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English Translation of Patent Laying-Open No. H09-24026

(54) [Title of the Invention] Pressure Measuring Device for Blood Circuit

(57) [Abstract]

[Object] To provide a pressure measuring device for a blood circuit structurally simplified and capable of accurately detecting the pressure of blood.

[Technical Feature] A pressure measuring device has a casing divided by a diaphragm 1 formed of a flexible sheet into a blood chamber 8 and an air chamber 9 that are both enclosed spaces. The pressure of blood passing through the blood chamber 8 is transmitted to the air chamber 9 by way of the diaphragm 1, and pressure in the air chamber 9 is detected by a pressure sensor to detect pressure in the blood chamber 8. The diaphragm 1 is formed into a corrugated shape in cross section, forming an irregular surface on both surfaces thereof.

[Effects] The corrugated diaphragm 1 may be more easily deformable than a planar diaphragm, and the blood chamber 8 has an irregularly formed surface. Accordingly, blood flowing over the surface of the diaphragm 1 has a turbulent flow, slowing down its rate of flow over the surface. This helps to minimize errors in pressure detection.

[Scope of Claims for Patent]

[Claim 1]

A pressure measuring device for a blood circuit, comprising a casing (5) divided by a diaphragm (1) formed of a flexible sheet into a blood chamber (8) and an air chamber (9) that are both closed spaces, wherein a pressure of blood passing through the blood chamber (8) is transmitted to the air chamber (9) by way of the diaphragm (1), pressure in the air chamber 9 is detected by a pressure sensor to detect pressure of blood in the blood chamber (8), the diaphragm (1) having a corrugated shape in cross section, and forming an irregular surface on both surfaces thereof.

[Detailed Description of the Invention]

[0001]

[Technical Field to Which the Invention Belongs]

The invention relates to a device for detecting pressure in a blood circuit.

[0002]

[Prior Art]

When blood is extra-corporeally circulated to be subjected to a required treatment, it is important to accurately detect pressure of the blood. The treatment of blood requires accurate control of the pressure of blood. When, for example, blood permeates through a filtration film, the pressure of blood needs to be regulated to a predefined pressure. Any deviation in pressure level from the predefined value may result in adverse outcomes, such as to be out of optimal filtering condition, or damage to the filtration film.

[0003]

Conventionally, a drip chamber 12 illustrated in Fig. 1 has been used to measure the pressure of blood extracorporeally circulated. The drip chamber 12 is air-tightly sealed and used with air 13 being reserved in an upper part thereof. The air-tightly sealed drip chamber 12 is capable of detecting the pressure of blood 14 by detecting the air pressure. To detect the air pressure, a pressure sensor 15 is coupled to the upper section of the drip chamber 12. The drip chamber discharges blood

supplied thereto through its bottom section.

[0004]

The drip chamber has an advantage in accurate measurement of the pressure of blood. However, contact of blood with air is unavoidable. Any contact with air can accelerate the coagulation of blood. In a drip chamber with a filtration member provided inside, therefore, coagulated blood may clog the filtration member and finally block the flow of blood. In such a case, interruption of a medical treatment may result. Furthermore, contact with air creates a risk of bacterial infection. There is yet a further problem: difficulty in large volume reduction of the drip chamber increases a priming volume (PV value), which is a burden on a patient's blood supply. One drip chamber has a PV value ranging from 20 to 30 ml. Since three to four drip chambers are ordinarily used, it becomes a considerable volume in total.

[0005]

With an aim to prevent these adverse outcomes, a diaphragm pressure measuring device structured to separate blood and air using a diaphragm was invented and described in Japanese Patent Laying-Open No. 1986-143069. As illustrated in a sectional view of Fig. 2, the pressure measuring device includes a diaphragm 1 horizontally fixed in a casing 5. A part below the diaphragm 1 is defined as a blood chamber 2, and a part above the diaphragm 1 is defined as an air chamber 3. The diaphragm 1 is formed of an easy to deform flexible sheet, for example, a silicon rubber.

[0006]

[Problems to be Solved by the Invention]

The pressure measuring device illustrated in Fig. 2 may advantageously avoid any contact of blood with air, thereby solving the problem of the drip chamber. On the other hand, in the pressure measuring device thus structured, there is a drawback in that it is difficult to reduce measurement error. This is because it is not possible to completely equalize pressure in the blood chamber 2 and the air chamber 3. Deformation of the diaphragm 1 necessitates a higher pressure in the blood chamber 2 than in the air chamber 3. A solution to this problem may be to reduce the diaphragm

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