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2,884,150

HEMATOCRIT CLOSURES

Filed April 5, 1956

2 Sheets-Sheet 1

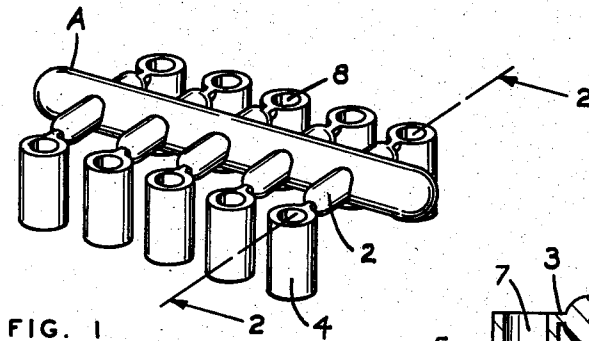


FIG. 1

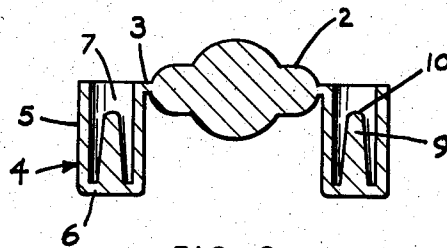


FIG. 2

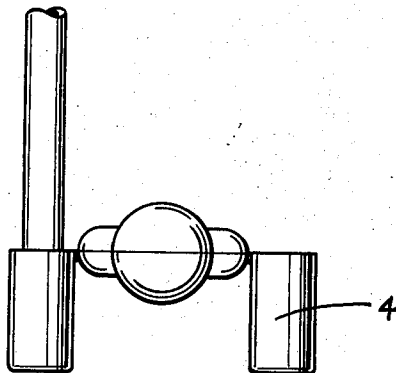


FIG. 3

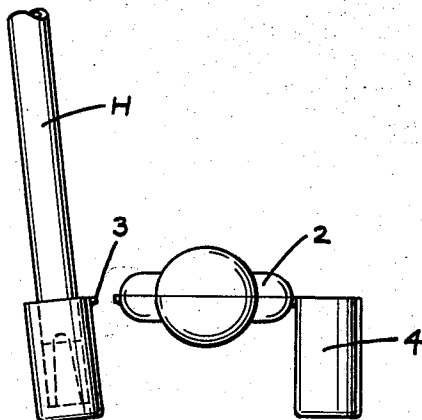


FIG. 4

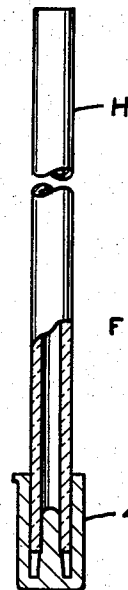


FIG. 5

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2 Sheets-Sheet 2

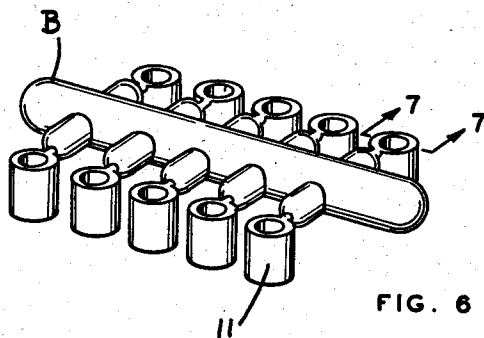


FIG. 6

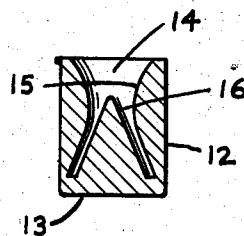


FIG. 7

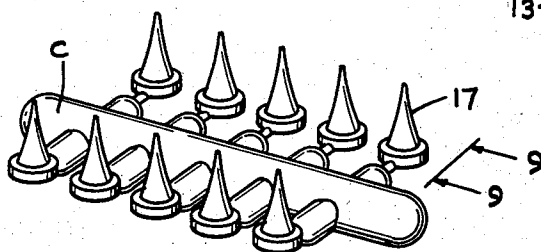


FIG. 8

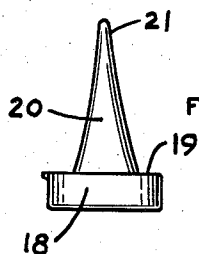


FIG. 9

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HEMATOCRIT CLOSURES

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1 Claim. (Cl. 215—41)

This invention relates in general to certain new and useful improvements in a medical laboratory device and, more particularly, to a closure element for hematocrit tubes.

For purpose of certain type of medical diagnosis, a sample of the patient's blood is placed in an elongated glass capillary tube which is usually referred to as an hematocrit tube. This hematocrit tube is of extremely small internal and external diametral size. Consequently, the blood sample is ordinarily sucked up through one open end of the tube either by capillarity or by applying suction to the other open end of the tube. When appropriately filled with the requisite amount of blood, the hematocrit tube is sealed by placing one end in a hot flame and fusing the glass of the tube. The sealed tube is then placed in a centrifuge and whirled to produce a centrifugal separation between the red corpuscles and the plasma in the sample. The analysis is completed by measuring the length of the columns thus formed in the hematocrit tube and computing the arithmetical proportion between such lengths. It has long been recognized that this analytical procedure is not as accurate as it should be because it is very difficult to fuse the end of a hematocrit tube with any satisfactory degree of reproducibility. Very often the globule of glass formed during the fusing procedure is of irregular shape and, as a result, it is very difficult to make a visual measurement, since it is very difficult to locate the exact bottom margin of the column by visual observation. In addition to this, the globule of glass may be large or small and will accordingly produce various difficult meniscus effects which also introduce difficulty in visually reading the hematocrit determination. The fusing of the glass may also overheat the blood sample causing decomposition within sample and thereby producing erratic results.

Finally the hematocrit tube must ordinarily be filled by the technician or intern at the time the sample is taken from the patient and then carried to the laboratory for sealing and centrifuging. Consequently, the hematocrit tube is open at both ends for an appreciable period of time so that a portion of the sample can, and frequently does, leak out. These circumstances frequently produce additional inaccuracy and error in the analytical results.

It is, therefore, the object of the present invention to provide a closure for hematocrit tubes and the like which is simple, effective, and easy to apply.

It is another object of the present invention to provide a closure for hematocrit tubes and the like which is inexpensive and, therefore, disposable.

It is also an object of the present invention to provide a closure for hematocrit tubes and the like which can be manufactured in a uniformed size so as to provide a substantially accurate point of reference from which analytical measurements can be accurately made.

With the above and other objects in view, our invention resides in the novel features of form, construc-

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tion, arrangement, and combination of parts presently described and pointed out in the claims.

In the accompanying drawings (two sheets)—

Fig. 1 is a perspective view of a cluster of hematocrit tube closures constructed in accordance with and embodying the present invention;

Fig. 2 is a transverse sectional view taken along line 2—2 of Fig. 1;

Fig. 3 is an end elevational view of the cluster of hematocrit tube closures showing an hematocrit tube in place in one such closure;

Fig. 4 is an end elevational view similar to Fig. 3, diagrammatically illustrating the manner in which an hematocrit tube and its individual closure element is severed from the cluster;

Fig. 5 is an elevational view of an hematocrit tube and its individual closure element severed from the cluster, partly broken away and in section;

Fig. 6 is a perspective view of a modified form of closure-cluster constructed in accordance with the present invention;

Fig. 7 is a sectional view taken along line 7—7 of Fig. 6;

Fig. 8 is a perspective view of another modified form of closure-cluster constructed in accordance with and embodying the present invention; and

Fig. 9 is a sectional view taken along line 9—9 of Fig. 8.

Referring now in more detail and by reference characters to the drawings, which illustrate a preferred embodiment of the present invention, A designates a closure-cluster molded or otherwise suitably formed from a plastomer such as vinyl polymers, natural rubber or other soft rubber-like material comprising a central runner of more or less rod-like shape and having a plurality of uniformly spaced laterally projecting gates 2 which are narrowed down at their outer ends to relatively thin fork-like necks 3 which integrally connect to small thimble-shaped closure elements 4 each having substantially cylindrical side walls 5 and a bottom wall 6 defining a tubular recess 7 having a circular top opening 8. Formed integrally with and projecting upwardly from the bottom wall 6 is a concentrically positioned elongated, somewhat tapered, plug member 9 which terminates at its upper end in a round-pointed tip 10, the latter being spaced downwardly a short distance below the rim of the opening 8.

Although in Fig. 1, the hematocrit tube closure-cluster A is shown with ten symmetrically arranged closure elements 4, the present invention is by no means limited to this specific arrangement. If desired, any number of such closure elements 4 can be arranged in a cluster and the arrangement need not be symmetrical. Because hematocrit tubes are very small and the closure elements 4 are of correspondingly small size it is desirable to arrange a plurality of such closure elements 4 in a cluster for ease in handling. The outer cylindrical wall 5 of the cup-like element serves to guide the hematocrit tube smoothly and accurately onto the plug member 10. Because of the very small size of the hematocrit tube it thus becomes possible to effect a secure and accurate closure.

In use, the intern or technician will fill the hematocrit tube H with the desired amount of blood sample and immediately insert the lower end thereof in one of the closure elements 4 of the hematocrit tube closure-cluster A substantially in the manner shown in Fig. 3. The hematocrit tube H is inserted only part way into the closure element 4 to the degree which may be conveniently obtained by a light downward pushing action with the fingers. Thereupon the closure element 4, into which the hematocrit tube H has been inserted, is torn

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off somewhat in the manner shown in Fig. 4. Finally the hematocrit tube H and closure element 4 are tapped lightly against the table or other similar flat surface with a gentle tapping action and the tapered plug member is driven snugly up into the bore of the hematocrit tube H substantially as shown in Fig. 5.

The closed hematocrit tube H can then be placed in a centrifuge and whirled in the conventional manner to effect a separation between the red corpuscles and the plasma. When the separation has been completed, the hematocrit tube H is removed from the centrifuge and measured in the usual manner. Since the closure element 4 is an accurately molded part, the distance between the downwardly presented end face of the bottom wall 6 and the top surface of the round-pointed tip 10 will always be substantially the same, within very close limits of tolerance. Consequently, the columnar measurements of the hematocrit can always be made accurately and precisely.

If desired, it is possible to provide a closure-cluster B as shown in Fig. 6 and formed of the same type of materials as the previously described closure-cluster A. The closure-cluster B, however, comprises a plurality of closure-elements 11 each integrally including a cylindrical wall 12 and a bottom wall 13 defining a tubular recess 14 having an interior wall face 15 which is of somewhat "hour-glass" shape as shown in Fig. 7. Molded concentrically with and projecting upwardly from the bottom wall 13 is a rather broad-based conical plug-member 16. It will be noted that the interior wall face 15 does not quite touch the plug-member 16 but guides the hematocrit tube securely thereon.

It is also possible to provide a further modified form of closure-cluster C as shown in Fig. 8 and formed of the same type of material as the previously described closure-cluster A. The closure-cluster C, however, comprises a plurality of closure elements 17 each integrally including a cylindrical bottom member 18 having a flat annular face 19 and a concentric upwardly projecting tapered plug-element 20. At its upper end the plug-member 20 is integrally provided with a short rod-like

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guide means 21 which is rounded off at its extremity and is of uniform circular cross-sectional shape and is smaller in diametral size than the bore of a hematocrit tube. It has been found that this rod-like guide means 21 can be readily threaded into the bore of the hematocrit tube and will guide the plug-member 20 into securely seated position. The plug-member 20, as well as the previously described plug-members 16 and 9, will form a standard bottom reference surface from which measurements can be accurately and reproducibly made.

It should be understood that changes and modifications in the form, construction, arrangement, and combination of the several parts of the hematocrit tube closure may be made and substituted for those herein shown and described without departing from the nature and principle of our invention.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

A closure for hematocrit tubes and similar small gauge tubing, which closure comprises a unitary cup-like member formed of a resilient rubbery material and provided with an arcuate internal wall adapted to fit snugly around an open end of the tubing, said cup-like member having a transverse bottom wall adapted for spaced end-wise disposition across the open end of the tubing, and a conical plug-forming element projecting upwardly from the bottom wall of the cup for tight-fitting disposition throughout a substantial portion of its length within the bore of the tubing, said element being deformable so as to conform to the contour of the bore.

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