FORM 1

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

602829

APPLICATION FOR A STANDARD PATENT

I\We,

WESTFALIA SEPARATOR AG

of WERNER-HABIG-STRASSE 1
4740 OELDE 1
FED. REP. GERMANY

hereby apply for the grant of a standard patent for an invention entitled:

FLOW-THROUGH CENTRIFUGE

which is described in the accompanying complete specification

Details of basic application(s):

Number of basic application	Name of Convention country in which basic application was filed	Date of basic application
P3723092.1	DE	13 JUL 87

My/our address for service is care of CLEMENT HACK & CO., Patent Attorneys, 601 St. Kilda Road, Melbourne 3004, Victoria, Australia.

DATED this 17th day of May 1988

WESTFALIA SEPARATOR AG

CLEMENT HACK & CO.

TO: The Commissioner of Patents.

LODGED AT SUB-OFFICE
17 MAY 1988
Melbourne

Forms 7 and 8

AUSTRALIA

Patents Act 1952

DECLARATION IN SUPPORT OF A CONVENTION OR NON-CONVENTION APPLICATION FOR A PATENT OR PATENT OF ADDITION

Name(s) of Applicant(s)

In support of the application made by WESTFALIA SEPARATOR AG

Title

for a patent for an invention entitled FLOW-THROUGH CENTRIFUGE

Name(s) and address(es) of person(s) making declaration

I/We, Dipl.-Ing. Gunthard Pautsch, Prozessionsweg 20
4740 Oelde 1, Fed.Rep.of Germany and
Dipl.-Ing. Hubert Günnewig, Beethovenstraße 10
4740 Oelde 1, Fed. Rep. of Germany
do solemnly and sincerely declare as follows:-

1. I am/we are the applicant(s) for the patent, or am/are authorised by the abovementioned applicant to make this declaration on its behalf.

2. The basic application(s) as defined by Section 141 of the Act was/were made in the following country or countries on the following date(s) by the following applicant(s) namely:-

Country, filing date and name of Applicant(s) for the or each basic application

in Germany on 13th July 19 87
by WESTFALIA SEPARATOR AG
in _____ on _____ 19 ____
by _____

3. The said basic application(s) was/were the first application(s) made in a Convention country in respect of the invention the subject of the application.

Name(s) and address(es) of the or each actual inventor

4. The actual inventor(s) of the said invention is/are
Dr. John R. Wells, 4372, Keystone Avenue, Culver City, CA 90323, USA
Gunthard Pautsch, Prozessionsweg 20, 4740 Oelde 1
Werner Kohlstette, Von Bodelschwingh-Str. 16, 4740 Oelde 1
Detlef Grabbe, Köntrup 17, 4722 Ennigerloh 2

See reverse side of this form for guidance in completing this part

5. The facts upon which the applicant(s) is/are entitled to make this application are as follows:-
The applicant is the assignee of the acutual inventor

DECLARED at 4740 Oelde 1 this 19th day of April 1988

Westfalia Separator AG

ppa. [signature]
(Procurator) (Proxi)

This form may be completed and filed after the filing of a patent application but the form must not be signed until after it has been completely filled in as indicated by the marginal notes. The place and date of signing must be filled in. Company stamps or seals should not be used.

No legalisation is necessary

PF/Mar/19/1981

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(Modified Examination)

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FLOW-THROUGH CENTRIFUGE

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(56) Prior Art Documents
US 4447220

(57) Claim

1. Flow-through centrifuge, in particular for the production of proteins from human blood plasma, with a cylindrical centrifuge drum which contains ~~a plurality of~~ concentrically-arranged chambers interconnected at their base regions, into which the blood plasma, or the like, is introduced into the inner region of said chambers and a liquid phase is drawn off continuously from the outer region, wherein the centrifuge drum contains concentrically-arranged annular-shaped or circular-segment-shaped chambers, consisting of synthetic plastics material containers interconnected at their base regions by means of at least one channel, where the synthetic plastics material container(s) nearest to the axis of rotation of the centrifuge drum has/have a charging pipe and the synthetic plastics material container(s) in the outer region of the centrifuge drum has/have a discharge channel at the top, and the outer surfaces of the synthetic plastics material container(s), of the ~~inter~~ connection channel(s), of the discharge channel(s)

.../2

and of the charging pipe(s) are supported against the inner surface of the wall of the centrifuge drum and against ~~the~~ moulded components which can be inserted into, and removed from, the centrifuge drum.

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COMPLETE SPECIFICATION 602829 Form 10

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Complete Specification-Lodged:
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Related Art:

This document contains the amendments made under Section 49 and is correct for printing.

TO BE COMPLETED BY APPLICANT

Name of Applicant:
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Actual Inventor:

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Melbourne, Victoria 3004,
Australia.

Complete Specification for the invention entitled:
FLOW-THROUGH CENTRIFUGE

The following statement is a full description of this invention including the best method of performing it known to me:-

The present invention relates to a flow-through centrifuge, in particular for the production of proteins from human blood plasma, with a cylindrical centrifuge drum which contains a plurality of concentrically-arranged chambers interconnected at their base regions, wherein the blood plasma, or the like, is introduced into the inner region of said chambers and a liquid phase is drawn off continuously from the outer region.

A flow-through centrifuge of this type is already known from the German Patent (DE-PS 24 23 319) which discloses that the centrifuge drum has two concentrically-arranged chambers which are interconnected at their base region by way of channels through which the blood plasma, or the like, can flow from the inner chamber into the outer chamber. The liquid phase flows from this outer chamber into a skimming chamber and is conveyed to the outside by way of a skimming disc. The plasma proteins (albumin) are deposited in the two chambers of the centrifuge. When these two chambers become full, the albumin must be scraped out manually from these chambers by the operator. Precautions must be taken during this operation that the protein material does not become infected by the operators and also that the operators do not come into contact with any disease germs which may be present in said protein material.

Because the centrifuge drum of the known type of flow-through centrifuge is fabricated exclusively from metal components which can withstand very great mechanical stresses, it is possible to operate these centrifuges at the maximum speed of revolution allowed for the materials employed. It is essential to use very high speed centrifuges for the economical recovery of plasma proteins.

The problem to be solved by the present invention is how to configure a flow-through centrifuge, especially for the industrial production of proteins from human blood plasma, of the type described initially in such a manner that, while maintaining economical operation with the maximum speed of revolution, the product will be protected from contamination and the operators will be protected against infection by any pathogenic microorganisms contained in the product and, at the same time, the amount of labour required to remove and store

the centrifuged protein material will be reduced to a minimum.

This problem is solved by the present invention with the provision of a centrifuge drum which contains concentrically-arranged annular-shaped or circular-segment-shaped chambers, consisting of synthetic plastics material containers, interconnected at their base regions by means of at least one channel, where the synthetic plastics material container(s) nearest to the axis of rotation of the centrifuge drum has/have a charging pipe and the synthetic plastics material container(s) in the outer region of the centrifuge drum has/have a discharge channel at the top, and the outer surfaces of the synthetic plastics material container(s), of the ~~inter-connection~~ connection channel(s), of the discharge channel(s) and of the charging pipe(s) are supported against the inner surface of the wall of the centrifuge drum and against the moulded components which can be inserted into, or removed from, the centrifuge drum.

Because support surfaces are provided for the total area of the outer surfaces of the synthetic plastics material containers which are inserted into the centrifuge drum, where said surfaces can be formed by parts of the centrifuge drum, by parts of the insertable and removable moulded components or by the walls of adjacent synthetic plastics material containers, it is only necessary to transmit forces to the support surfaces from the walls of the synthetic plastics material containers while the centrifuge is in operation, so that, even with very high speed centrifuges, it is possible to use synthetic plastics material bags as the synthetic plastics material containers.

The synthetic plastics material containers are sterile when delivered. To maintain the sterility of the interior of the containers, the inlet and outlet openings of the containers are closed by sterile plugs. This plug closure remains in position during the insertion of the containers into the centrifuge drum and during the mounting of the moulded components and, optionally of the partition walls. It is only shortly before the placing in position of the distributor, of the components which delimit the skimming chamber for the liquid phase which is to be taken away, and of the cover lid of the centrifuge

drum, that the plug closures are removed.

When the interior spaces of the synthetic plastics material containers have become filled with the protein material, the centrifuge drum is brought to a halt and, after opening the cover lid from the drum and after removal of the drum components in the charging and discharging regions as well as some of the moulded components, the filled synthetic plastics material containers are removed from the centrifuge drum and placed in storage if necessary. To remove the protein material from the synthetic plastics material containers, it is necessary to destroy the synthetic plastics material containers.

Losses of the product are avoided when the centrifuge in accordance with the present invention is employed. A cleansing of the drum inserts between each of the separate batches is no longer necessary. Coating of the inside of the centrifuge drum with special materials, titanium for example, is not needed.

Additional characteristics and features of the present invention will become apparent from a perusal of the subsidiary Claims and of the following description of an example of embodiment which is illustrated in the accompanying drawings.

There is depicted in :

Fig. 1 a vertical section through the centrifuge drum of a flow-through centrifuge with inserted synthetic plastics material containers, actually in the region of a bottom inter-connecting channel and a top discharge channel,

Fig. 2 a vertical section through the centrifuge drum of a flow-through centrifuge with inserted synthetic plastics material containers, displaced from the region of said inter-connecting channel and said discharge channel,

Fig. 3 an intermediate stage during the assembly,

Fig. 4 a section along line IV-IV in Fig. 3,

Fig. 5 a section along line V-V in Fig. 1,

Fig. 6 a section along line VI-VI in Fig. 3,

Fig. 7 a section along line VII-VII in Fig. 3.

The flow-through centrifuge comprises a centrifuge drum 1 which has a cylindrical base portion 2, a cover lid 3 and a

closure collar 4 which is used to fasten the lid 3 securely into position on the base portion 2.

There is a cooling jacket 5 through which a cooling liquid flows around the base portion 2 but the function of this is not discussed any further here. In the example of embodiment illustrated in Fig. 1, the inner surface 6 of the wall of the base portion 2 is flush with the inner surface 7 of the wall of the cover lid 3.

The interior space of the centrifuge drum is limited in the direction towards the axis 8 of rotation and in the direction towards the bottom by the integrally moulded insertion component 9 which has a base plate 10 consisting of two plate components 11 and 12 disposed at an obtuse angle to each other.

In the intermediate stage of assembly depicted in Fig. 3, the synthetic plastics material containers 13 and 14 have been placed in position on the base plate 10 of the insertion component 9 and these two containers 13, 14 are in communication with each other through the channel 15 in the bottom region.

The structural configuration of the channel 15 is depicted in Fig. 4. The connecting channel 15 is fabricated as a hose and is affixed to the base 17 of the synthetic plastics material container 13 by means of the longitudinal rib 16. The channel 15, the rib 16 and the base 17 of the synthetic plastics material container 13 form an integral unit. In addition, the channel 15 is attached to the synthetic plastics material container 14 so that the two concentrically disposed containers 13, 14 form a single structural unit.

The container 13 is provided with a short charging pipe 18. The synthetic plastics material container 14 is furnished with a discharge channel 19 at the top which has a short discharge pipe 20 at its upper end. The charging pipe 18 and the discharge pipe 20 are closed by means of the plugs 21, 22 when they are delivered and when they are being installed in the centrifuge drum. These plugs prevent any contaminants from gaining access to the interior of the synthetic plastics material containers.

In the case of the example of embodiment depicted in the drawings there is an cylindrical jacket 23 located between the two synthetic plastics material containers 13, 14 in order to provide support surfaces for the adjacent walls of said containers. The annular jacket 23 is provided with apertures through which the connection channel 15 and the discharge channel 19 pass.

Beneath the base 17 of the inner container(s) 13 there is a moulded component 24, made preferably from synthetic plastics material, which rests on the base plate 10 of the insertion component 9 and fills the space between the base 17 of the inner container(s) 13 and said base plate 10. This moulded component 24 is provided with one or more recesses to accommodate a connection channel 15 as required. So that the total external surface of the connection channel 15 which is formed by a hose can be supported on moulded component surfaces during operation of the centrifuge, additional moulded components 26 are disposed within the recess 25 in the moulded component 24.

It can be seen from Fig. 4 that the total surface of the connection channel 15 is embedded in moulded components.

The discharge channel(s) 19 is/are also embedded in moulded components 27, 28 which are disposed between the upper surface of the inner synthetic plastics material container(s) 13 and the cover lid 3.

The disposition of these moulded components 27, 28 in relation to the discharge channel 19 may be readily seen in Fig. 1 and Fig. 5.

It may be learned from inspection of Fig. 6 that the concentrically-arranged synthetic plastics material containers 13 and 14 can have a circular-segment-shaped configuration so that the interior of the centrifuge drum is filled up with a series of these synthetic plastics material containers. Because of the employment of smaller circular-segment-shaped synthetic plastics material containers 13 and 14, it is possible to manufacture said synthetic plastics material containers by a blow-moulding process.

In the example of embodiment depicted in Fig. 6, the adjacent, radially-directed walls of the synthetic plastics

material containers provide support for each other during operation of the centrifuge.

The flow-through centrifuge drum is provided with a distributor compartment 30 to which the blood plasma is supplied through a central stationary inlet pipe 31. Associated with the distributor compartment 30 there is a collection chamber 32 and a short filler pipe 33 which engages in the short charging pipe 18 of the synthetic plastics material container 13. A short pipe 34 engages in the top opening 20 of the discharge channel 19 and it is through said pipe 34 that the extracted liquid phase passes into the skimming chamber 35.

In the illustrated example of embodiment (Fig. 2), the base plate 10 is provided with an annular flange 36 which supports the cylindrical jacket 23. The annular flange 36 has apertures 37 in the region(s) of the connection channel(s) 15 which are in alignment with the apertures 38 in the cylindrical jacket 23. These apertures are filled with a moulded component 39 which forms an integral structural unit with the synthetic plastics material containers 13, 14 and connection channel 15.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS :

1. Flow-through centrifuge, in particular for the production of proteins from human blood plasma, with a cylindrical centrifuge drum which contains ~~a plurality of~~ concentrically-arranged chambers interconnected at their base regions, into which the blood plasma, or the like, is introduced into the inner region of said chambers and a liquid phase is drawn off continuously from the outer region, wherein the centrifuge drum contains concentrically-arranged annular-shaped or circular-segment-shaped chambers, consisting of synthetic plastics material containers interconnected at their base regions by means of at least one channel, where the synthetic plastics material container(s) nearest to the axis of rotation of the centrifuge drum has/have a charging pipe and the synthetic plastics material container(s) in the outer region of the centrifuge drum has/have a discharge channel at the top, and the outer surfaces of the synthetic plastics material container(s), of the ~~inter~~ connection channel(s), of the discharge channel(s) and of the charging pipe(s) are supported against the inner surface of the wall of the centrifuge drum and against ~~the~~ moulded components which can be inserted into, and removed from, the centrifuge drum.

2. The flow-through centrifuge according to Claim 1, wherein the connection channel between an inner and an outer synthetic plastics material container is securely attached to said containers.

3. The flow-through centrifuge according to Claim 2, wherein the connection channel forms an integral unit with the inner container, passes underneath the base of said inner container and is securely attached to said base by means of a longitudinal rib.

4. The flow-through centrifuge according to any one of Claims 1 to 3, wherein the centrifuge drum is filled with circular-segment-shaped synthetic plastics material containers of which

the inner and outer associated containers that are connected at the base region by means of the connection channel form an integral structural unit.

5. The flow-through centrifuge according to Claim 4, wherein a cylindrical jacket is located between the inner circular-segment-shaped container and the outer circular-segment-shaped container.

6. The flow-through centrifuge according to Claim 3 or 4, wherein beneath the base of the inner container(s) there is one of said moulded components which is provided with one or more recesses to accommodate the said connection channel as required and at least one other of said moulded components is disposed within the portion of the recess adjacent to the floor of the inner container(s).

7. The flow-through centrifuge according to Claim 1, wherein two of said moulded components are disposed between the upper cover plate of the inner synthetic plastics material container(s) and the cover lid of the centrifuge drum to fill the space between said upper cover plate and said cover lid and the discharge channel(s) of the outer container(s) is/are embedded in said moulded components.

8. The flow-through centrifuge according to Claim 1, wherein the adjacent walls of the pairs of synthetic plastics material containers are in direct contact with each other.

9. The flow-through centrifuge according to Claim 1, wherein the boundary wall of the synthetic plastics material container(s) facing towards the axis of rotation of the centrifuge drum is supported on an insertion component which delimits the filling space of the centrifuge drum towards the axis of rotation and towards the bottom of said centrifuge drum.

10. The flow-through centrifuge according to Claim 9, wherein the insertion component has a base plate consisting of two plate components which provide support for the base(s) of the synthetic plastics material container(s) and one or more

moulded components which are disposed beneath the base of the synthetic plastics material container(s).

11. The flow-through centrifuge according to Claim 10, wherein the base plate is provided with an annular flange which supports a cylindrical jacket and said flange has apertures in the region(s) of the connection channel(s) which are in alignment with the apertures in the cylindrical jacket and these apertures are filled with a moulded component which forms an integral structural unit with the synthetic plastics material containers and the connection channel.

12. The flow-through centrifuge according to any one of the foregoing Claims, wherein the moulded components are fabricated from synthetic plastics material.

13. The flow-through centrifuge according to Claim 1, wherein associated with a distributor compartment there is a collection chamber and a short filler pipe which engages in a short charging pipe of the inner synthetic plastics material container.

DATED THIS 17TH DAY OF MAY 1988
WESTFALIA SEPARATOR AG
By its Patent Attorneys:
CLEMENT HACK & CO.
Fellows Institute of Patent
Attorneys of Australia

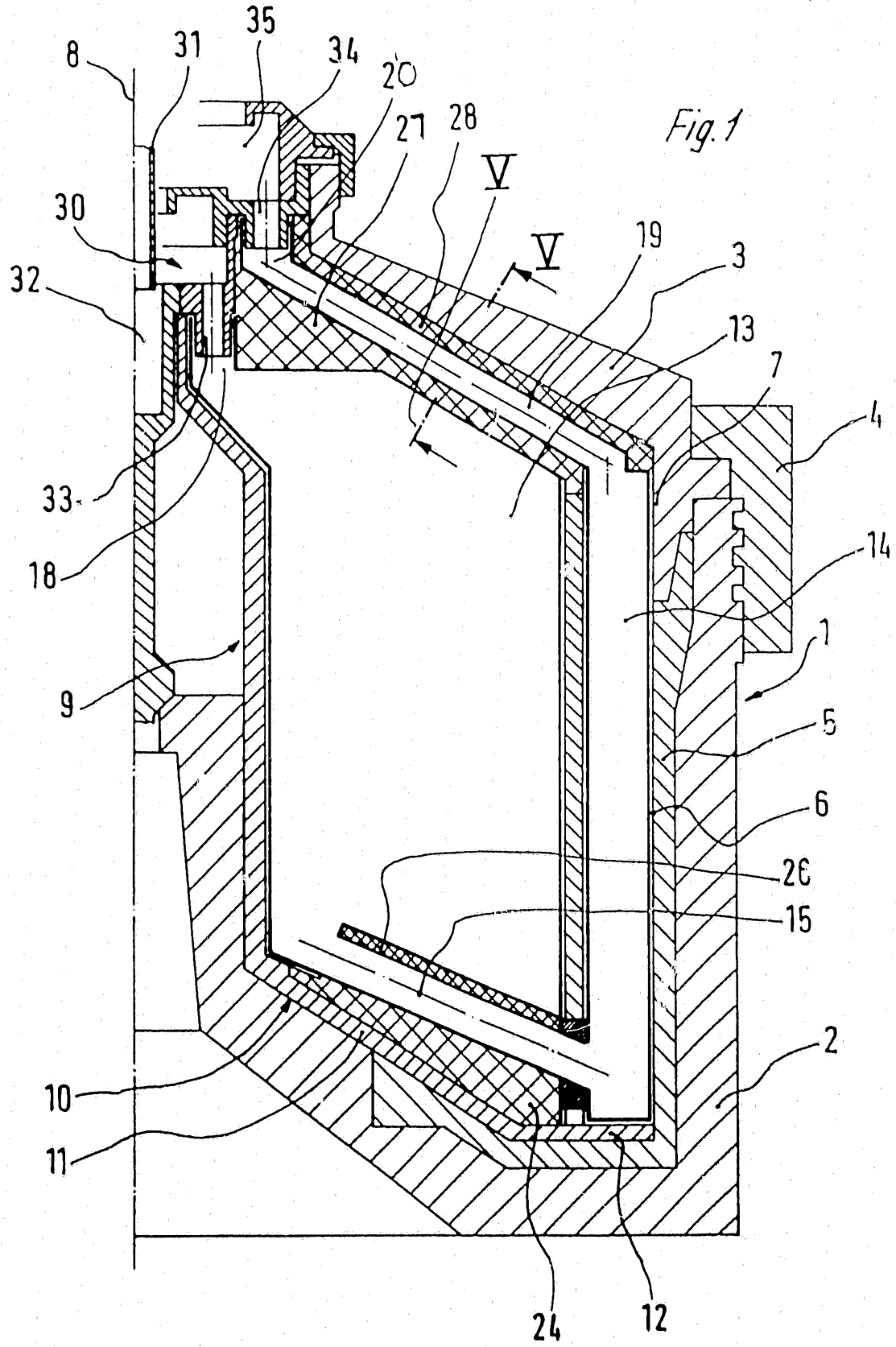


Fig. 1

Fig. 2

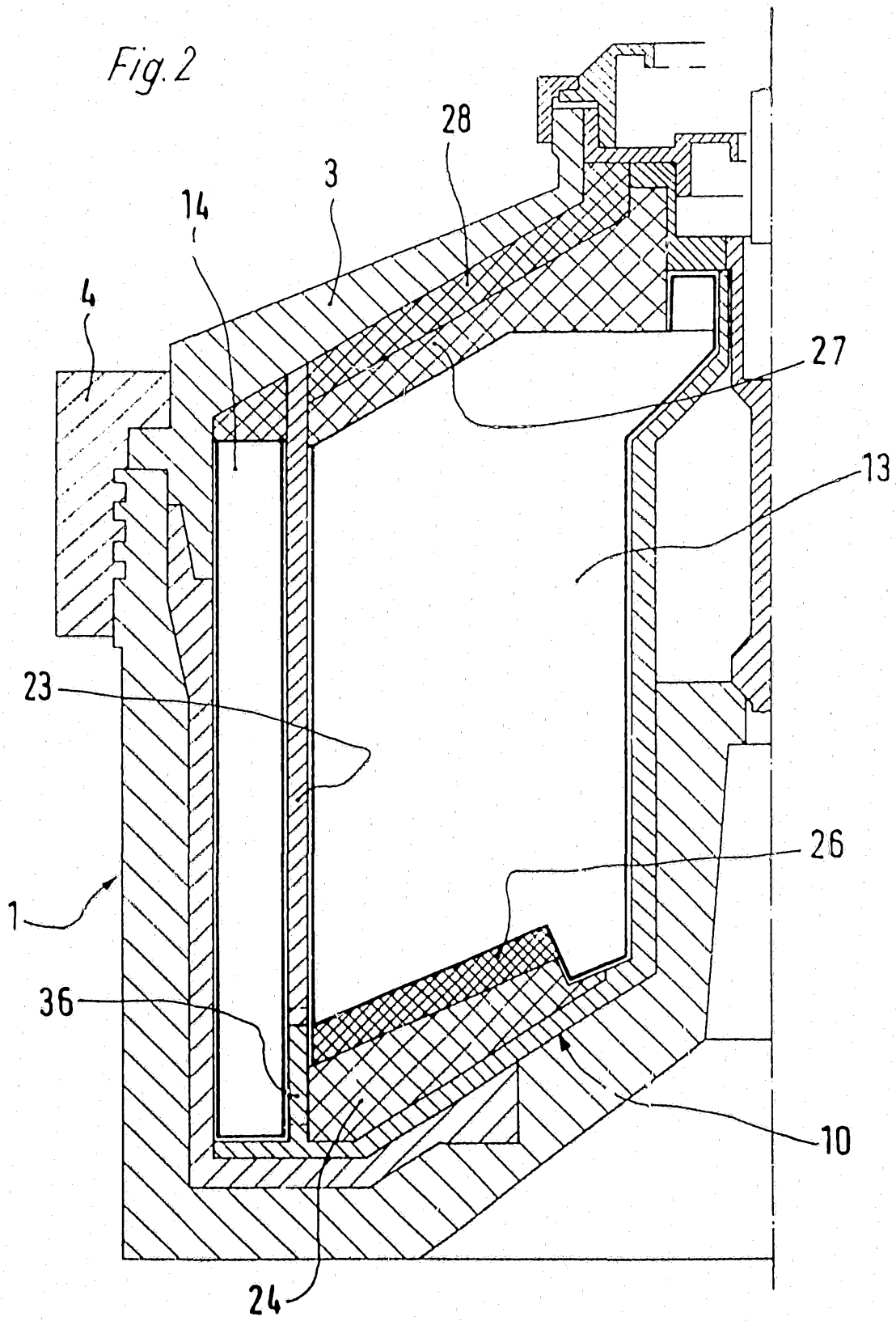
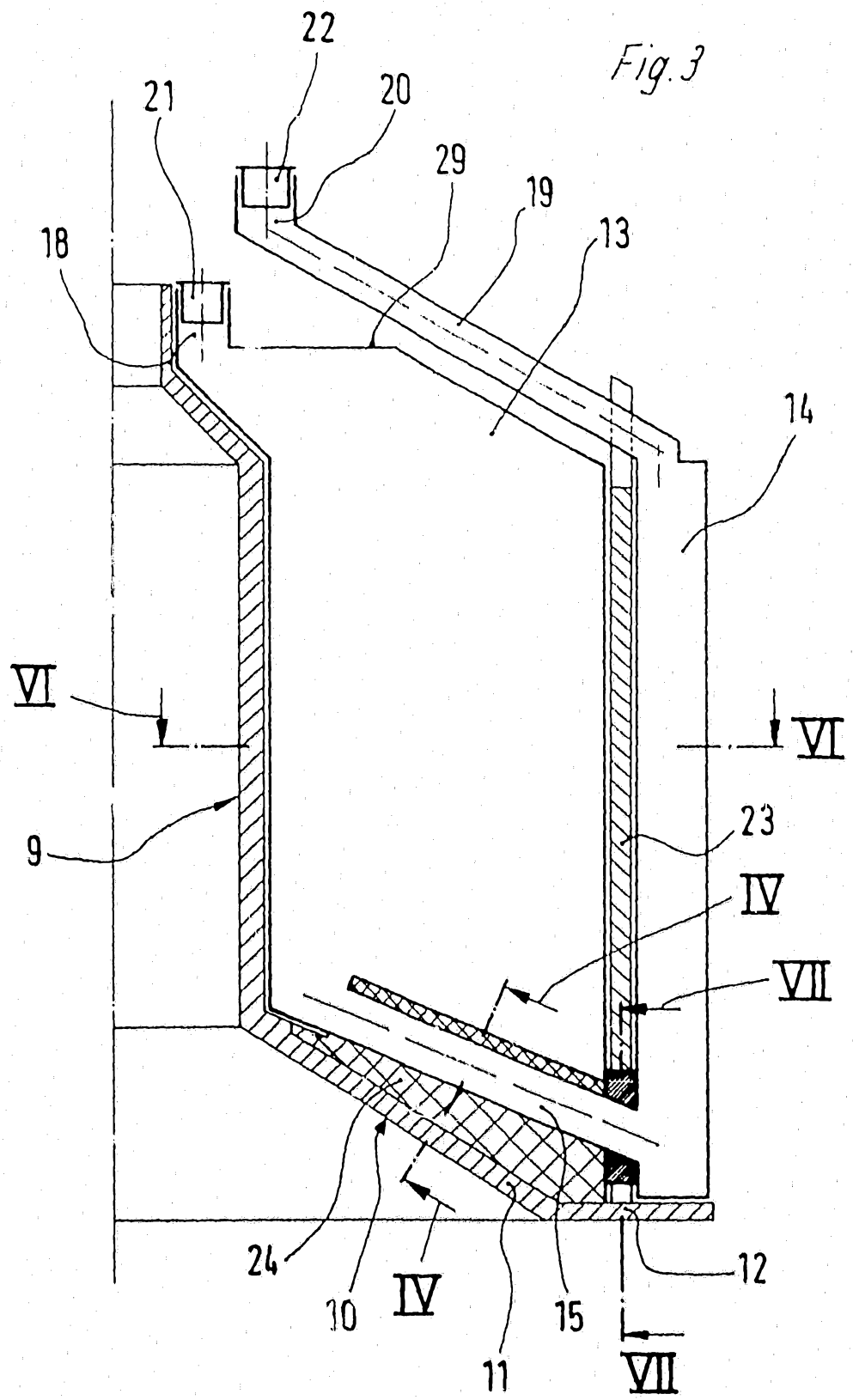


Fig. 3



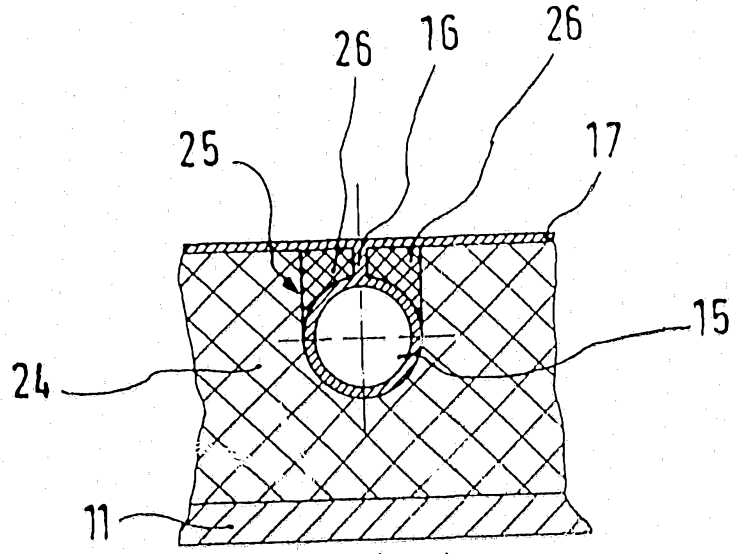


Fig. 4

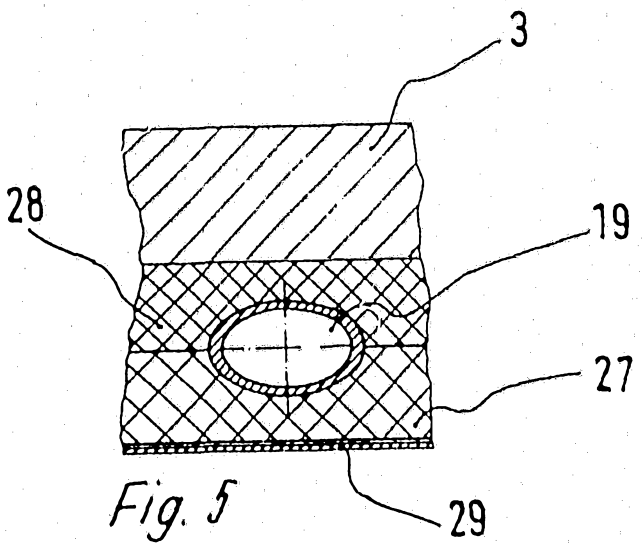
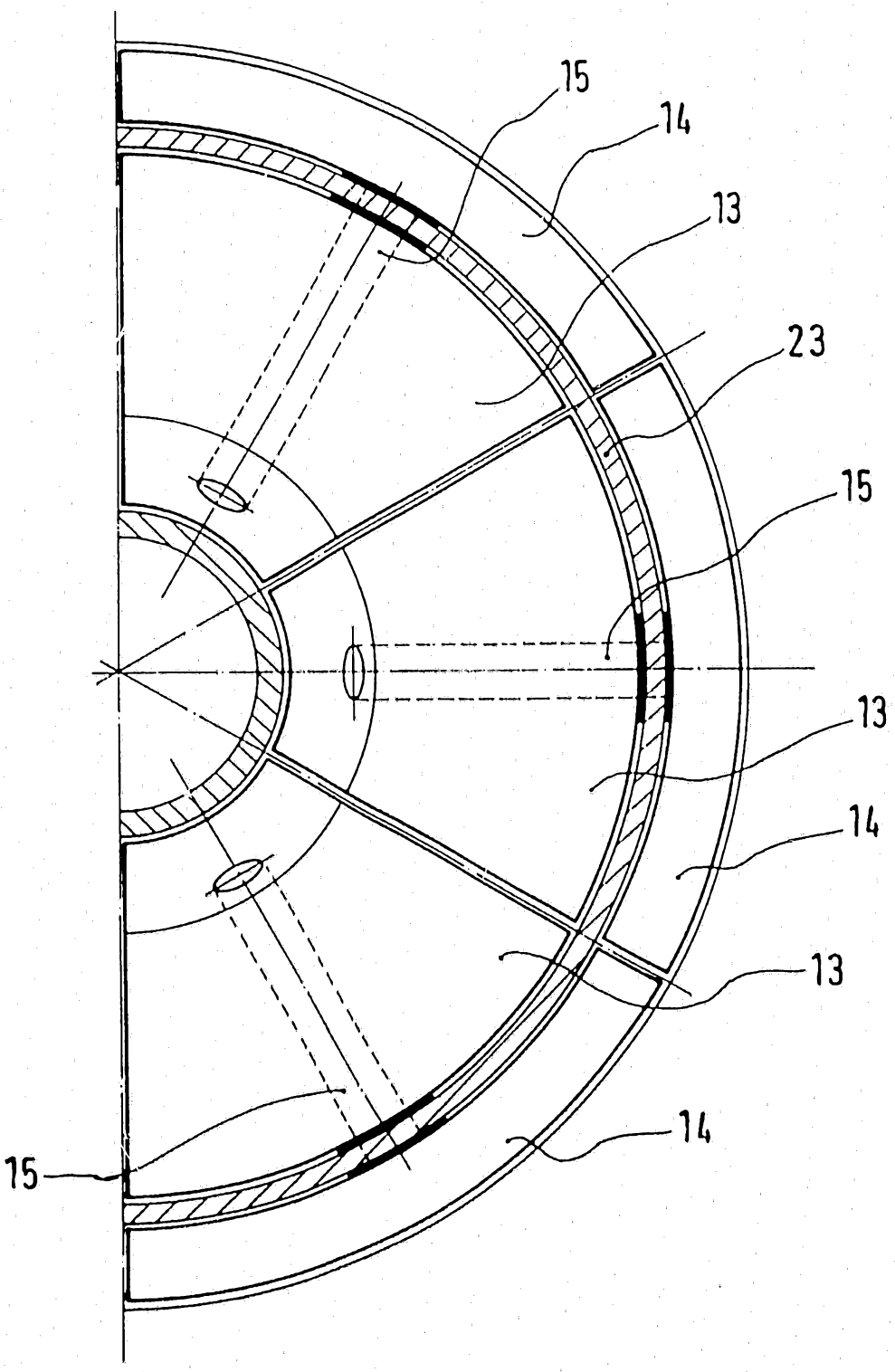


Fig. 5

Fig. 6



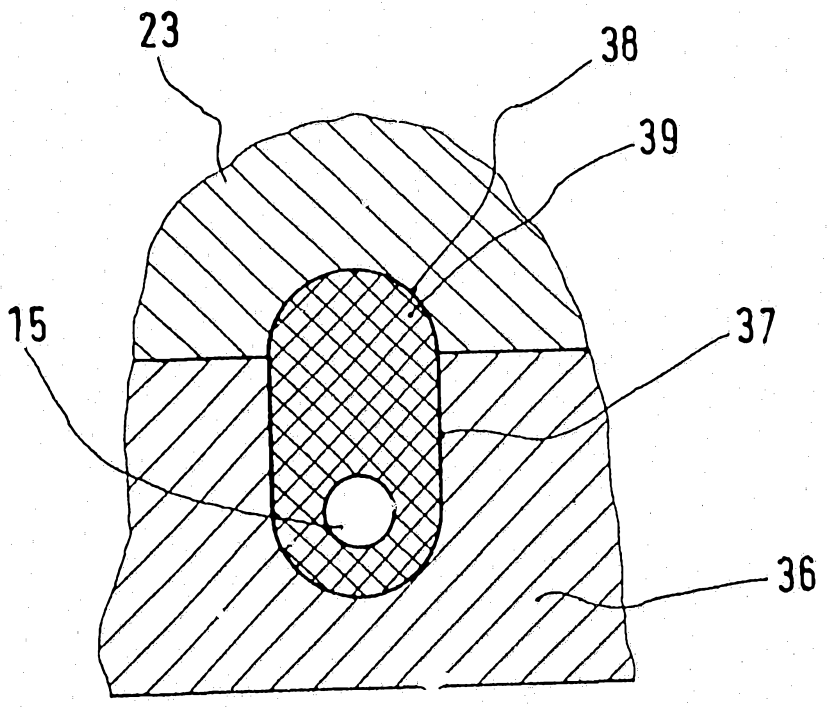


Fig. 7