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(54) Suction equipment for medical operation.

(57) A suction equipment for use in a medical operation comprising a mat means (10) made of soft plastic and including a partition plate (11) of thin thickness enough to maintain a given shape so as to suit the shape of an organism to be operated with an area enough to wrap the operating portion of the organism, a plurality of projections (12) provided and distributed on at least the upper surface of the partition plate (11) in height enough to flow fluid thereamong, and a suction means (20) including a flexible tube (21) whose one end is mounted on the upper surface of the partition plate (11) with providing an opening (24) for introducing liquid on the partition plate (11) into the tube (21), and whose other end is extended out of the partition plate (11) and has a portion (22) for connecting with a pump (33) which is operated to take out the liquid from the partition plate (11) through the tube (21).

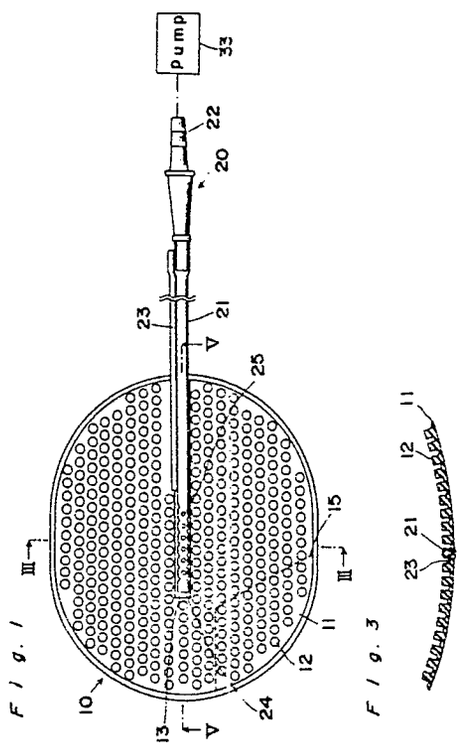

Fig. 1 Fig. 3

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Suction Equipment for Medical Operation

BACKGROUND OF THE INVENTION

The present invention generally relates to auxiliary suction equipment for performing a medical operation such as a heart operation, a liver operation, and an orthopedic surgery to be caused an issue of blood from an organism.

To facilitate understanding of the present invention the following explanation is proceeded in connection with a medical operation especially related to a heart operation. For instance, the present invention is to provide an auxiliary suction equipment for use in a heart operation which partitions off a heart to be operated on, and cooling ice-slushes from other internal organs, absorbs, removes blood, body fluid caused from the operation parts, thawed water or the like of ice slush in a heart opening art to be performed under the protection of the heart muscle by a local low-temperature method in order to control the metabolism of the heart to be operated on, simultaneously with the use of an ectosomatic auxiliary circulating circuit or a cardiovascular system which temporarily performs the auxiliary, agency operations for the pump operation of the heart in the mechanical way.

Generally, in order to partition off a heart or the like to be operated on from the other internal organs, doctors cut blister polyurethane or silicone resin sheet into proper size with a pair of scissors to wrap the heart or the like or to insert gauze, etc. thereinto if necessary. Also, various shapes of spreader sets or suckers were commonly used as equipment for absorbing blood, body fluid and ice slush, etc. caused during the operation, in the operation parts to re-use or remove it, with one assistant being required for the operation thereof.

SUMMARY OF THE INVENTION

Accordingly, an essential object of the present invention is to provide novel auxiliary suction equipment which are capable of carrying out a medical opening art using an ectosomatic auxiliary circulating circuit or a cardiovascular system without hindrance, and are easier to operate and simpler in construction.

Consideration in the invention of the suction equipment is that sufficient adiabatic effect is obtained on the employment of plastic materials for a base plate of mat means so that adjacent diaphragm nerve may not be paralyzed, the mat means made of soft plastic is rich in flexibility and is deformed to suit the shape of the heart, blood or fluid caused from the heart or the like is naturally flowed into suction openings of a tube provided on the mat means, the shape, size of the base plate may be easily changed with scissors in accordance with the heart size, the neighboring internal organ condition, the suction openings of the tube whose other end is to be connected with a pump have no possibility of being closed with the internal organs, and the construction of the suction equipment may be made with ease and low cost.

According to the present invention, the suction equipment for use in a medical operation comprises a mat means made of soft plastic in molding and including a partition plate of thin thickness enough to maintain a given shape so as to suit the shape of an organism such as a human heart with an area enough to wrap the operating portion of the organism, a plurality of projections provided and distributed on at least the upper surface of the partition plate in height enough to flow fluid thereamong, and a suction means including a flexible tube whose one end is mounted on the upper surface of the partition plate with providing an opening for introducing liquid on the base plate into the tube, and whose other end is extended out of the partition plate and has a connector for connecting with a pump which is operated to take out the liquid from the partition plate through the tube.

The partition plate of mat means is inserted between the operating portion such as a heart to be operated on and other internal organs, with refrigerants such as ice slushes being thrown between the mat means and the heart. The connector at the other end of the tube is connected with the suction opening of a pump. Body fluid, blood or the like which has been caused from the organism or the like during the operation gathers into the suction openings of the tube along the flow path of the surface of the base plate, so that it is absorbed, reused or removed.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects and features of the present invention will become clear from the following description taken in conjunction with the preferred embodiments thereof with reference to the accompanying drawings, in which

Fig. 1 is a front-face view of a suction equipment for a medical operation in a first embodiment of the present invention;

Fig. 2 is a perspective view, on an enlarged scale, of a central portion of Fig. 1;

Fig. 3 is a cross-sectional view taken along a line III-III of Fig. 1;

Fig. 4 is an enlarged view of a central portion of Fig. 2;

Fig. 5 is a cross-sectional view taken along a line V-V of Fig. 1;

Fig. 6 is a front-face view of a suction equipment for a medical operation in a second embodiment of the present invention;

Fig. 7 is a cross-sectional view taken along a line VII-VII of Fig. 6;

Fig. 8 is a front-face view showing a suction equipment for a medical operation in a third embodiment of the present invention;

Fig. 9 is a cross-sectional view taken along a line IX-IX of Fig. 8;

Fig. 10 is a front-face view showing a suction equipment for a medical operation in a fourth embodiment of the present invention; and

Fig. 11 is a cross-sectional view taken along a line XI-XI of Fig. 10.

DETAILED DESCRIPTION OF THE INVENTION

Before the description of the present invention proceeds, it is to be noted that like parts are designated by like reference numerals throughout the accompanying drawings. Also, the following description is proceeded by way of example for an application to a heart operation of a human being on the employment of a suction equipment of the present invention.

Figs. 1 to 5 show a suction equipment for use in a medical operation in accordance with a first embodiment of the present invention, which can easily partition off a portion of an organism such as a heart to be operated on from other internal organs in a heart opening art of patient to be performed under the protection of the heart by a local low-temperature method of controlling the metabolism of patient simultaneously with the use of ectosomatic auxiliary circulating circuit which performs the pump operation of an auxiliary agency for the heart in a mechanical way.

Referring to Fig. 1, the suction equipment comprises a mat means 10 including a partition plate 11 of pan type to be placed in the space of the heart to be operated and other internal organs for partitioning therebetween, and a plurality of projections 12 provided on the partition plate 11 to form a passage for flowing blood or body fluid generated from the operation parts of patient from the whole area of the partition plate 11 into the central portion of the partition plate 11, and a suction means 20 including a suction tube 21 of which one end is opened at the central portion of the partition plate 11 while the other end of which is connected to a suction pump 33 through a connector 22 in order to suck out the blood or body fluid from the central portion of the partition plate 11 to the suction pump 33, and an air tube 23 for introducing air from the outside of the partition plate 11 to the neighborhood of an opening 24 of the suction tube 21.

The partition plate 11 has a large size in dimension enough to wrap the half of the heart, with the long diameter being 120 mm, the short diameter being 100 mm, providing with many small projections 12 arranged each being 2 through 5 mm in height across the entire surface of the partition plate 11 of 1 through 2 mm in thickness. The partition plate 11 is curved like a round plate, and furthermore is flexible so that it may be freely deformed through application of small amount of force. The shape of the small projections 12 is formed as far as no end of continuous flow route is formed, of such as as dot-shape 12 with a diameter of 3 to 5 mm and a height of 2 to 4 mm, as shown in Fig. 4, linear shape 12′ with a length of more than 5 mm and a height of 3 mm as shown in Fig. 8 of the third embodiment of the present invention or the shape. The top planes of the projections 12 are formed of flat surfaces to be attached smoothly with the heart of patient to be treated.

Also, the arrangement of the projections 12 is not restricted to provide on the front face of the partition plate 11, but may be provided on the back face of the partition plate 11 as well as the front face thereof as shown in Figs. 6, 7 of the second embodiment of the present invention. The projections 12 are provided with a thermal insulating function for the partition plate 11 and a passage forming function for liquid to be sucked by the suction tube 21.

The partition plate 11 with projections 12 is integrally molded of plastic, such as soft plastic, foamed plastic or the like, which is flexible, adiabatic even at low temperatures of 0° through 4° C, being adopted as a thermal insulating material, for example, silicone, polyethylene, urethane, vinyl chloride or blister materials thereof is preferable, especially blister material of silicone-origin resin is desirable. In addition, the partition plate 11 is provided with a train of perforations 15 in line which is able to tear off some portion of the partition plate 11 to reduce optionally the area of the partition plate 11 in order to fit to the small size of the heart to be operated.

The suction tube 21, made of transparent soft plastic, has an outer diameter of 4 mm and an inner diameter of 2.5 mm, providing suction openings 24 in one end portion thereof to suck the fluid, and the connector 22 in the other end thereof for connection with the suction pump 33, with one end portion being bonded by a bonding agent within a groove or concave 13 provided at the central por-

tion of the front surface of the partition plate 11. The suction tube 21 is mounted on the front surface of the partition plate 11 in height which is almost the same as those of the projections 12. The suction openings 25 are also provided at the top, bottom and left and right sides of the suction tube 21 in lines along the longitudinal direction of the suction tube 21, the top suction openings 25 being passed through the back side of the partition plate 11 through the corresponding holes 14 provided on the concave 13 of the partition plate 11, in order to suck continuously liquid appeared on the front surface and the back side portion of the partition plate 11 by the sucking operation of the suction pump 33 during the heart operation of patient. The partition plate 11 may be provided through the tube bottom face, in addition to the tube tip end, the both right, left side faces of the tube, and the tube top portion. The air-tube 23 for introducing an air from the outside to the central portion of the upper surface of the partition plate 11 to suck into the suction openings 24, 25 of the suction tube 21 has an outer diameter of 2 mm and an inner diameter of 1 mm, and is bonded by a bonding agent along the suction tube 21. The air tube is provided to assist the suction operation of the suction tube effectively.

The shape of the partition plate 11 of the present invention is not restricted to an oval shown in Fig. 1, but may be round in shape or oval with a notch portion 16 rounded off previously in one portion thereof as shown in Fig. 8 of the third embodiment of the present invention. The reason why such a notch portion 16 as described hereinabove is provided is that it is often convenient to have it into an escape shape, because blood vessels are provided here in the case of the human heart.

The suction tube 21 of the present invention may be branched into two forks, three forks or more each having a suction opening at its tip end. Also, a ready-made spreader set or sucker may be bonded as it is.

As is clear from the foregoing description, according to the arrangement of the present invention, many types of spreader sets or suckers are not required to be prepared as before and the operators thereof are not required, thus simplifying the heart opening art. Also, as the small projections are provided on the surface of the partition plate, the adiabatic property of the mat is improved and the unnecessary fluid smoothly flows into the tube suction openings. Furthermore, the tissues of the heart are raised by projections to prevent the tube suction openings from being blockaded, thus allowing the natural sucking to be performed.

Although the present invention has been fully described in connection with the preferred embodiments thereof with reference to the accompanying drawings, it is to be noted that various changes and modifications are apparent to those skilled in the art. For instance, as shown in Figs. 10 and 11, the mat means 10 may further provide a passage 41 for introducing medium such as cold water from the outside to the inside of the mat means 10 in order to control the surface temperature of the mat means 10. The passage is formed as a kind of cavity 41 as shwon in Fig. 11 in molding, providing with an exit and an inlet so as to circulate the medium from the inlet to the outlet through the cavity 41. The exit is provided with an exhaust pipe 44 of which one end is connected to the cavity and the other end is opened to discharge, while the inlet is provided with an inlet pipe 42 of which one end is connected to the cavity and the other end is connected with a water pump for supplying cold water into the passage. Also, the cavity is provided at almost all area of the mat means. Such changes and modifications are to be understood as included within the scope of the present invention as defined by the appended claims unless they depart therefrom.

Claims

1. A suction equipment for use in a medical operation comprising a mat means made of soft plastic and including a partition plate of thin thickness enough to maintain a given shape so as to suit the shape of an organism to be operated with an area enough to wrap the operating portion of the organism, a plurality of projections provided and distributed on at least the upper surface of the partition plate in height enough to flow fluid thereamong, and a suction means including a flexible tube whose one end is mounted on the upper surface of the partition plate with providing an opening for introducing liquid on the partition plate into the tube, and whose other end is extended out of the partition plate and has a portion for connecting with a pump which is operated to take out the liquid from the partition plate through the tube.

2. The suction equipment as defined in Claim 1, wherein said partition plate is formed of a round shape, and the one end of the tube is mounted at the center of the partition plate.

3. The suction equipment as defined in Claim 1, further comprising an auxiliary tube provided along the tube to introduce air from the outside of the partition plate to the neighborhood of the opening of the tube.

4. The suction equipment as defined in Claim 1, wherein each of said projections is formed of round dot-shape.

5. The suction equipment as defined in Claim 1, wherein each of said projections is formed of line shape.

6. The suction equipment as defined in Claim 1, wherein said partition plate is provided with a concave on the upper surface for engaging the end of the tube therein.

7. The suction equipment as defined in Claim 1, wherein said partition plate is provided with a line of perforations for tearing off a portion of the partition plate to reduce the area of the partition plate.

8. The suction equipment as defined in Claim 1, wherein said mat is formed as one unit in molding.

9. The suction equipment as defined in Claim 1, wherein said partition plate is provided with an extra portion for enlarging the area of the upper surface of the partition plate.

10. A suction equipment for use in a medical operation comprising a mat means made of soft plastic and including a partition plate of thin thickness enough to maintain a given shape so as to suit the shape of an organism to be operated with an area enough to wrap the operating portion of the organism, a plurality of projections provided and distributed on at least the upper surface of the partition plate in height enough to flow fluid thereamong, a suction means including a flexible tube whose one end is mounted on the upper surface of the partition plate with providing an opening for introducing liquid on the partition plate into the tube, and whose other end is extended out of the partition plate and has a portion for connecting with a pump which is operated to take out the liquid from the partition plate through the tube, and a passage means provided with a mat means for introducing medium from the outside to the inside of the mat means so as to control the surface temperature of the mat means.

11. The suction equipment as defined in Claim 10, wherein said passage means is provided with an exit port and an inlet port to be connected with a pump for feeding the medium

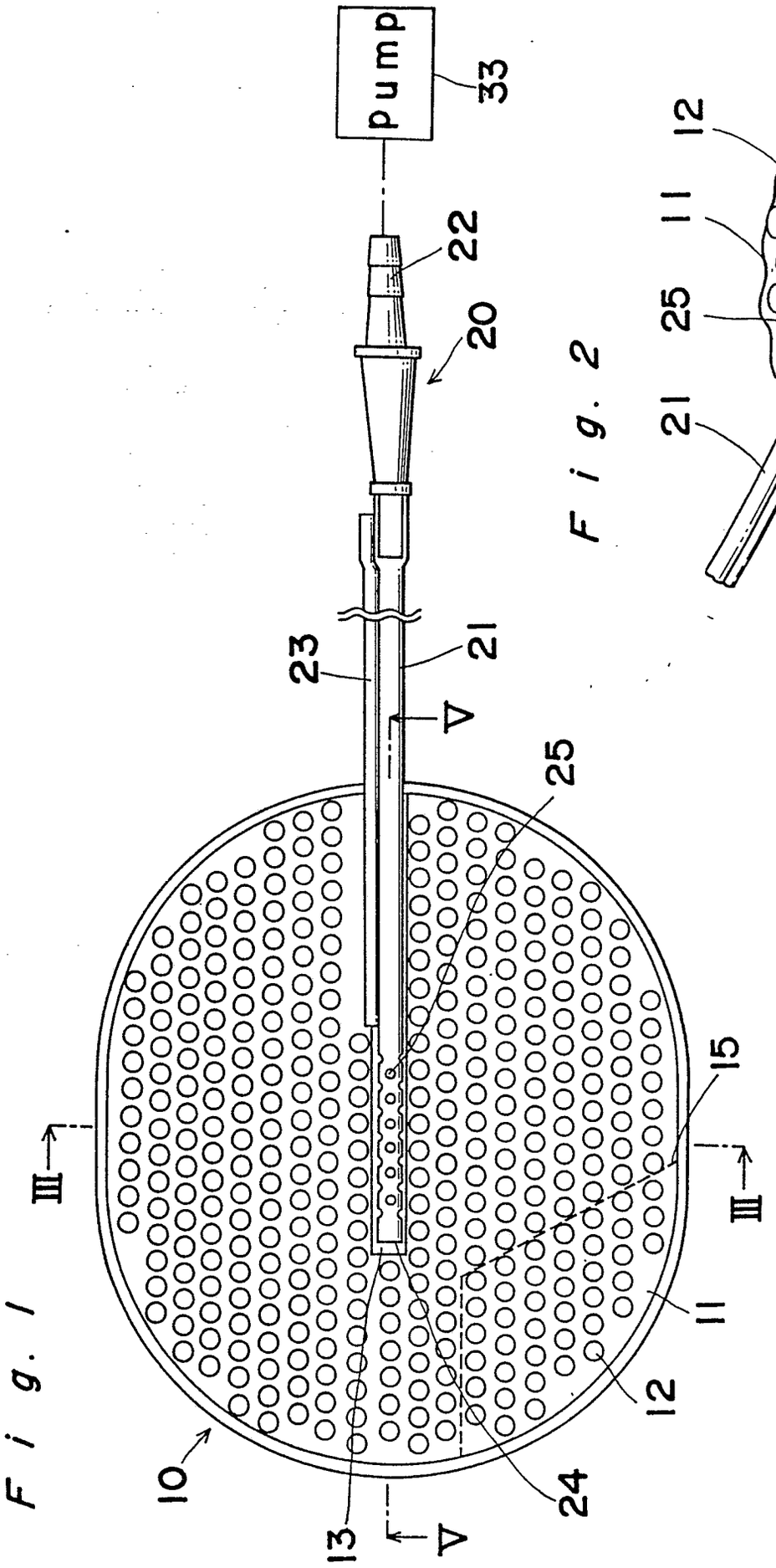


Fig. 1

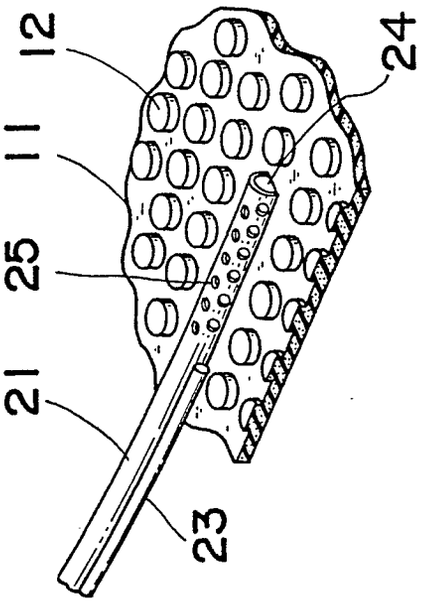


Fig. 2

Fig. 3

Fig. 5

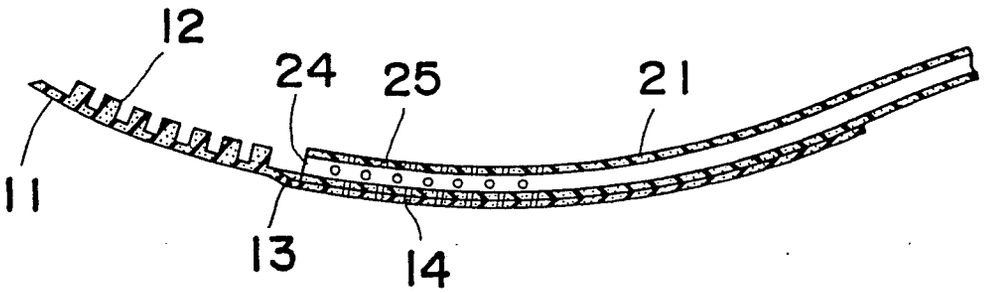


Fig. 4

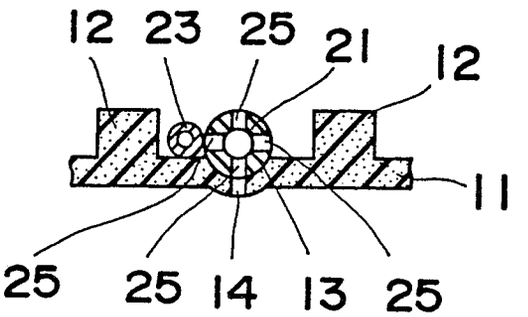


Fig. 6

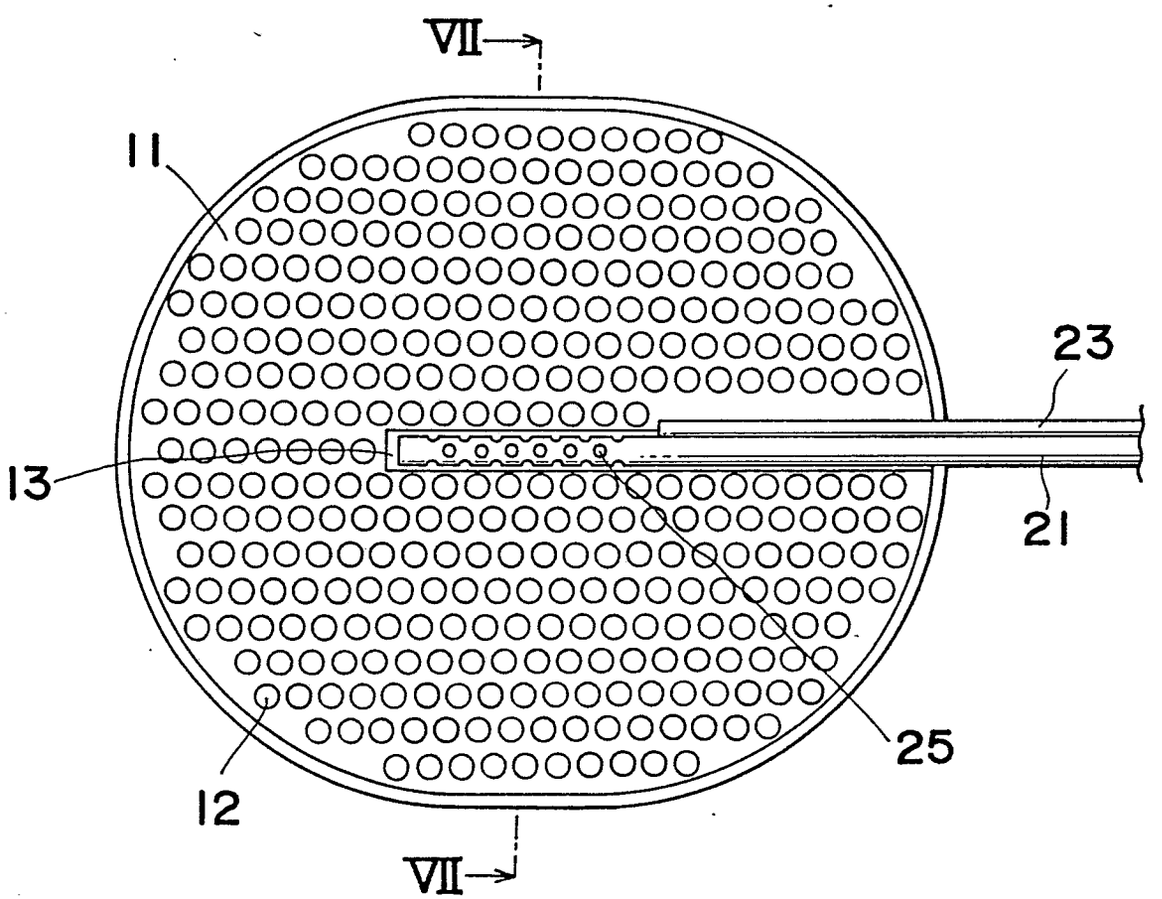


Fig. 7

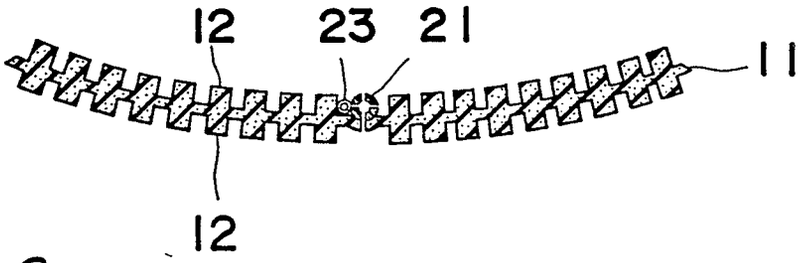


Fig. 8

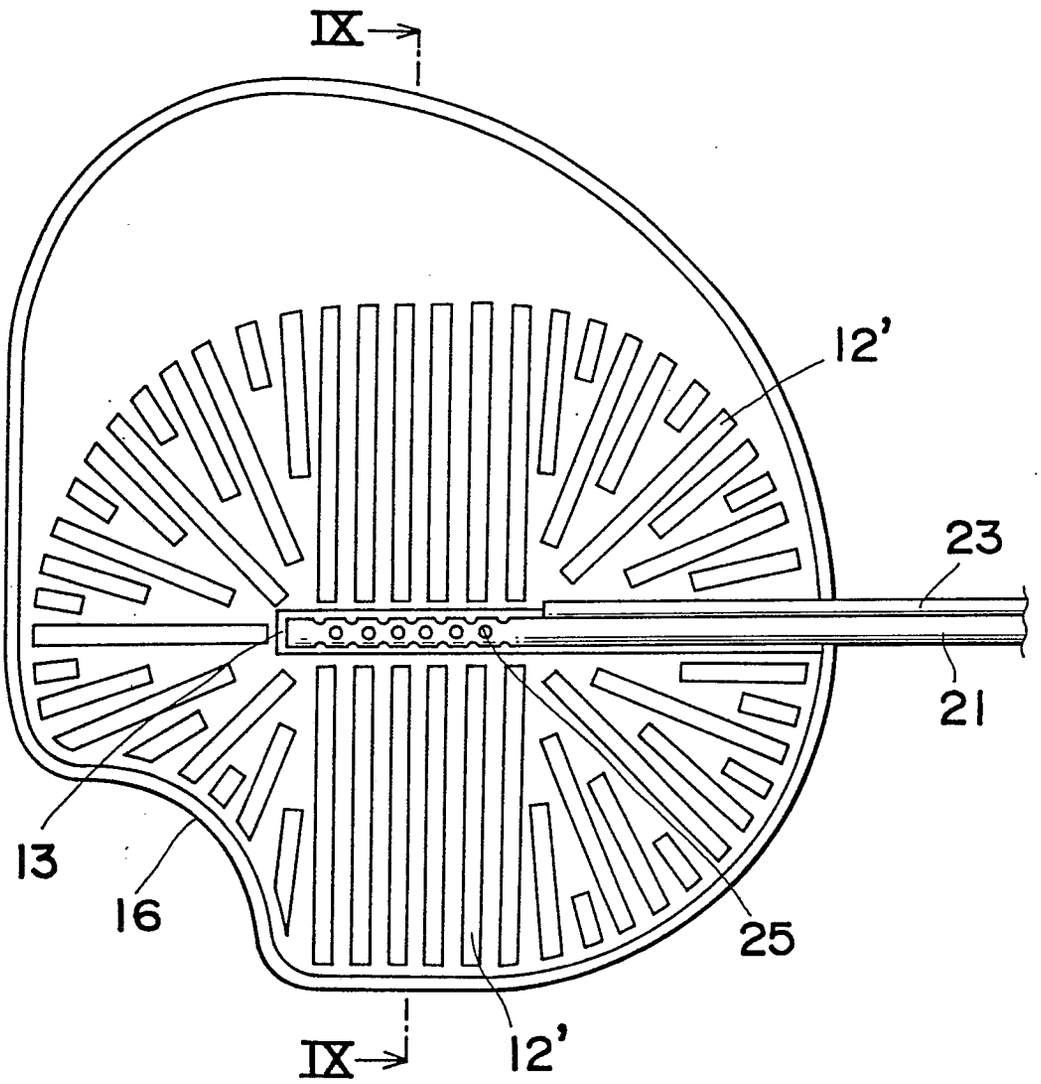
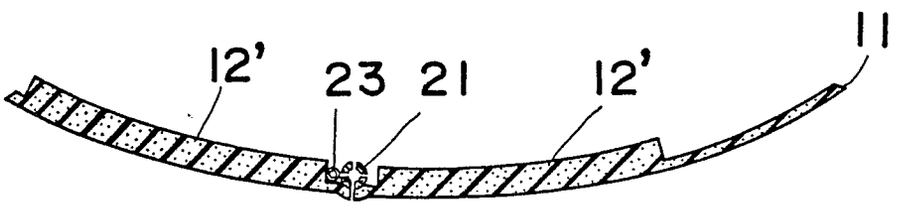


Fig. 9



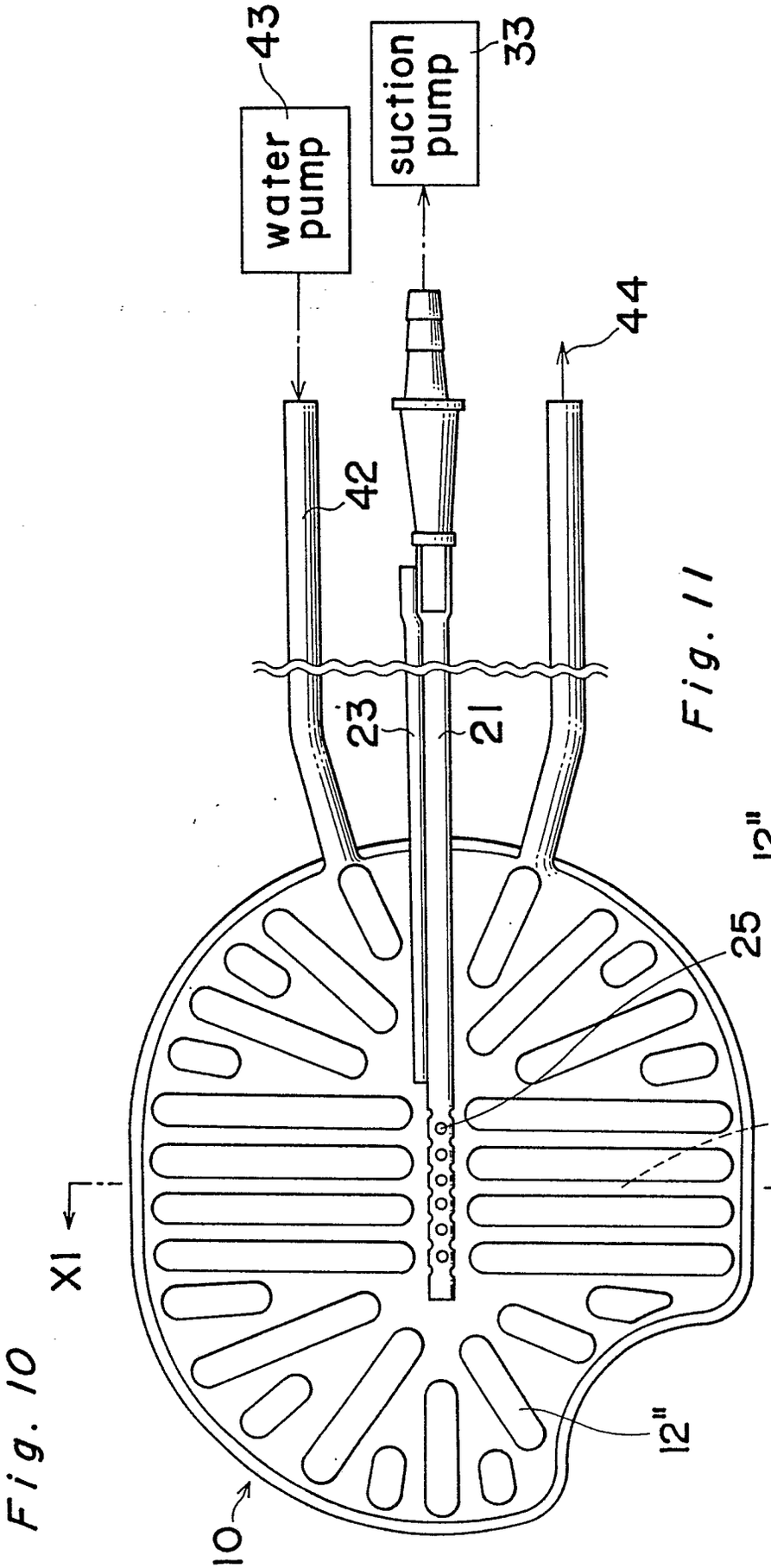

43
water pump
suction pump
33
44
42
23
21
25
41
12"
10
X1
X1

Fig. 10

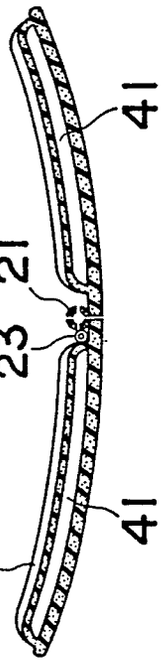

41
21
23
41
12"

Fig. 11

European Patent Office

EUROPEAN SEARCH REPORT

Application number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 88305625.1

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	US - A - 4 533 352 (A.L. VAN BEEK et al.)	1,4, 5,8	A 61 M 1/00
A	* Fig. 1-4; abstract; column 2, lines 5-18; column 3, line 34 - column 5, line 3 *	2,3, 10	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

A 61 M 1/00
A 61 M 27/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	11-11-1988	LUDWIG

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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