

[54] **PLASMA CONCENTRATE AND TISSUE SEALANT METHODS AND APPARATUSES FOR MAKING CONCENTRATED PLASMA AND/OR TISSUE SEALANT**

0109374 5/1984 European Pat. Off. .
 0253198 1/1988 European Pat. Off. .
 0534178 3/1993 European Pat. Off. .
 0592242 4/1994 European Pat. Off. .

(List continued on next page.)

[75] Inventors: **Richard D. Antanavich**, Paso Robles;
Randel Dorian, Orinda, both of Calif.

OTHER PUBLICATIONS

[73] Assignee: **PlasmaSeal Corporation**, San Francisco, Calif.

Journal of Oral Maxillofacial Surgery, vol. 43, pp. 605-611, 1985, Helene Matras, MD, "Fibrin Seal: The State of The Art".

Ann Thorac Surg, vol. 53, pp. 530-531, 1992, Mehmet C. Oz, MD, et al., "Autologous Fibrin GLue From Intraoperatively Collected Platelet-Rich Plasma".

(List continued on next page.)

[21] Appl. No.: **351,010**

[22] Filed: **Dec. 7, 1994**

[51] Int. Cl.⁶ **B01D 33/15; B01D 33/27; A61M 1/14; A61K 35/16**

[52] U.S. Cl. **210/782; 422/44; 494/31; 494/33; 494/36; 494/45; 210/500.38; 604/4; 424/530**

[58] Field of Search **422/44; 494/31, 494/33, 36, 37, 45; 210/650, 651, 653, 782, 500.38, 321.68, 107; 604/4; 436/63, 175; 424/530**

Primary Examiner—Nina Bhat
Attorney, Agent, or Firm—William B. Walker

[57] **ABSTRACT**

An inexpensive device with a disposable cartridge for preparing tissue sealant is disclosed. The device is particularly applicable to star preparation of autologous tissue sealant. A method of sealing tissue in which the tissue sealant is applied immediately after mixing platelet-rich plasma concentrate (from the device) with a solution of calcium and thrombin is also disclosed. Preparation in the operating room of 5 cc sealant from 50 cc patient blood requires less than 15 minutes and only one simple operator step. There is no risk of tracking error because processing can be done in the operating room. Chemicals added may be limited to anticoagulant (e.g., citrate) and calcium chloride. The disposable cartridge may fit in the palm of the hand and is hermetically sealed to eliminate possible exposure to patient blood and ensure sterility. Adhesive and tensile strengths are comparable or superior to pooled blood fibrin sealants made with precipitation methods. Antifibrinolytic agents (such as aprotinin) are not necessary because the tissue sealant contains high concentrations of natural inhibitors of fibrinolysis from the patient's blood. The tissue sealant also contains patient platelets and additional factors not present in available fibrin sealants that promote wound healing.

[56] **References Cited**

U.S. PATENT DOCUMENTS

- 2,553,004 5/1951 Rabatine .
- 3,453,364 7/1969 Flodin et al. .
- 3,972,812 8/1976 Gresl, Jr. .
- 4,059,108 11/1977 Latham, Jr. .
- 4,204,537 5/1980 Latham, Jr. .
- 4,225,580 9/1980 Rothman et al. .
- 4,294,707 10/1981 Ikeda et al. .
- 4,298,598 11/1981 Schwarz et al. .
- 4,300,717 11/1981 Latham, Jr. .
- 4,303,193 12/1981 Latham, Jr. .
- 4,362,567 12/1982 Schwarz et al. .
- 4,377,572 3/1983 Schwarz et al. .

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

- 9103724 3/1993 Brazil .
- 1074709 7/1993 China .
- 0090997 10/1983 European Pat. Off. .
- 0102773 3/1984 European Pat. Off. .

45 Claims, 4 Drawing Sheets

