

[54] BLOOD SAMPLE TRAY APPARATUS

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[51] Int. Cl. B04b 9/12

[58] Field of Search 233/1 R, 26, 27, 28; 23/259; 73/423 R, 423 A; 210/380

[56] References Cited

UNITED STATES PATENTS

3,379,370 4/1968 Anderson 233/26
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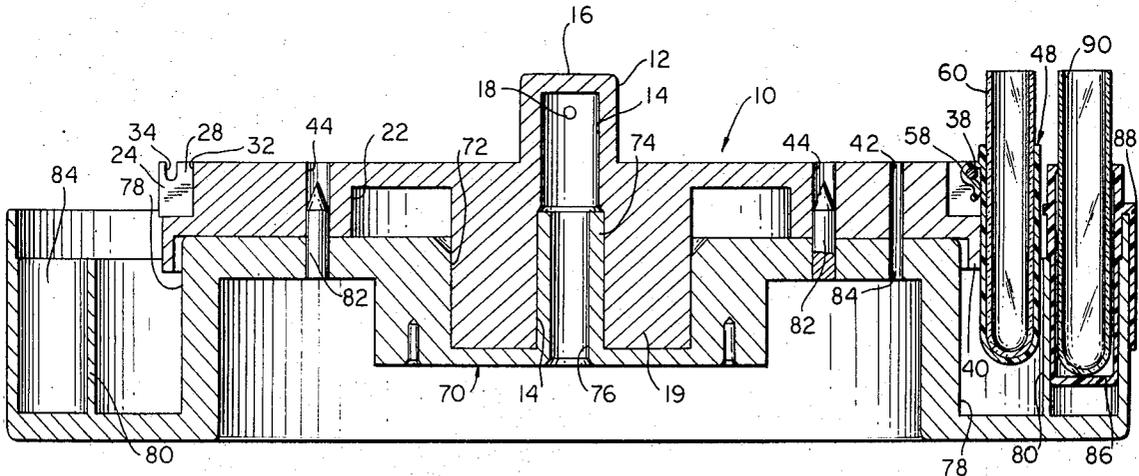
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[57] ABSTRACT

New and improved sample processing and supply apparatus are disclosed and comprise tray means from which are pivotally supported a plurality of partially filled sample container means. In use, said tray means are operatively connected to centrifuge drive means and rotated to centrifuge each of said samples and separate the same into sample constituent layers, whereupon said tray means are removed as a unit from said centrifuge drive means and operatively associated with automatic sample analysis means for indexing to supply a series of one of said sample constituents from said sample container means to said analysis means. Outer tray means comprising a plurality of outer sample container means are provided for use in conjunction with said tray means for the concomitant supply of, for example, a whole sample and a separated sample constituent to said sample analysis means. For such use, the tray means and outer tray means are combined in predetermined manner which insures ample container means and outer sample container means alignment, and the combined trays indexed as a unit.

13 Claims, 6 Drawing Figures



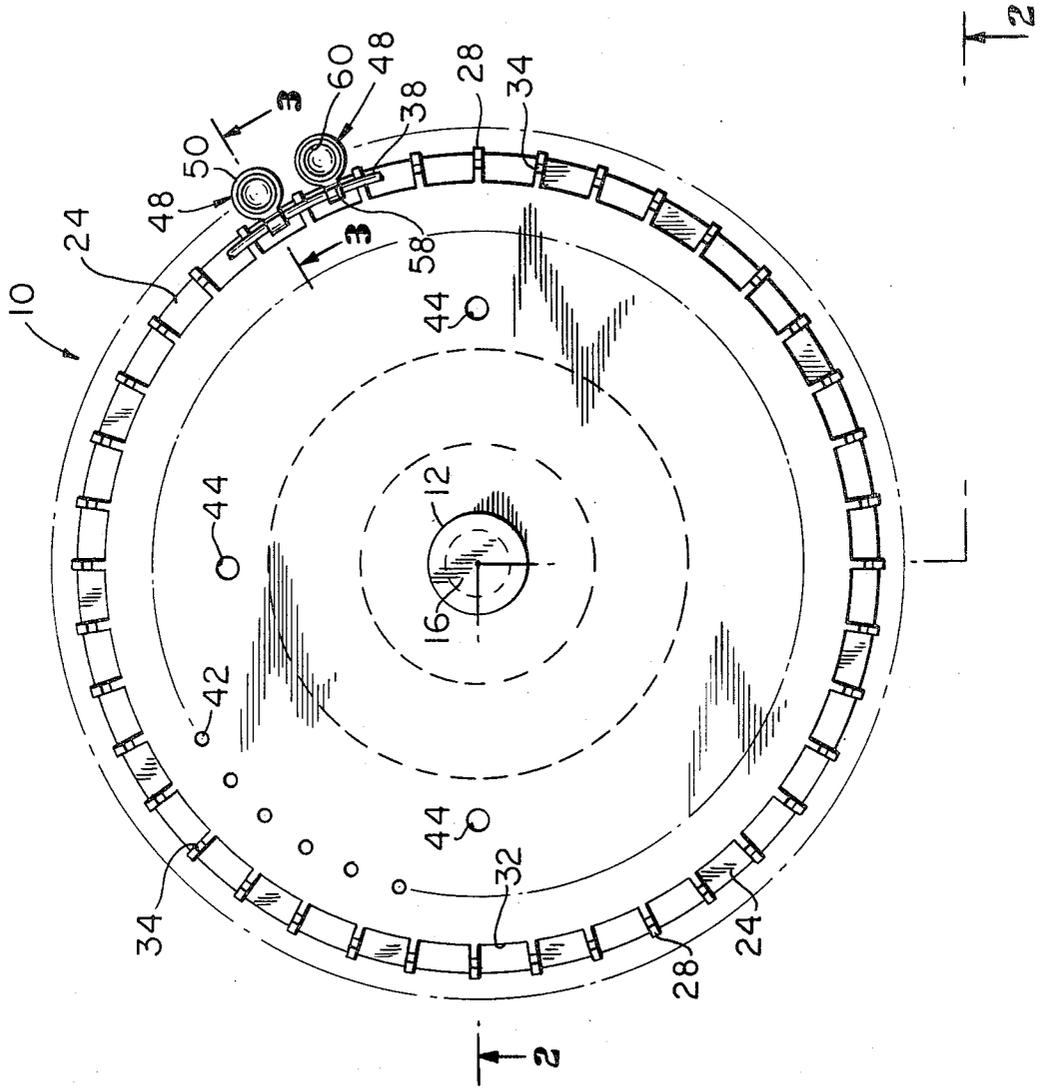


FIG. 1

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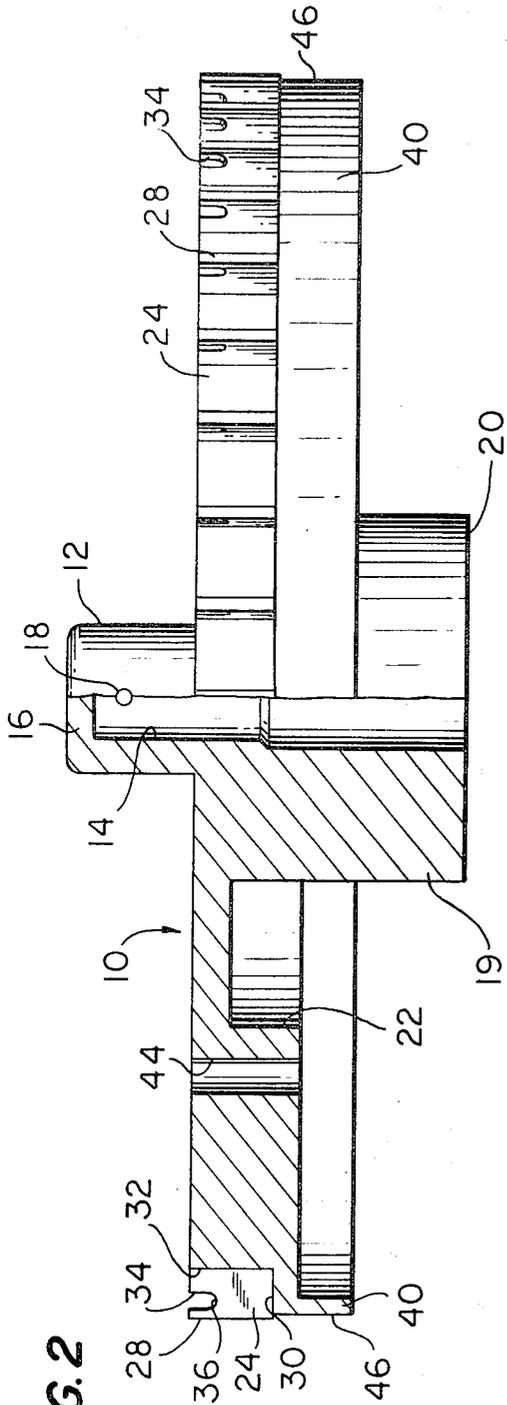


FIG. 2

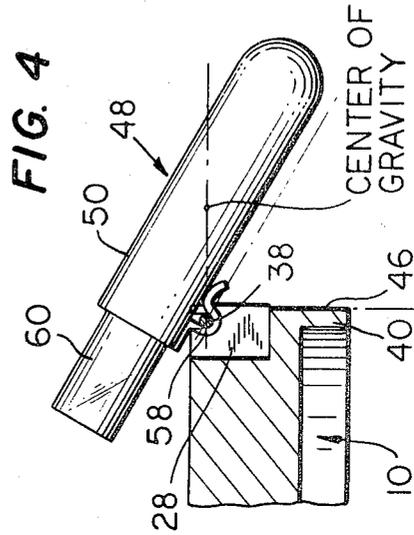


FIG. 4

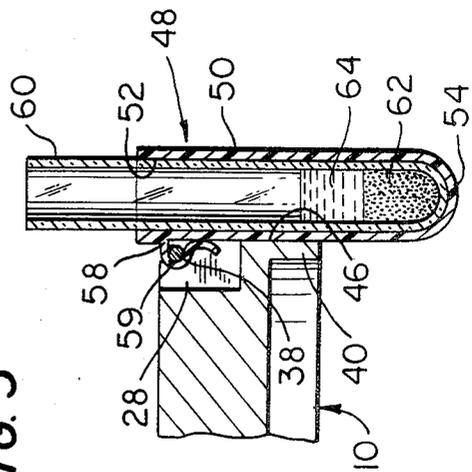


FIG. 3

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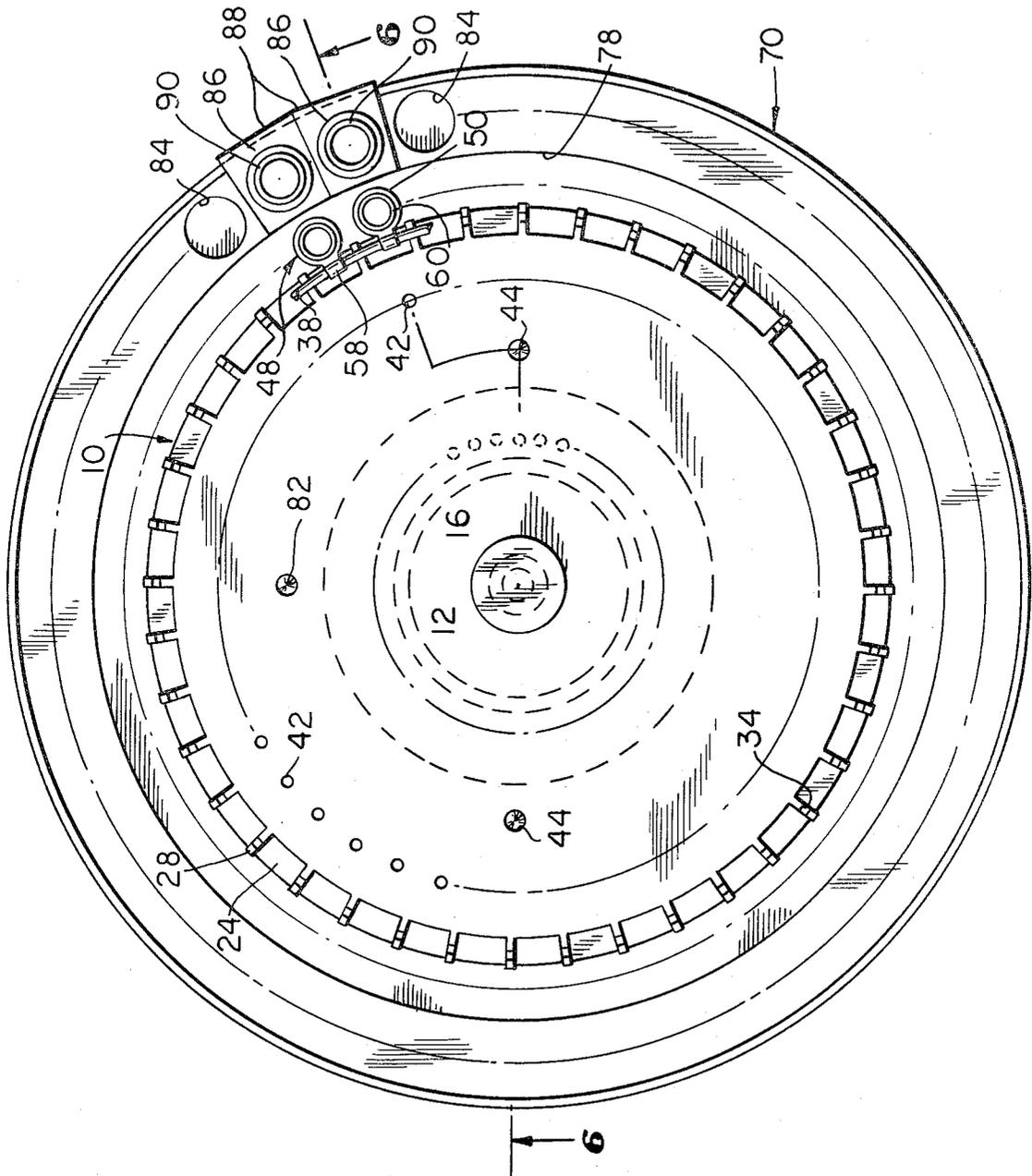


FIG. 5

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BLOOD SAMPLE TRAY APPARATUS**BACKGROUND OF THE INVENTION****1. Field of the Invention**

This invention relates to new and improved sample processing and supply apparatus which are particularly, though by no means exclusively, adapted to the processing and automated supply of a series of blood samples.

2. Description of the Prior Art

The operation of automatic blood sample supply, treatment and analysis apparatus of the nature disclosed, for example in U. S. Pat. No. 3,134,263 issued May 26, 1964 to Edward B.M. DeJong and assigned to the assignee hereof, and/or U. S. Pat. No. 3,241,432 issued Mar. 26, 1966 to Dr. Leonard T. Skeggs, et al and assigned to the assignee hereof, may, in many instances, be understood to require the initial centrifugation of each of a large plurality of whole blood samples to separate the same into respective packed cells and plasma layers and provide the requisite blood sample plasma for automated analysis purposes. This centrifugation of the large plurality of whole blood samples will generally require the individual transfer of the same from the containers into which the same are initially withdrawn from the patient into separate containers which can withstand the substantial centrifugal forces of centrifugation, the centrifugation of said samples to separate the same into said packed cells and plasma layers, and the subsequent re-transfer of the respective plasma layers thereof into containers—which may or may not be the original containers into which the blood samples were withdrawn from the patients—which are appropriate for use in said automated blood sample supply, treatment and analysis apparatus.

This transfer and re-transfer procedure is, of course, extremely tedious and time consuming to significant economic disadvantage. Of far greater disadvantage, however, is the fact that said procedure gives rise to the possibility of blood sample-donor confusion with attendant mis-identification of a sample or samples with regard to the donor thereof and resultant totally unacceptable invalidation of the analysis results as should be obvious. This is to say that despite immediate donor identification of the blood sample container concomitant with the withdrawal thereof from the patient, the necessity for transfer and re-transfer as described of said sample can, in the absence of extreme care and attention on the part of the operating technician, nonetheless result in unacceptable sample mis-identification.

This problem of sample-donor confusion and/or mis-identification becomes even more acute in instances wherein said automated blood sample supply, treatment and analysis apparatus require a separate container of whole blood, in addition to the container of plasma, for each of the samples to be analyzed, and wherein said whole blood and plasma containers for each blood sample to be analyzed must be precisely aligned on the sample supply device to insure the requisite, concomitant supply thereof to the sample treatment and analysis devices.

OBJECTS OF THE INVENTION

It is, accordingly, an object of this invention to provide new and improved sample processing and supply apparatus which are operable to substantially minimize, if not eliminate, the problems of sample confusion and/or sample mis-identification.

Another object of this invention is the provision of apparatus as above which function to materially reduce the time required for sample processing to thereby render the latter less expensive.

Another object of this invention is the provision of apparatus as above which are readily and conveniently utilizable with existing sample processing and automated sample supply apparatus.

Another object of this invention is the provision of apparatus as above which require the use of only readily available, relatively inexpensive components of proven dependability

ty in the fabrication thereof, and which are of basically simple construction and manner of operation to thereby provide for relatively low apparatus costs and long periods of accurate, substantially maintenance-free apparatus operation.

A further object of this invention is the provision of apparatus as above which are particularly, though by no means exclusively, adapted to the centrifugation and subsequent automated supply of a large plurality of blood samples in conjunction with the operation of automated blood sample supply, treatment and analysis apparatus of the nature disclosed in U. S. Pat. No. 3,134,263 and/or 3,241,432.

A still further object of this invention is the provision of apparatus as immediately above which enable the use of a relatively fragile blood sample withdrawal container for blood sample centrifugation.

SUMMARY OF THE INVENTION

As disclosed herein the new and improved sample processing and supply apparatus of the invention are applied by way of illustration to the centrifugation of a plurality of whole blood samples, and the subsequent series supply of the respective separated blood plasmas to automated sample analysis means. The apparatus comprise a disc-like tray having a generally circular array of cutouts extending around the periphery thereof. A generally cylindrical sample container holder is pivotally mounted in part in each of said cutouts through use of a holding ring which extends therethrough.

For use as described, a container into which has been withdrawn a whole blood sample from a different patient is placed in each of said sample container holders, and the thusly loaded tray operatively mounted on commonly utilized centrifuge apparatus and rotated at high speed to centrifuge said whole blood samples and separate each of the same into a packed cell layer and a plasma layer, respectively. Thereafter, the loaded tray is removed as a unit from said centrifuge apparatus and operatively associated with automatic blood sample supply, treatment and analysis apparatus to function, through the indexing thereof, as the sample plasma supply tray.

The respective sample container holders are supported from the tray in such manner that the same are substantially vertically disposed absent tray rotation to facilitate sample plasma supply usage of the tray, and in such manner that the same will move pivotally upward during tray rotation to bring the sample container center of gravity into substantial alignment with said holding ring and thereby concentrate centrifugal forces substantially at the point of pivotal container attachment with resultant minimization of stresses on the sample container.

For use with automatic sample supply, treatment and analysis apparatus which require concomitant whole blood sample and blood sample plasma supply, the apparatus of the invention comprises an outer tray within which the tray fits in a single relative position, only, and which in turn carries a generally circular array of outer whole blood sample containers, each of which is automatically radially aligned with a different one of said sample containers to thereby provide radially aligned sets of an inner centrifuged blood sample container for plasma supply, and an outer container of a whole blood sample from the same donor for concomitant whole blood supply.

Use as described of the apparatus of the invention substantially minimizes, if not eliminates, the possibility of blood sample-donor confusion with resultant blood sample mis-identification by eliminating the need for transfer and re-transfer of the blood sample between two or more containers attendant the centrifugation thereof.

DESCRIPTION OF THE DRAWINGS

The above and other objects and significant advantages of this invention are believed made clear by the following detailed description thereof taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a top plan view of a tray constructed and operative in accordance with the teachings of this invention and includes the depiction of a member of the sample container holders operatively connected thereto;

FIG. 2 is a view taken generally along line 2—2 in FIG. 1;

FIG. 3 is a cross-sectional view taken along line 3—3 in FIG. 1 and better illustrating the construction of the sample container holder and the attachment thereof to the Samplerfuge tray;

FIG. 4 is a view of a sample container holder depicted in the position the same will assume relative to the tray during high speed rotation of the latter;

FIG. 5 is a top view of the of FIGS. 1 and 2 operatively positioned within a mating, outer sample container holder tray; and

FIG. 6 is a cross-sectional view taken along line 6—6 in FIG. 5.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to FIGS. 1 and 2, a sample container holding tray constructed and operative in accordance with the teachings of this invention is indicated at 10 and may be seen to be of generally disc-like configuration.

A generally cylindrical central portion 12 extends upwardly as shown from the upper surface of the tray 10, and comprises a stepped bore 14 extending therethrough which terminates in an end face 16. An attachment pin 18 extends across said bore and, in conjunction with the stepped bore 14, functions to enable the operative attachment of the tray to a centrifuge device as described in greater detail hereinbelow. In like manner, a generally cylindrical central portion 19 extends downwardly as shown from the lower surface of the tray to provide a flat end surface 20 which functions to enable the standing of the tray on any appropriate support surface to thus eliminate the need for a stand. The bore 14 continues as shown through the central portion 18. A generally circular groove 22 is formed as shown in the lower surface of the tray to surround the central portion 18 and provide for the ready mating of the former with automated sample supply, treatment and analysis apparatus as explained in greater detail hereinbelow.

Substantially equally dimensioned and equally spaced cutouts 24 are formed as shown in the outer and upper peripheries of the tray 10 and extend completely therearound to form a generally circular array thereof. Each of said cutouts is defined as shown by the opposing surfaces of adjacent wall-like elements 28 and by the relevant surfaces 30 and 32 of the tray 10. A generally elongated notch 34, having a rounded lower extremity 36, is formed as shown at substantially the same location in the upper surface of each of the wall-like elements 28 to form a generally circular array of said notches.

A holding ring is indicated at 38 and is so dimensioned as to fit snugly as shown, with substantial friction, into the array of the notches 34. The holding ring 38 is manually insertable into and removable from the circular array of notches 34.

A generally circular lip 40 extends downwardly as shown slightly radially inwardly of the lower peripheral edge of the tray 10 and provides a locating surface 46 to insure the substantially vertical orientation of the sample container holders when the tray is at rest as described in greater detail hereinbelow.

A generally circular array of substantially equally dimensional "end of run" apertures 42 are formed as shown to extend through the tray 10, and each of said apertures is formed in substantial radial alignment with the central portion of a different cutout 24. The "end of run" apertures 42 function to receive a stand-off pin, not shown, to limit the indexing of the tray 10 when the same is used as a sampler or sample supply tray as described in detail hereinbelow. Spaced keying apertures are indicated at 44 and function to insure a precise positional relationship between the tray 10 and said outer sample container holding tray when the same are utilized together, again as described in greater detail hereinbelow.

The tray 10 is preferably fabricated by moulding from any suitable material in the nature, for example, of the synthetic polycarbonate. Particular advantages of polycarbonate are the ready availability thereof, the low cost and low weight thereof, the high durability and strength characteristics thereof which provide for long tray life and substantial resistance to fatigue in the face of the very high centrifugal forces which will be applied thereto upon high speed tray rotation, the very low coefficient of expansion thereof which will preserve dimensional integrity despite substantial change in environmental temperature and will thereby insure the dimensional compatibility thereof with precisely dimensioned mating components, and the ready machineability thereof to thereby facilitate the detailed tray finishing as may be required after the basic moulding of the tray 10. Alternatively, the tray 10 may, of course, be fabricated from any readily available metal of suitable characteristic in the nature, for example, of aluminum. The holding ring 38 is preferably fabricated from any suitably durable and strong metal in the nature; for example, of a stainless steel rod which is bent to the desired generally circular configuration and completed by the brazing of the butt ends.

Referring now to FIGS. 1, 3 and 4, for a detailed description of the sample container holder, the same is indicated generally at 48 and comprises a generally cylindrical body member 50 having an open upper extremity 52 and a generally rounded lower extremity 54.

A spring clip is indicated at 58 and extends as shown from the surface of the container holder body 50 to provide means for the secure but readily removable pivotal attachment of the container holder 48 to the holding ring 38. More specifically, and as best seen in FIGS. 3 and 4, the spring clip 58 includes a bowed portion 59 which extends as shown around the inner side surface of the holding ring 38 to bear firmly thereagainst while enabling pivotal movement of the container holder.

A sample container which may, for example, take the form of a Vacutainer tube as manufactured and marketed by the Becton and Dickinson Company, is indicated at 60 and fits as shown into the sample container holder 48.

As best illustrated in FIG. 1, a sample container holder 48 is operatively attached as described to the holding ring 38 in each of the tray cutouts 24 to extend partially into the latter. Of particular importance to satisfactory utilization of the tray 10 as a sampler or sample supply tray is the fact that with the tray 10 substantially stationary, said sample container holder and the sample container 60 will assume a substantially vertical position as clearly illustrated in FIG. 3, due to the force of gravity and the contact between the inner surface of the sample container and the locating surface 46 provided by the undercut lip 40, to thus insure that aspiration of the sample from the sample container 60 may be readily and satisfactorily achieved.

The sample container holder 48 is preferably moulded as an integral unit from polycarbonate to provide the numerous advantages discussed hereinabove. Alternatively, said holder may of course be formed from a suitable metal in the nature of steel or aluminum, and the spring clip 58 formed independently and spot welded thereto.

In use, a whole blood sample is properly proportioned between containers 60 and 90 while trays 10 and 70 are mated, to maintain correlation therebetween and the patient. For example, for the centrifugation and subsequent series supply of a large number of blood samples, each from a different patient, it may be understood that substantially the same measured quantity in the range, for example of 10–15cc, of whole blood from a different patient is withdrawn into a sample container 60 in the nature of a Vacutainer, and the latter placed as illustrated in a sample container holder 48. Preferably, each of said sample containers bears positive identification in the nature of a label or the like affixed thereto which positively identifies the patient from which the blood sample was taken. Following this, the thusly loaded tray 10 is placed as a unit on the drive unit of a centrifuge device in the nature, for example, of the widely used Sorvall GLC-1 for

operative attachment thereto and high speed rotation of said Samplerfuge tray, it being understood that stepped bore 14 and attachment pin 18 are, of course, specifically configured and dimensioned to provide for such operative attachment, in ready and convenient manner, to said centrifuge drive unit.

High speed rotation of the loaded tray 10 is then effected to result in centrifugation of each of said whole blood samples into respective packed cells and plasma layers in manner well understood by those skilled in this art, and illustrated at 62 and 64 in FIG. 3.

Of particularly significant advantage with regard to the respective sample container holders 48 is the fact that each of the same is designed and fabricated in such manner that the respective center of gravity thereof will, attendant the high speed rotation of the tray 10, be rotated upwardly through, for example, approximately 60 degrees, as clearly illustrated in FIG. 4 about the center of holding ring 38 into substantial horizontal alignment with said holding ring center. As a result, the very substantial centrifugal forces which are generated attendant such rotation will be concentrated on the sample container holder in the region of the spring clip 58, whereby substantially the only forces applied to the sample container 60, which is most likely to be a relatively fragile glass Vacutainer as discussed hereinabove, will be applied to the bottom portion thereof where the same may best be resisted to thusly substantially eliminate the problem of sample container breakage during sample centrifugation.

After blood sample centrifugation has been satisfactorily completed, the still fully loaded tray is removed as a unit from the centrifuge and placed as a unit, in precisely predetermined position as established by the keying apertures 44, on automatic, continuous flow sample supply, treatment and analysis apparatus of the nature disclosed, for example in U. S. Pat. No. 3,134,263 and/or 3,241,432, to function as sample supply turntable therefor. This is to say that the tray would be indexed through one complete rotation thereof as indicated by the "end of run" apertures 42 to present each of the sample containers 60 of appropriately centrifuged blood in turn to an off-take device which would be operable, for example, to automatically insert an off-take probe thereinto above the level of the packed cells layer to aspirate a measured quantity of the separated blood plasma or serum therefrom for subsequent automated treatment and analysis in the manner explained in detail in each of said United States Patent. Of particularly significant advantage here is the fact that the need for transfer of the respective blood samples, and/or even the need for individual transfer of the appropriately identified sample containers 60 once the same are placed on the tray, between the time the blood samples are withdrawn from the patient and the time the same are supplied as described for automated treatment and analysis, is completely eliminated whereby the possibility of mis-identification of a blood sample as to donor through sample confusion which is, of course, totally unacceptable as should be obvious, is likewise completely eliminated.

For applications wherein separate containers of, for example, centrifuged and uncentrifuged blood samples from the same donor are required, it may be understood that the apparatus of the invention will additionally comprise an outer sample container holder tray as indicated at 70 in FIGS. 5 and 6 and which is of the same generally cylindrical configuration as the Samplerfuge tray 10 and which is specifically designed to mate with and carry the latter. To this effect, generally circular mounting groove 72 is formed as shown generally centrally of the outer tray 70 and provides a receptacle for the downwardly extending central portion 19 of the tray 10 as best seen in FIG. 6. In like manner, a generally cylindrical central portion 74 extends as shown upwardly from the outer tray 70 into the lower portion of the stepped bore of the tray 10. The tray portion 74 includes a central bore 76.

A generally circular mounting groove 78 is formed as shown in the radially outer portion of the outer tray 70 and provides a receptacle for the downwardly extending lip 46 of the tray 10,

and for the respective downwardly extending loaded sample container holders 48. A locating surface 80 is provided by the outer wall of said groove to insure the maintenance of the substantially vertical orientation of said sample container holders. Spaced, vertically extending keys 82 are provided to extend upwardly as shown from the outer tray 70 into the keying apertures 44 in the tray 10 to thus enable the mating thereof only in a precisely predetermined manner.

A generally circular array of "end of run" apertures 84 extend as shown through the outer tray 70 and are respectively in substantial alignment with the "end of run" apertures 42 in the tray 10 to thus provide for the extension of said "end of run" apertures completely through the combined trays.

A generally circular array of substantially equally spaced and dimensioned outer sample container holder mounting apertures 84 extends as shown adjacent the outer edge of the outer tray 10 and, as best seen in FIG. 5, the number of said mounting apertures is equal to the number of sample container holders 48 supported as described from the tray 10, and each of said mounting apertures is in substantial radial alignment with a different one of said holders.

A generally cylindrical outer sample container holder is indicated at 86 and it may be understood that one of said holders is placed as shown in each of the mounting apertures 84. The outer sample container holders 86 each preferably take the form of that shown and described in the copending application for U. S. Patent of Alvin Engelhardt, Ser. No. 72,743, filed Sept. 14, 1970 and assigned to the assignee hereof, which is a continuation-in-part of Ser. No. 830,059, filed on June 3, 1969 and now abandoned. Each of the sample container holders comprises an identification label mounting flange 88 which overlies the outer edge of the tray 70 and provides a surface for the affixation of a sample identification label to the holder 86. Said identification label may, for example, contain a sample identification number formed thereon in both arabic and coded form and the latter may, of course, be readily detected by remote read-out apparatus due to the exposed location of said identification label. An outer sample container, which may again take the form of a Vacutainer, is indicated at 90 and fits snugly as shown into each of the outer sample container holders 86.

For use, for example, of the combined trays 10 and 70 of the invention in automatic, continuous flow blood sample supply, treatment and analysis apparatus as represented by Technicon Instruments Corporation's Hemolab which functions to automatically effect cell counting and determine a number of other hematological parameters in the nature of prothrombin and partial thromboplastin times, of a series of blood samples from different patients, it may be understood that two blood samples would be withdrawn from each patient into separate Vacutainers. One each of the latter would be identified with sample identification numbers and mounted as described in precisely predetermined order in the sample container holders 48 of the Samplerfuge tray 10 for centrifugation as described, while the remaining Vacutainer of each of said sets would be suitably identified with a corresponding sample identification number and mounted as described in a similarly identified outer sample container holder 86 for positioning of the latter as described in the same precisely predetermined order in the mounting apertures 84.

The loaded tray 10 containing the now centrifuged whole blood samples is then inserted as described into the loaded outer tray 70 containing the same but uncentrifuged whole blood samples to form the combined tray assembly of FIGS. 5 and 6, and it may be readily understood that each radially aligned pair of sample containers 48 and 90 will, of necessity, contain blood from the same patient. Said combined tray assembly is then utilized as described as the sampler tray or sample supply tray of the sample supply, treatment and analysis means under discussion.

More specifically, and for use in a Hemolab application, it may be understood that the combined tray assembly would be indexed to present each radially aligned set of sample con-

tainers in turn to dual-probe sample off-take means for the concomitant aspiration of whole blood from the outer sample container 90 of each said set for use in automatic whole blood cell counting or the like, and the aspiration of the plasma from the upper layer of the centrifuged blood from the inner sample container 50 of each said container set for use in automatic prothrombin and/or partial thromboplastin time determination.

Although disclosed by way of example hereinabove as applied to the processing and analysis of whole blood samples, it may be understood that the apparatus of the invention are in no way limited thereto, but rather, may be applied with equal advantage to the processing and/or analysis of a wide variety of samples other and different than blood samples.

While we have shown and described the preferred embodiment of our invention, it will be understood that the invention may be embodied otherwise than as herein specifically illustrated or described, and that certain changes in the form and arrangement of parts and in the specific manner of practicing the invention may be made without departing from the underlying idea or principles of this invention within the scope of the appended claims.

What is claimed is:

1. A sample processing and supply apparatus for use in the centrifugation of a plurality of samples and the subsequent automated supply thereof to automated sample analysis means, comprising, tray means, a plurality of sample container means, each of which is adapted to contain a different sample, means supporting said sample container means from a peripheral portion of said tray means with freedom for movement therebetween, said tray means being rotatable to centrifuge samples contained in said sample container means and being indexable to supply said samples in series to automated sample analysis means, outer tray means having a plurality of outer sample container means mounting means, a plurality of outer sample container means mounted in said mounting means, said tray means and said outer tray means comprising attachment means providing for the attachment thereof only in a single relative position in which each of said outer sample container means of said outer tray means will be operatively associated with a different one of said sample container means of said tray means.

2. In sample processing and supply apparatus as in claim 1 wherein, said sample container means respectively comprise open upper extremities, and said support means are effective to support said sample container means from said tray means in substantially vertical manner absent the rotation of said tray means to thereby facilitate sample supply to said automated sample analysis means.

3. In sample processing and supply apparatus as in claim 1 wherein, said support means comprise pivotal attachment means and said sample container means are pivotally moveable thereabout during rotation of said tray means.

4. In sample processing and supply apparatus as in claim 3 wherein, said tray means are disposed in substantially horizontal manner, the respective centers of gravity of said sample container means are disposed below said pivotal attachment means absent the rotation of said tray means, and wherein said sample container means will be pivotally moved about said pivotal attachment means attendant the rotation of said tray means in such manner that the respective centers of gravity of said sample container means will be in substantial horizontal alignment with said pivotal attachment means to concentrate centrifugal forces at the latter.

5. In sample processing and supply apparatus as in claim 1 wherein, said tray means are of generally circular configuration and comprise cutouts formed in the periphery thereof, said support means comprise pivotal attachment means, and said sample container means are pivotally moveable into said cutouts attendant the rotation of said tray means to centrifuge said samples.

6. In sample processing and supply apparatus as in claim 5

wherein, said pivotal attachment means comprise a holding ring which extends around said tray means through said cutouts, and attachment means on said sample container means for pivotal attachment thereto.

7. In sample processing and supply apparatus as in claim 6 wherein, said sample container means each comprise a generally cylindrical sample container holder having said attachment means included therein, and a complementally configured sample container which fits within said sample container holder for combination therewith.

8. In sample processing and supply apparatus as in claim 7 wherein, said sample containers respectively comprise open upper extremities, and said pivotal attachment means are operable to support said sample container holders and said sample containers in substantially vertical manner absent the rotation of said tray means to thereby facilitate sample supply to said automated sample analysis means.

9. In sample processing and supply apparatus as in claim 7 wherein, said tray means are disposed in substantially horizontal manner, the respective centers of gravity of said combined sample container holders and sample containers are disposed below said holding ring absent the rotation of said tray means, and wherein said combined sample container holders and sample containers will be pivotally moved about said holding ring attendant the rotation of said tray means in such manner that the respective centers of gravity of said combined sample container holders and sample containers will be in substantial horizontal alignment with said holding ring to concentrate centrifugal forces on said sample container holder attachment means.

10. A sample processing and supply apparatus for use in the centrifugation of a plurality of samples and the subsequent automated supply thereof comprising, tray means, a plurality of sample container means, each of which is adapted to contain a different sample, means supporting said sample container means from a peripheral portion of said tray means with freedom for movement therebetween, said tray means being rotatable to centrifuge samples contained in said sample container means and being indexable to supply said samples in series to automated sample analysis means, said tray means being of generally circular configuration and comprise cutouts formed in the periphery thereof, said support means comprising pivotal attachment means, said sample container means being pivotally movable into said cutouts attendant the rotation of said tray means to centrifuge said samples, and generally circular outer tray means having a plurality of outer sample container means mounting means forming a generally circular array thereof, outer sample container means mounted in each of said mounting means, said tray means and said outer tray means comprising attachment means providing for the generally concentric attachment thereof only in a single relative position in which each of said outer sample container means will be in substantial radial alignment with a different one of said sample container means.

11. In sample processing and supply apparatus as in claim 10 wherein, said pivotal attachment means comprise a holding ring which extends around said tray means through said cutouts, and attachment means on said sample container means for pivotal attachment thereto.

12. In sample processing and supply apparatus as in claim 11 wherein, said sample container means each comprise a generally cylindrical sample container holder having said attachment means included therein, and a complementally configured sample container which fits within said sample container holder for combination therewith.

13. In sample processing and supply apparatus as in claim 12 wherein, said sample containers respectively comprise open upper extremities, and said pivotal attachment means are operable to support said sample container holders and said sample containers in substantially vertical manner absent the rotation of said tray means to thereby facilitate sample supply to said automated sample analysis means.

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