

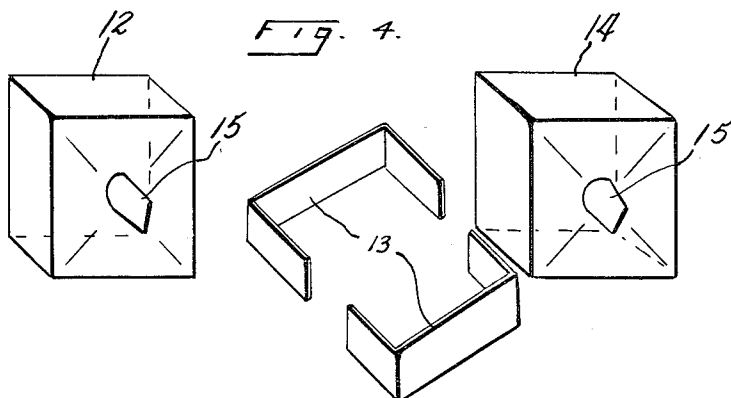
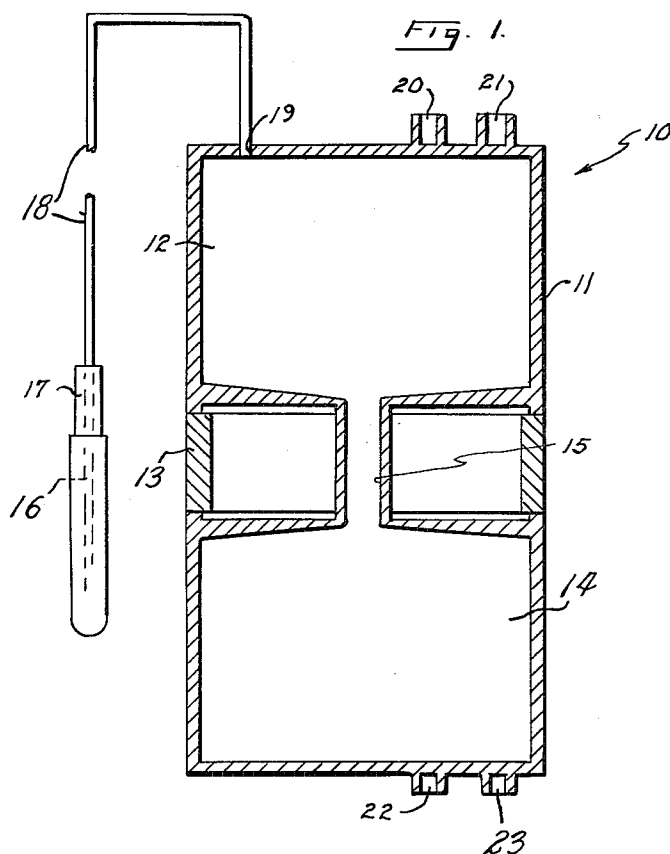
May 25, 1965

J. F. CACCAVO ET AL
APPARATUS FOR COLLECTING, SEPARATING, STORING
AND DISPENSING WHOLE BLOOD

3,185,154

Filed Aug. 14, 1962

2 Sheets-Sheet 1



INVENTOR
JOSEPH F. CACCAVO
WILLIAM J. PIEMONTE
BY *Howard J. Jeanmon*
AGENT

May 25, 1965

J. F. CACCAVO ET AL
APPARATUS FOR COLLECTING, SEPARATING, STORING
AND DISPENSING WHOLE BLOOD

3,185,154

Filed Aug. 14, 1962

2 Sheets-Sheet 2

FIG. 2.

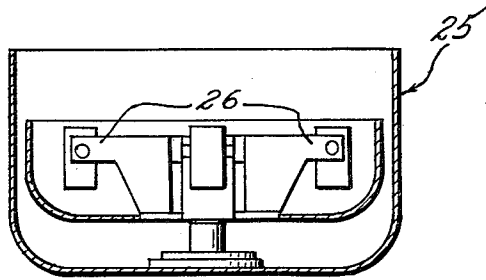
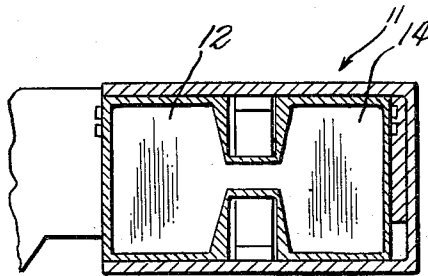


FIG. 3.



INVENTOR
JOSEPH F. CACCAVO
WILLIAM J. PIEMONTE
BY *Howard J. Jeanmon*

AGENT

1

3,185,154

**APPARATUS FOR COLLECTING, SEPARATING,
STORING AND DISPENSING WHOLE BLOOD**
Joseph F. Caccavo, 1975 Ocean Parkway, and William J.
Piemonte, 2135 80th St., both of Brooklyn, N.Y.
Filed Aug. 14, 1962, Ser. No. 216,928
2 Claims. (Cl. 128-272)

This invention relates to medical fluid handling and more particularly to blood collecting, storing and dispensing of whole blood and the apparatus for the use of human blood as unadulterated undistorted tissue for blood banking purposes. The collecting and dispensing of whole blood, that is, taking it from a donor and dispensing or infusing into a patient is but one phase in the medical handling of blood. Due to the collecting of blood from many donors and the storage of that blood in large blood banks, the blood must be collected and stored under sterile air-free conditions, each individual blood donation must be typed and identified also under sterile air-free conditions and the samples marked or labeled. The blood may be dispensed to a patient or as it more usually happens, the blood must be refrigerated and stored for use at a later date. In a blood bank there are large quantities of individual blood donations, each being hermetically sealed. The packing of these donations in a refrigerated container requires a strong durable enclosure for each donation. The form of the enclosure for the blood donation should be compact, easily stacked one above another and not compressible or distortable when so packed. The collective system for the blood should be complete, that is, with the infusion needle cemented to the enclosure and enclosed. The system is hermetically sealed and the enclosure should be provided with extra blind ports for sampling, for typing, or cross-matching or serology purposes. The enclosure should have a blood labeling or identifying means. The blood collecting and storing container must also be composed of an inert, non-toxic, hemorepellent material of medical quality. The container or enclosure should also be easily sterilized either by autoclaving or other heat or chemical action to free the container from any living micro-organisms, and the container should be provided with an anti-coagulant. Due to the practice of separating whole blood into its major components before refrigerating and storing, the container or enclosure for collecting each blood donation should be adaptable to a centrifuge and easy removal and storage after centrifugation without breaking its hermetic seal. In the handling of blood it is necessary to provide a completely sealed apparatus and a sterile technique is required for the necessary preservation of shed blood against coagulation and degradation.

It is an object of the invention to provide a bacteriologically safe technique together with a minimum of equipment for the collecting, storage and dispensing of whole blood.

It is a further object of this invention to provide the apparatus for the collecting, storage and dispensing of whole blood as a unitary system that is storable in small space and when filled with blood is capable of withstanding the hazards of all types of handling and shipping.

It is a further object of this invention to improve the medical fluid handling equipment for obtaining blood for sampling, typing, cross matching or culture purposes.

It is a further object of this invention to improve the medical fluid handling equipment for dispensing blood for transfusion or infusion of blood to be given to a patient.

It is a further object of this invention to improve the medical fluid handling equipment for receiving any type of heterogeneous or homogenous solutions collected under sterile sealed conditions.

2

A still further object of this invention is to collect blood, separate said blood by centrifugation into its major components, namely blood cells and plasma.

A still further object of this invention is to collect blood in a completely sealed unit that is comprised of two interconnected chambers.

A still further object of this invention is to dispense blood from a completely sealed unit that is comprised of two interconnected chambers.

A still further object of this invention is to collect blood in a unitary, completely hermetically sealed system that is comprised of two interconnected chambers to in turn separate said blood by centrifugation into its two major components and store said separated blood under refrigeration.

A still further object of this invention is to collect blood in a unitary, completely hermetically sealed system that is comprised of two interconnected chambers to in turn separate said blood by centrifugation into its two major components and separate said two interconnected chambers and hermetically seal and store said separated blood components under refrigeration.

A further object of this invention is to provide a container or enclosure that may be easily sterilized either by autoclaving or other heat or chemical action to free the container from any live micro-organisms.

A still further object of this invention is to provide a design and construction of a unitary apparatus for handling medical fluids and reducing and holding to a minimum the possibility of contamination of the fluids.

Other objects of this invention shall be apparent by reference to the accompanying detailed description and the drawings in which

FIG. 1 is a cross sectional view of a unitary system and apparatus,

FIG. 2 is a cross sectional view of a centrifuge with the unitary apparatus mounted at rest in the trunnion carrier,

FIG. 3 is a cross sectional view slightly enlarged with the unitary system and trunnion carrier in its centrifuging position, and

FIG. 4 is an exploded view in perspective of the unitary apparatus after separation.

The apparatus of this invention comprises a unitary hermetically sealed fluid handling system 10. The system comprises a centrally closed boxlike container 11 that defines a storage means or reservoir for the fluid. This container 11 is divided into two chambers 12 and 14 (FIG. 1 illustrating an inherently rigid boxlike form) with a connecting duct 15 connected through an aperture in the bottom wall of the first chamber and through an aperture in the top wall of the second chamber. It is to be noted that chambers 12 and 14 are held in a spaced relation by a pair of U-shaped spacers 13 which completely enclose tube 15 and provide a sufficient length for the severing and fusing of tube 15. Integrally connected with the sterile sealed assembly is an infusion tube 16, the infusion tube being hermetically sealed in an envelope 17 and connected by a tube 18 to a port 19 in the upper chamber 12. Chamber 12 is also provided with two tube supporting projections (blind ports) 20 and 21 to permit the piercing of the chamber wall for sampling, cross matching or serology purposes. Chamber 14 is also provided with two tube supporting projections (blind ports) 22 and 23 to permit the piercing of the chamber wall for dispensing or infusion of blood to a patient. The infusing element or blood dispensing element or recipient sub-set is not shown as it is not a part of the invention. This device is simply connected to one of the dispensing ports when the infusion of blood is to be given to a patient. The container 11 may be fabricated from a polyvinyl chloride resin base material such as a polyvinyl chloride

acetate copolymer that is impermeable and each wall has considerable tensile and flexural strength, also considerable impact strength and toughness and has stability to sterilizing temperatures of at least 120° C. and is capable of hermetic sealing and is chemically inert and has a non-reactive interior surface that is glossy smooth and is non-wettable by the medical liquids to prevent coagulation and degradation of the blood. Although the material utilized in the walls has considerable tensile and flexural strength to provide inherent rigidity the wall as illustrated in FIG. 1 provides a degree of flexibility to permit squeezing the container during the dispensing of blood.

In practice the system 10 is used for collecting blood from a patient. The infusion needle 16 is removed from its protective sheath or envelope 17 and is inserted into the patient's arm in the usual manner. The blood then flows by means of gravity through the infusion tube 18 into chamber 12 and through the connecting duct 15 and into chamber 14. When the blood has reached a sufficient volume to fill chamber 14 it will continue to rise through the duct and fill chamber 12. When the complete apparatus has been filled the infusion needle is removed and tube 18 is hermetically sealed. When necessary, samples may be taken from tube 18 before it is hermetically sealed. The system 10 at this point may be stored for future use or the entire apparatus may be used for transfusion into another patient in which case the infusing element and its connecting tube (not shown) may be inserted in 22 or 23 puncturing the container wall; or the entire system may be mounted in a centrifuge 25, FIG. 2, that is, the container 11 is mounted in a trunnion cup 26 of the centrifuge and is ready for centrifugation. The centrifuge is operated at a predetermined speed and the centrifugal force produced will separate the blood into its major components as illustrated in FIG. 3. The chamber 14 will contain the packed blood cells together with some plasma and a light buffy coat while the chamber 12 will retain the concentration of plasma. After centrifugation the container 11 may be removed from the trunnion cup and the metal spacer 13 (which is provided in two pieces, FIG. 4) may be removed and the connected duct 15 may be heat sealed in two places and severed so that chamber 12 and chamber 14 are now separated into two separate compartments as shown in FIG. 4. The compartments must be properly identified and marked and may then be stored under refrigeration for future use. The compartments are compact, easily handled and easily packed for shipment wherever they may be needed. It is to be noted that the compartments may be constructed of various sizes, however in the handling of blood the system 10 is provided with a total volume of approximately 500 ml. It is also to be noted that the entire apparatus or system contains a specified or given amount of anti-coagulant material.

Although the medical fluid handling system has been described with relation to the collecting, storage and dis-

pensing of whole blood it has also been described as utilized in the separation of the blood components and storage of the separate components, however the system may be utilized for the collection and storage of any fluids in which there at least two components having different densities (different specific gravities). Although the system has been described with relation to a particular configuration of the container, the container may be constructed in any fashion to provide the two separable containers and the container may be shaped in other than the square form without departing from the spirit of this invention and this invention shall be limited only by the appended claims.

What is claimed is:

1. An apparatus for the collection, centrifuging, storing and dispensing of whole blood in a completely hermetically sealed container comprising two separated chambers, in which said two chambers are boxlike in form and inherently rigid, each chamber comprising four side walls, a top and a bottom wall, said bottom wall of one chamber and said top wall of the other chamber each having an aperture, a duct extending from one aperture to the other, said duct and said two chambers being integrally formed of a polyvinyl chloride resin base material, said duct being adapted to be easily severed to provide two separate chambers, said duct also being adapted to be heat sealed and a pair of U-shaped, spacer elements having, flat, upstanding side walls of a width slightly less than the length of said duct positioned around said duct with open ends abutting, said spacer wall engaging the said bottom wall of said one chamber and said top wall of said other chamber so that the said container retains its shape when under stress in a centrifuge.

2. In an apparatus according to claim 1 in which said two chambers are provided with blind ports for dispensing or collecting of whole blood.

References Cited by the Examiner

UNITED STATES PATENTS

2,663,298	12/53	Rose	128—214
3,001,397	9/61	Leonard	128—214 X
3,028,075	4/62	Blum	233—26
3,064,647	11/62	Earl	128—272 X
3,074,402	1/63	Broman	128—214
3,079,919	3/63	Harrison et al.	128—272
3,096,283	7/63	Hein	128—214 X

OTHER REFERENCES

Raccuglia: "Disposable Container for Separation and Storage of Blood Components in a Sterile Closed System," from Proceedings of The Seventh Congress of the International Society of Blood Transfusion (Rome, 1958), pp. 388—390.

RICHARD A. GAUDET, *Primary Examiner*.
JORDAN FRANKLIN, *Examiner*.