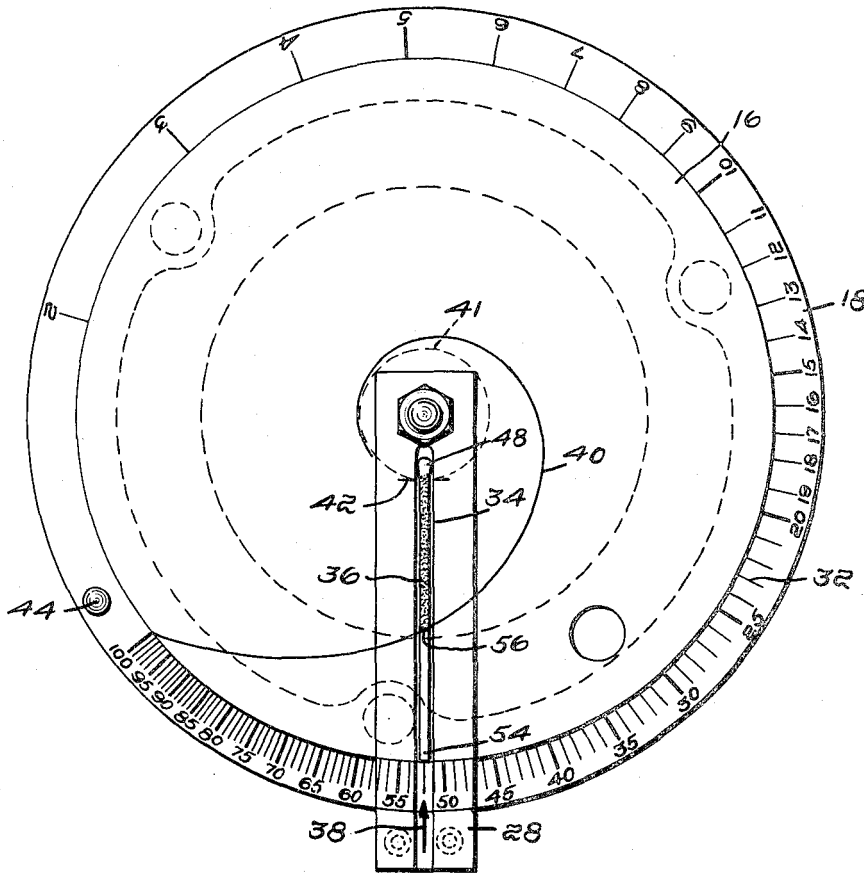
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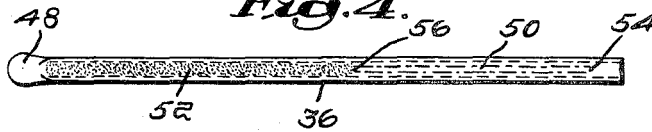
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*Fig. 3.*



*Fig. 4.*



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**MICROHEMATOCRIT AND SEDIMENTATION  
READER**

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7 Claims. (Cl. 33—1)

This invention relates to a novel device for conveniently and quickly determining the percentage red cell content of centrifuged or sedimented blood in capillary tubes of the type used in the Guest and Siler microhematocrit technique. Such tests are commonly made by substantially filling a small capillary glass tube with the blood to be tested, heat sealing one end of the tube, centrifuging the sample to pack the red cells in the closed end of the tube, and then measuring the percentage of red cell pack thus obtained. Since the blood column length of samples thus obtained are not uniform, the measuring step has presented a considerable task. The primary object of my invention resides in the production of a novel device for performing this function more easily, quickly and accurately than has been possible by the use of a divergent line or "perspective" graph or other means heretofore known.

My invention basically contemplates a circular slide rule employing a logarithmic scale in association with a logarithmic spiral. The logarithmic spiral is constructed so to cooperate with the blood column in the tube as automatically to convert to logarithmic dimensions on the scale the ratio of the red cell pack to the total blood column. The production of an instrument of this nature and for the purpose described comprises a further object of the invention.

These and other features of the invention will be more readily understood and appreciated from the following detailed description of a preferred embodiment thereof, selected for purposes of illustration and shown in the accompanying drawings in which—

Fig. 1 is a plan view of a machine embodying the invention.

Fig. 2 is a vertical sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is a view like Fig. 1 with the parts in another position, and

Fig. 4 is an enlarged view of centrifuged blood in a capillary tube.

Referring to the drawing, 10 indicates a base provided with feet 12 for support on a horizontal surface. A post 14 is carried by and extends vertically upward from the center of the base. Rotatably mounted on the post above the base are two disks 16 and 18 separated by a third disk 20 therebetween. The disks are mounted on a bushing 22 on the post and are held in frictional engagement by a spring washer 24 resting on check nuts 26 secured to the post. The disks are normally rotatable together as a unit on the post but the frictional engagement of the intermediate disk 20 permits rotation of the disk 16 relative to the disk 18.

Mounted on the post and extending radially outward therefrom over the disks is an arm 28 of "Lucite" or other transparent material and a bracket 30 affixes the outer end of the arm to the base. The bottom disk 18 is somewhat larger and projects outwardly beyond the periphery of the disk 16. This outer portion of the disk 18 is divided into a logarithmic scale 32 reading from 1 to 100

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such that its range of ninety-nine divisions occupies the entire 360° circumference.

The arm 28 is grooved radially in its top face at 34 to receive and support a capillary tube 36 and is provided with a fixed index 38 at its outer end in cooperating relation to the logarithmic scale and in alignment with the groove 34. A logarithmic spiral 40 is drawn on the disk 16 for 360° about the axis of the post 14. The innermost end of this spiral starts on a circle 41 inscribed about the post axis and passing through the intersection of the groove 34 with an index 42 on the arm 28. When the disk 16 is in the position of Fig. 1 the inner end of the spiral coincides with the intersection of the groove 34 with the index 42 and the outer end of the spiral is in radial alignment therewith along the groove at the peripheral margin of the disk 16. A pin stop 44 is provided on the disk 18 for contact with the arm 28 and, when in contact with the arm as illustrated in Fig. 1, the starting point of the scale 32 is in alignment with the fixed index 38. The disk 16 is provided with a finger hole 46 therein for convenience in rotating the disk.

The capillary tube 36 is closed at one end 48 and the red blood cells have been separated by centrifugal action from the clear blood plasma 50 and are packed together in the column 52 at the closed end of the tube. The function of the invention is to determine the percentage red blood cell content of the column of blood in the tube. The procedure employed for this purpose is substantially as follows.

The capillary tube to be determined is placed in the groove 34 as illustrated with the bottom end of the red cell pack 52 in registry with the index 42. While maintaining the stop 44 in contact with the arm 28 (Fig. 1) the disk 16 is independently rotated to cut the spiral 40 across the outer end 54 of the blood plasma column. The combined disks 16 and 18 are then rotated to a position in which the spiral cuts the plasma-red cell interface or junction 56. The graduation on the logarithmic scale 32 which is now aligned with the fixed index 38 indicates the packed red cell percentage value of the blood in the tube.

It will be apparent that the radial distance between the starting and finishing points of the spiral 40 (Fig. 1) on the disk 16 corresponds to the scale 32 on the disk 18, i. e. both are equally traversed by a 360° disk rotation. In effect, the spiral divides such radial distance into parts corresponding to the indices on the scale 32 and the percentage proportions for all these parts are automatically indicated at 38 on the scale 32 upon rotation of the combined disks. The spiral groove is formed by dividing into 100 equal parts the radius between the index 42 and the margin of the disk 16 and establishing the main parts of the groove by using as coordinates of the equal intervals marked on the radius and the divisions of the logarithmic scale which numerically correspond to them.

The apparatus is relatively simple in construction, requires little skill in operation and yields results having an accuracy substantially greater than has been possible by reading means heretofore employed. Furthermore, the results appear to be free from fatigue-induced error and the accuracy is dependent only on the human operating factor and the accuracy with which the scale and groove are drawn.

Having thus disclosed my invention what I claim as new and desire to secure by Letters Patent is:

1. A device for determining the packed red cell percentage value of centrifuged blood in a capillary tube, comprising a base, a member mounted for rotation about a fixed axis on the base, means providing a logarithmic scale graduated from one to 100 associated with the rotatable member to move synchronously therewith past a fixed index, a disk superposed on the member for rotation therewith about said axis, means frictionally connect-

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ing the disk and member, a logarithmic spiral on the disk extending about said axis, and an arm fixed to the base and extending radially outward from said axis over the disk, the arm being adapted to support a capillary tube radially thereon and having an index adjacent to said axis and disposed therefrom a radial distance corresponding to that of the inner end of said spiral.

2. The device defined in claim 1 in which the logarithmic scale is disposed on said member adjacent to and outwardly of the periphery of the disk and in which said fixed index is disposed on said arm in cooperating relation with the scale.

3. The device defined in claim 2 in which said arm is transparent and is provided with a radial groove therein for supporting a capillary tube in alignment with said fixed index.

4. The device defined in claim 3 plus means for supporting the base horizontally on a horizontal surface, a post disposed centrally of and extending vertically upward from the base, and means supporting the member and disk on the post for rotation about the post and said axis and for fixing the arm immovably to the base and post.

5. A device for determining the packed red cell percentage value of centrifuged blood in a capillary tube, comprising a base, means for supporting the base horizontally on a horizontal surface, a post disposed centrally of and extending vertically upward from the base, a disk rotatably mounted on the post, means providing a logarithmic scale graduated from 1 to 100 on the disk at and extending entirely about its periphery, a second disk rotatably mounted on the post over the first disk and in-

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wardly of the scale, means frictionally connecting the disks, a logarithmic spiral on the second disk extending about the post, an arm fixed to the base and extending radially outward from the post over the disks, and means for supporting a capillary tube radially on the arm, the arm having an index adjacent to the post axis and disposed therefrom a radial distance corresponding to that of the inner end of said spiral and having an index at its outer end cooperating with the scale.

6. The device defined in claim 5 plus a stop carried by the first disk in position to engage the arm and automatically locate the end of the scale in registry with the second named index.

7. A device for determining the percentage value of a specified portion of a relatively long body, comprising a base, means for supporting the base horizontally on a horizontal surface, a post disposed centrally of and extending upwardly from the base, a member rotatably mounted on the post, means providing a logarithmic scale graduated from 1 to 100 associated with the member to move synchronously with its rotation past a fixed index, a disk superposed on the member for rotation therewith about the post, means frictionally connecting the disk and member, a logarithmic spiral on the disk extending about the post, and an arm fixed to the base and extending radially outward from the post axis over the disk, the arm being adapted to support said body radially thereon and having an index adjacent to the post axis and disposed therefrom a radial distance corresponding to that of the inner end of said spiral.

No references cited.