

(19) **DANMARK**



Patent- og
Varemærkestyrelsen

(12)

Oversættelse af europæisk patentskrift

(10) **DK/EP 3402869 T3**

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- (51) Int.Cl.: **C 12 M 1/00 (2006.01)** **C 12 M 3/00 (2006.01)**
- (45) Oversættelsen bekendtgjort den: **2022-01-10**
- (80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2021-12-01**
- (86) Europæisk ansøgning nr.: **16790877.1**
- (86) Europæisk indleveringsdag: **2016-10-21**
- (87) Den europæiske ansøgnings publiceringsdag: **2018-11-21**
- (86) International ansøgning nr.: **EP2016001748**
- (87) Internationalt publikationsnr.: **WO2017157404**
- (30) Prioritet: **2016-03-15 DE 102016003136**
- (84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**
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- (54) Benævnelse: **ANORDNING OG FREMGANGSMÅDE TIL OPTAGELSE AF EN ENGANGSBEHOLDER**
- (56) Fremdragne publikationer:
EP-A1- 2 725 092
WO-A1-2006/032084
WO-A1-2015/039034
DE-A1- 4 028 871
DE-A1-102005 006 055
DE-A1-102010 007 559
DE-A1-102010 018 678
DE-U1-202007 013 406
US-A1- 2011 310 696

DEVICE AND METHOD FOR ACCOMMODATING A DISPOSABLE CONTAINERDescription

5 [0001] The invention relates to a device and a method for accommodating a disposable container.

[0002] Bioreactors and pallet tanks serve as devices for accommodating, storing and/or cultivating biological media, such as fluids and/or cell cultures for example. Biological media can be provided in disposable containers, which can enclose a volume of a few
10 liters up to several hundred liters. The biological media are inserted, within a disposable container, into the bioreactor, in which they are tempered to a predeterminable temperature over a predetermined time period of usually several hours. Furthermore, various analyses can be carried out on the biological medium in such a bioreactor.

[0003] A bioreactor may be handled under clean room conditions, and therefore
15 particularly high quality assurance requirements are placed on the bioreactor.

[0004] In so-called single-use processes, the disposable containers used may in particular be disposable pouches. Both in the upstream and in the downstream, the use of disposable containers proves to save time and costs and to be reliable in terms of process technology. While experience with cell culture processes and some microbial cultures has
20 already been gained, it has hitherto scarcely been possible to carry out processes using phototrophic organisms such as algae and/or plant cell cultures, in particular for a production scale of more than 50 liters.

[0005] Document US 2011/0310696 A1 relates to a fluid mixing system comprising a support housing having a base and vertical side walls. An opening is formed in one side
25 wall. An elongate frame is fastened to the support housing in an adjacent manner.

[0006] Document WO 2015/039034 A1 relates to a bioreactor support structure for accommodating different bioreactors. The bioreactor support structure includes two or more agitator motors with control systems or a position-adjustable agitator motor, a removable spacer and/or lid, multiple configurations for ports and samples, and multiple
30 exhaust filter heaters.

[0007] Document DE 10 2010 018 678 A1 relates to a bioreactor assembly comprising a bioreactor and an illumination element for illuminating a medium arranged in a reactor interior. The illumination element has an emitting surface, via which electromagnetic

radiation, such as light, is emitted, which is reflected into the reactor interior via at least one end face. With its emitting surface, the illumination element forms a bearing surface or support surface for the bioreactor. The bioreactor assembly is designed as an agitating device, comprising a reactor receptacle that can be caused to vibrate for a bioreactor designed as a container with a transparent wall, the reactor receptacle having a flat illumination element, the emitting surface of which forms a bearing surface or support surface for the bioreactor to be accommodated.

[0008] Document EP 2 725 092 A1 relates to a device for cultivating phototrophic microorganisms in a photobioreactor. A light element is suspended centrally in a cylindrical tank of the photobioreactor.

[0009] Document DE 20 2007 013 406 U1 relates to an illumination device for bioreactors. A first embodiment of the illumination device is configured to be arranged from outside on a transparent cylindrical bioreactor, so that it illuminates the reactor interior through the transparent reactor walls. A second embodiment of the illumination device is configured to be suspended in the interior of a cylindrical bioreactor. In this case, the illumination device emits light in all directions.

[0010] The problem addressed by the invention is that of providing a possibility, of the type mentioned in the introduction, for accommodating a disposable container containing phototrophic organisms, which in particular is suitable for a production scale of more than 50 liters.

[0011] This problem is solved by the subjects of the independent claims. Preferred exemplary embodiments form the subjects of the dependent claims.

[0012] A first aspect relates to a device for accommodating a disposable container having a receptacle with at least one receptacle wall, which limits a receptacle interior of the receptacle for accommodating the disposable container. The device further has a tempering unit for tempering the receptacle wall. An illumination device is arranged at an inside of the receptacle wall tempered by the tempering unit facing the receptacle interior, which is designed to emit light into the receptacle interior of the receptacle.

[0013] The device may be designed as a bioreactor and/or pallet tank, which may be designed to accommodate disposable containers with a volume of approximately 1 liter to approximately 2000 liters, preferably with a volume of approximately 200 liters to approximately 1000 liters. The device may be designed as a system comprising multiple components, in particular with or without a disposable container as an associated

component. The device may in particular be designed to accommodate disposable containers containing a biological medium, such as a fluid, which is to be stored, tempered, cultivated and/or otherwise analyzed in the system over a predetermined period of time. The biological medium may be designed as a cell culture and/or may contain phototrophic organisms.

[0014] The disposable container may be designed as a disposable pouch having flexible pouch walls, in particular having transparent plastic walls. The disposable container may have stirring components in its interior, which can be coupled to a stirring unit of the device in order thus to make it possible to mix the contents of the disposable container.

[0015] The receptacle of the device provides the receptacle interior, which is designed to accommodate the disposable container. The receptacle interior may be designed to accommodate a predeterminable type of disposable container, that is to say for example a disposable container from a predeterminable manufacturer and/or having a predeterminable fill volume. The receptacle wall or walls define the receptacle interior.

The receptacle walls need not fully surround and/or bound the receptacle interior. For instance, the receptacle may have for example a stirring opening, through which a stirring device can be connected to the disposable container arranged in the receptacle interior. Such a stirring device is preferably formed at the upper end of the receptacle. The receptacle may thus be designed in particular without a cover and/or such as to be open at the top.

[0016] In the context of this invention, the terms "top", "bottom", "side", "vertically", "horizontally", "height", "lateral", etc. relate to the Earth's reference system, in which the system or the device is arranged in an operating position.

[0017] The disposable container is preferably inserted into the receptacle in such a way that it rests on a base of the receptacle and is in direct physical contact with the receptacle walls of the receptacle, in particular in contact with the base of the receptacle and/or with the receptacle walls adjoining the base.

[0018] The at least one receptacle wall can be tempered by means of the tempering unit. The tempering unit may temper the receptacle wall to a predeterminable temperature, in particular to a settable temperature. The tempering unit may in particular be designed to cool the receptacle wall. The tempering unit may either be arranged directly at an outside of the receptacle wall that is averted from the receptacle interior, or may be at

least in direct heat exchange with the receptacle wall. The receptacle wall may have a high thermal conductivity, that is to say may for example be metallic.

[0019] The receptacle may have at least one openable and closable door, through which the disposable container can be inserted into the receptacle interior.

5 [0020] Arranged in the receptacle interior is the illumination device, which in an operating position of the device is arranged between the receptacle wall and the disposable container. In the operating position of the device, a disposable container is inserted into the device. The disposable container need not be a constituent part of the device. However, the disposable container may be designed as a constituent part of the device.

10 [0021] The illumination device may be arranged in the receptacle interior in such a way that it is in heat exchange with the tempered receptacle wall. In particular, the illumination device is tempered, for example cooled, by means of the tempering unit. This enables a thermal dissipation of the illumination-induced heat that may be generated during operation of the illumination device. Here, the illumination device does not require
15 its own cooling system, but rather can be tempered or cooled by means of the tempering unit of the device.

[0022] The device is particularly suitable for accommodating disposable containers containing phototrophic organisms or cell cultures. The medium located in the disposable container can be irradiated by means of the light emitted by the illumination device. Here,
20 the walls of the disposable container are preferably designed to be transparent for at least the light wavelength(s) at which the illumination device emits light into the receptacle interior.

[0023] In the context of this invention, the term "light" does not necessarily mean visible light, but rather can relate to electromagnetic radiation with a wavelength of
25 approximately 50 nm to approximately 50 μm . The term thus also encompasses in particular ultraviolet and infrared light. The wavelength or the wavelength range of the light emitted by the illumination device can be adapted to particular requirements of the medium in the disposable container. The illumination device may have one or more light
30 sources, which are oriented in such a way that they emit light in the direction away from the receptacle wall and toward the receptacle interior, in particular in a direction away from the receptacle wall and toward the spatial region in which the disposable pouch is arranged in the operating position, for example toward a center point and/or a central axis of the receptacle interior.

[0024] In the operating position, the illumination device may both directly adjoin the receptacle wall and directly adjoin the disposable container. This proximity between the disposable container and the illumination source enables a particularly efficient radiation of light into the interior of the disposable container, with greatly reduced losses. At the same time, by tempering using the tempering unit, it is possible to avoid an adverse, excessive generation of heat by the illumination device, which otherwise might lead both to damage of the cell cultures and to damage of a plastic wall of the disposable container.

[0025] The device is thus particularly suitable for accommodating disposable containers which have a culture volume for a microbial culture, a cell culture, a culture of cell and/or tissue conglomerates of plant and/or animal cells and/or hybrid forms.

[0026] The device may furthermore have a controller, which serves to control the light emitted by the illumination device. The illumination device may for example emit modulated and/or non-modulated electromagnetic radiation, or also coherent electromagnetic radiation such as laser light for example. The illumination device can be controlled in such a way that it emits a controllable quantity of light during controllable periods of time. The illumination device can in particular also be switched off.

[0027] According to one embodiment, the illumination device has at least one light source, which is arranged at a position of the inside of the receptacle wall which is directly tempered by the tempering unit at an outside of the receptacle wall that is averted from the receptacle interior. In this case, in particular all the light sources of the illumination device may be arranged at positions of the inside of the receptacle wall which are tempered at the outside. This embodiment is particularly efficient since heat generated at the one or more light sources can be very efficiently dissipated in this embodiment. For instance, in this embodiment, the light source of the illumination device is arranged on one side of the receptacle wall, while the tempering unit is arranged on the opposite side of the receptacle wall. In this case, the tempering can act on the light source through the receptacle wall, the light source either being arranged in direct physical contact with the receptacle wall or being spaced apart from the receptacle wall only by a carrier. As the carrier, use may be made of a substrate, in particular a substrate that is thermally conductive at least at certain points. The tempering on the outside of the receptacle wall may take place for example by means of a temperature-control medium, which tempers the receptacle wall on the outside.

[0028] According to one embodiment, the illumination device has a plurality of light sources, which are arranged distributed over at least 50% of the area of the insides of all lateral receptacle walls. By using a plurality of light sources, the light power and/or the number of photons that can be emitted into the receptacle interior is increased. The light sources may for instance be arranged in such a way that light sources are arranged on as many receptacle walls as possible. One aim here may be to achieve substantially uniform illumination over the outer surfaces of the receptacle. In this embodiment, light sources are arranged at least on 50% of the lateral receptacle walls. Here, the lateral receptacle walls are those walls of the receptacle that limit the receptacle interior in a lateral direction. In the case of an upright receptacle that is substantially cylindrical, for example, these are all the walls of the cylinder casing apart from the cylinder base and the cylinder cover. Preferably, the light sources may be arranged on substantially all lateral receptacle walls. Here, "substantially" means that those surfaces of the lateral receptacle walls on which a door and/or a viewing window is arranged can be ignored. In this case, the light sources may be arranged on the receptacle walls substantially from the bottom to the top, in particular from a foot of the receptacle up to an intended fill level.

[0029] According to one embodiment, the illumination device has a plurality of actuatable LEDs as light sources. As a result, both modulated and unmodulated radiation can be emitted. LEDs are suitable as particularly efficient light sources since LEDs generate relatively little heat in relation to the quantity of light emitted, as a result of which the heat generation can be reduced and at the same time the emitted light power can be increased. Furthermore, LEDs can be designed with a small structural height, so that these light sources can be arranged substantially flat on the inside of the receptacle wall, without excessively reducing the volume of the receptacle interior and without forming significant protrusions in the interior of the receptacle, which would hinder insertion of the disposable container.

[0030] According to one embodiment, the illumination device emits at least 90% of the emitted light power with a predetermined wavelength and/or on a predetermined wavelength spectrum between 50 nm and 50 μ m. The illumination device may thus be designed to emit electromagnetic radiation with the predetermined wavelength or on a predetermined wavelength spectrum. In particular, this may be laser light and/or light from LEDs. The predetermined wavelength or the predetermined wavelength spectrum can be adapted to the contents of the disposable container, in particular to wavelengths

that influence the metabolism of the cells located therein. In this case, the illumination device may for example be designed to emit at least 90% of the emitted light power at the predetermined wavelength or on the predetermined wavelength spectrum.

[0031] According to one embodiment, the illumination device is designed to emit light by means of replaceable light sources, which have different emission spectra. For instance, the device can first be used for a culture medium that requires electromagnetic radiation of a first wavelength and/or of a first wavelength spectrum, which is emitted by a first set of light sources of the illumination device. The light sources can subsequently be replaced with light sources that emit predominantly light of a second wavelength and/or of a second wavelength spectrum, which may be suitable for influencing the cell or the metabolism in a different way. The replaceable design of the light sources serves on the one hand to make it possible to replace damaged individual light sources when necessary, and also to vary the emission spectrum of the illumination device, for example by replacing all the light sources with light sources that emit differently. In this embodiment, the illumination device may in particular have a holder, which is arranged and/or fastened in the interior of the receptacle, and may additionally have at least one replaceable carrier, on which the light sources are arranged. These carriers may for example be strip-shaped, it being possible for a plurality of light sources to be arranged on each strip. The carriers, together with the light sources arranged thereon, for example as a subassembly, can be removed from the holder of the illumination device and replaced. The carriers of the light sources can in particular be individually replaced and/or individually fastened to the holder.

[0032] According to one embodiment, an external shape of an outside of the illumination device averted from the receptacle interior is adapted to an internal shape of the inside of the receptacle wall. In this case, therefore, the external shape of the illumination device is designed as a complementary counterpart to the internal shape of the receptacle wall. As such a counterpart, the outer wall of the illumination device nestles closely against the inner wall of the receptacle wall. This improves the heat conduction between the illumination device and the receptacle wall. In this case, a further layer, for example a thermally conductive foil and/or an adhesive, may be arranged between the receptacle wall and the illumination device.

[0033] In one development of this embodiment, the external shape of the illumination device is convex, while the internal shape of the receptacle wall is concave. By way of

example, the receptacle may be designed substantially in the form of an upright cylinder, which has a substantially circular or oval cross-section. The inside of the receptacle is thus concave. The outside of the illumination device is in this case adapted to said concave shape by virtue of said outside itself being convex in the direction toward the inside of the outer receptacle wall. Here, too, the heat conduction between the illumination device and the receptacle wall is increased.

[0034] According to one embodiment, the illumination device is designed to emit light with a light power of up to approximately $3000 \mu\text{mol}/\text{m}^2\text{s}$ to the receptacle interior. An intense generation of heat can occur with such a high emission power. This heat generation is compensated by the tempering unit. Particularly efficient cultivation of biological media can take place by virtue of the high light power.

[0035] According to one embodiment, the illumination device has a plurality of light sources arranged on a strip, wherein the strip is arranged substantially vertically along the receptacle wall. As a result, a plurality of light sources can be arranged on the receptacle wall simultaneously. This is particularly advantageous in the case of round and/or curved receptacle walls, on which vertical strips are arranged as carriers of the light sources. The strips may be designed either as carriers of a plurality of vertically spaced-apart light sources, or as carriers of in each case one elongate light source, for example an elongate and/or rod-shaped light source. A plurality of such strips can be arranged in the receptacle along the curvature of the receptacle wall. The strips can be arranged at a position in the receptacle at which the receptacle wall is curved only one-dimensionally, that is to say has a curvature only in one direction of extension. The receptacle wall may be of non-curved form in a direction perpendicular to the direction of curvature. The strips can thus be arranged in the receptacle in such a way that they extend along the receptacle wall in said non-curved direction of extension, in which the receptacle wall is substantially straight. The strips may be designed as a carrier and/or substrate for the light sources. Furthermore, the strips may be designed as thermal bridges between the light sources and the receptacle wall and/or may have such thermal bridges. A thermally conductive foil and/or an adhesive layer may additionally be arranged between the receptacle wall and the strip.

[0036] According to one embodiment, in an operating position of the device, the disposable container is in physical contact with the illumination device. This means that the illumination device is arranged in such a way that, in the operating position of the

device, in which the disposable container is inserted into the receptacle, the disposable container bears directly against the illumination device. This makes it possible for the contents of the disposable container to be illuminated in a particularly efficient manner or with low losses.

5 [0037] According to one embodiment, an in particular transparent resin layer and/or lacquer layer with a thickness of up approximately 1 mm is arranged above the light sources of the illumination device. Sharp edges of the illumination sources, which could damage the disposable container, can be smoothed by virtue of the resin layer and/or lacquer layer. Furthermore, by virtue of the resin layer and/or lacquer layer, protrusions
10 can be reduced in order to smooth the receptacle walls that are narrowed by the illumination device. The resin used may be an epoxy resin. The resin layer and/or lacquer layer is in particular transparent for the one or more wavelengths emitted by the illumination device. The resin layer and/or lacquer layer on the light sources preferably has a maximum thickness of approximately half a millimeter.

15 [0038] According to one embodiment, the illumination device has at least one thermal bridge between light sources of the illumination device and the tempered receptacle wall. Such thermal bridges improve the dissipation of heat from the light sources via the receptacle wall.

[0039] According to one embodiment, the tempering unit is designed to produce a heat
20 dissipation capacity of up to at least 8 kW, preferably at least 10 kW, particularly preferably up to at least 20 kW. Such a strong heat dissipation capacity of the tempering unit can allow almost equally as much heat to be generated when illuminating the contents of the disposable container. This embodiment therefore enables a particularly bright, strong and highly powerful illumination of a biological medium.

25 [0040] According to one embodiment, the receptacle wall is designed at least partially as a temperature control hollow wall. In this case, the tempering unit is designed to temper the receptacle interior with a temperature-control medium arranged in the temperature control hollow wall.

[0041] The temperature control hollow wall is formed in the receptacle walls of the
30 receptacle and may be designed as part of a closed temperature control circuit. The temperature control hollow wall may be designed as part of the receptacle walls. The temperature control hollow wall may be designed as a double wall, comprising a temperature control inner wall and a temperature control outer wall. In this case, the

temperature control inner wall may face the receptacle interior of the receptacle, and the temperature control outer wall may be averted from the receptacle interior.

[0042] The temperature-control medium is formed and arranged in a cavity between the temperature control inner wall and the temperature control outer wall. The tempering unit tempers the receptacle interior, in particular the contents of the disposable container and/or the illumination device, by means of the temperature-control medium. To this end, a controller may be provided, by means of which the temperature and/or the pressure of the temperature-control medium in the temperature control hollow wall can be controlled and/or set. The controller may be designed as part of the tempering unit.

The tempering unit may thus include the controller and/or the temperature-control medium arranged in the temperature control hollow wall.

[0043] The interior of the temperature control hollow wall may be designed as a free cavity or with at least one flow-guiding element for guiding the flow of the temperature-control medium through the temperature control hollow wall.

[0044] The two walls of the temperature control hollow wall, that is to say a temperature control inner wall and a temperature control outer wall, may be at a distance of a few millimeters from one another and may for example be spaced apart from one another by between 5 mm and 40 mm.

[0045] The inside of the temperature control hollow wall, that is to say the temperature control inner wall facing the receptacle interior, may be designed such as to directly adjoin the receptacle interior and/or the illumination device. In other words, no other element of the device may be formed between the receptacle interior and the temperature control hollow wall. In other words, the temperature control hollow wall may thus at least partially directly surround and/or limit the receptacle interior and/or the illumination device.

[0046] Here, "at least partially surround" means that the temperature control hollow wall surrounds the receptacle interior over at least 40%, preferably over at least 60%, particularly preferably over at least 70%, particularly preferably over at least 80%, at its outer surface. In particular, this may mean that the receptacle interior is completely surrounded and/or limited and/or tempered by the temperature control hollow wall apart from an upper cover region and possible viewing window and/or a door opening.

[0047] The temperature control hollow wall may be designed as an item of pressure equipment in accordance with the PED guideline ("Pressure Equipment Directive" for the

European Economic Area) and/or in accordance with the ASME guideline ("American Society of Mechanical Engineers" for the North American Economic Zone), in particular as an item of pressure equipment at approximately 6 barg.

[0048] In general, the temperature-control medium may be designed as a fluid, such as a liquid or a gas for example, which is located within a closed temperature control circuit. The temperature control hollow wall of the receptacle constitutes at least a part of this temperature control circuit.

[0049] According to one embodiment, the receptacle is designed to accommodate disposable containers with a volume of at least approximately 50 liters, preferably at least 1000 liters, particularly preferably at least approximately 2000 liters. In known devices, it has hitherto not been possible for disposable containers with such large volumes to be efficiently illuminated and cultivated. Only the particularly efficient illumination and cooling by the device according to the invention enables the application of light required for this. It must be noted here that, although the light emitted by the illumination device under some circumstances does not penetrate all the way to the center of the medium in the disposable container, it is nevertheless possible for adequately uniform illumination of the medium to be provided by virtue of the medium being mixed by means of a stirring device.

[0050] The device can satisfy the GMP guidelines. The GMP guidelines, which is an abbreviation for "Good Manufacturing Practice", are guidelines concerning requirements with regard to hygiene, premises, equipment, documentation and inspections in the pharmaceutical sector. The device can be designed such as to satisfy the requirements stated in the GMP guidelines, in particular the requirements with regard to sterility.

[0051] A second aspect relates to a method for accommodating a disposable container having the steps:

- accommodating a disposable container in a receptacle interior of a receptacle having at least one receptacle wall, which limits the receptacle interior;
- illuminating the disposable container arranged in the receptacle interior by means of an illumination device, which is arranged on an inside of the receptacle wall facing the receptacle interior; and
- tempering the receptacle wall.

[0052] The method can in particular be carried out using the device according to the first aspect. Everything that has been stated in connection with the device therefore applies also to the method according to the second aspect, and vice versa.

[0053] The invention will be described in greater detail below on the basis of exemplary embodiments shown in figures. Identical reference signs denote identical or similar components of the embodiments. Individual features of the embodiments can be combined with other embodiments. In the figures:

- Fig. 1 shows, in a perspective illustration, a device for accommodating a disposable pouch;
- Fig. 2A shows, in a first side view, a device for accommodating a disposable pouch;
- Fig. 2B shows, in a second side view, a device for accommodating a disposable pouch;
- Fig. 3 shows, in a perspective illustration, a vertical sectional view through a device for accommodating a disposable pouch;
- Fig. 4 shows, in a schematic illustration, a device for accommodating a disposable pouch, with an illumination device;
- Fig. 5 shows a schematically illustrated cross-section through an illumination device for a receptacle;
- Fig. 6A shows a schematically illustrated cross-section through part of an illumination carrier; and
- Fig. 6B shows a schematically illustrated cross-section through part of an illumination carrier.

[0054] Fig. 1 shows, in a perspective illustration, a device 1 for accommodating a disposable pouch as a disposable container. The device 1 shown in the figures may be designed as a constituent part of a system for accommodating a disposable pouch.

[0055] The device 1 has a receptacle 10, which has substantially the shape of a vertically arranged cylinder, that is to say the cylinder axis of which is arranged substantially vertically. The receptacle 10 has a receptacle interior, into which a disposable pouch can be inserted, which disposable pouch may contain for example a biological medium. The biological medium in the disposable pouch is stored and/or illuminated in the receptacle interior of the receptacle 10 over a predeterminable period of time. While the disposable pouch containing the biological medium is located in the interior of the receptacle 10,

various reactions may occur with or on the biological medium. The device 1 can thus also be designed as a bioreactor.

[0056] To observe the biological medium, one or more viewing windows are formed in the side walls, through which it is possible to look from outside through the receptacle wall into the receptacle interior of the receptacle 10 in order to observe the biological medium. To this end, the device 1 has two base viewing windows 12 in the lower third, as well as a door viewing window 32. The base viewing windows 12 are substantially in the form of an elongate oval, the long oval axis of which is oriented substantially horizontally along the curved cylinder outer wall of the receptacle 10. The door viewing window 32 is substantially in the form of an elongate rectangle, the longer sides thereof being oriented substantially vertically and being formed in the middle of a single-leaf door 30 in the receptacle wall of the receptacle 10.

[0057] Figs. 2A and 2B, together with Fig. 1, show different views of the device 1. For example, Fig. 2B shows a frontal side view looking toward the single-leaf door 30. The single-leaf door 30 extends in width, that is to say in the horizontal direction, approximately over a cylinder segment of the receptacle 10 of approximately 100°. In the horizontal direction, the single-leaf door 30 extends from two door hinges 34 along the cylinder casing to a door handle 35 at the opposite end of the door. The single-leaf door 30 is formed substantially in the upper two-thirds of the receptacle 10, while the lower third of the receptacle 10 is designed substantially in the form of a rigid base shell, which itself is not designed to be openable. The single-leaf door 30 is rotatable about the door hinges 34 and is thus openable. When the single-leaf door 30 is open, a door opening is formed at a lateral position in the receptacle 10, through which access is provided to the receptacle interior of the receptacle 10. Through the door opening, for example, the disposable pouch can be inserted into the receptacle interior of the receptacle 10 from a lateral direction, that is to say substantially in a horizontal movement direction.

[0058] The device 1 is mounted in a rollable manner on castors 18, on which the device can be pushed in a rolling manner through a room. In addition to the castors 18, the device 1 may have fixing feet 19 at the lower end, which serve for fixing and correctly orienting the device 1, for example on uneven floors.

[0059] The receptacle 10 is designed to be open at the top. In place of a cylinder cover, the receptacle 10 has a stirring opening. Formed above the receptacle 10, which is open at the top, is a stirring device 14, via which a stirring rod can be connected to the

disposable pouch, through the stirring opening, so that the interior of the disposable pouch can be thoroughly mixed. The stirring rod can be arranged in the interior of the disposable pouch and can be connected to the stirring device 14 via a coupling or clutch. The stirring device 14 is formed centrally above the receptacle 10 and is supported by a carrier bridge, which bears against an upper edge of the receptacle 10 on opposite side walls of the receptacle 10.

[0060] Fig. 2A shows a side view looking toward one of the two laterally arranged cable guides 13. The second of the two cable guides 13 is arranged on the opposite outer wall of the receptacle 10. The side view of Fig. 2A shows the device 1 in a position rotated through 90° in relation to the side view of Fig. 2B.

[0061] Fig. 3 shows, in a perspective illustration, a view of a vertical section through the device 1; an illumination device is not shown. Fig. 3 shows for example a disposable pouch 44 as the disposable container, more specifically a section through said disposable pouch 44, which is arranged in the receptacle interior of the receptacle 10. A biological medium 42 is arranged in the receptacle interior of the receptacle 10 and at the same time also in the interior of the disposable pouch 44, the biological medium being filled up to the height of a predetermined fill level 40. The biological medium 42 extends from the base of the receptacle 10 to the fill level 40 and thus fills the entire internal volume of the receptacle 10 up to the fill level 40, minus the volume of the walls of the disposable pouch 44 and of an illumination device (not shown).

[0062] The disposable pouch 44 is held in shape by a receptacle wall 16 of the receptacle 10, which can extend upward from the rounded base of the receptacle 10 to beyond the fill level 40. At least along the upper half of the receptacle 10, preferably along the upper two-thirds thereof, a receptacle wall 16 can extend upward in a substantially vertical direction.

[0063] The receptacle walls 16 of the receptacle 10 are designed at least in part as a temperature control hollow wall 20, in which a temperature-control medium flows (not shown in the figures). The temperature-control medium may be regulated to a low pressure of below 0.5 bar, or to a pressure of up to approximately 6 barg. The temperature control hollow wall 20 may extend around the entire base or the entire base shell of the receptacle 10 and upward along the receptacle walls 16 from the receptacle base to above the fill level 40 up to a predeterminable tempering height. The tempering height may be arranged substantially 1 cm to 20 cm vertically above the fill level 40.

[0064] The biological medium 42 may be in thermal contact with the temperature control hollow wall 20, from which it is separated only by the thin pouch wall of the disposable pouch 44 and at least in part by an illumination device (not shown). The biological medium 42 and/or the illumination device can be regulated to a predeterminable temperature by way of the temperature-control medium.

[0065] The device 1 may in particular be designed and provided for tempering the receptacle interior and the illumination device arranged therein to a predeterminable setpoint temperature of approximately 0°C to approximately 80°C, preferably of approximately 20°C to approximately 40°C.

[0066] The temperature control hollow wall 20 almost completely surrounds the receptacle interior of the receptacle 10 up to a point above the fill level 40. In the exemplary embodiments shown in the figures, “almost completely surrounds” means that the temperature control hollow wall 20 surrounds the receptacle interior completely up to the tempering height apart from at those positions at which the possibly provided base viewing windows 12 are arranged and at which the at least one single-leaf door 30 is arranged. A pane of glass may be arranged at the positions of the base viewing windows 12, which provides a view of the receptacle interior and in particular of the biological medium 42 located in the receptacle 10 (and possibly a corresponding blackout means without tempering). At the position of the single-leaf door 30, an aperture in the form of the door opening 36 is located in the temperature control hollow wall 20. In an alternative embodiment, a temperature control hollow wall may also be formed on the inside of the single-leaf door 30, said temperature control hollow wall being supplied with the temperature-control medium via tempering lines arranged on the door hinges 34.

[0067] In general, “almost completely surrounds” can mean that the temperature control hollow wall 20 completely surrounds the receptacle interior up to the tempering height apart from at a certain few predetermined positions. Said certain few positions may be the positions at which viewing windows are arranged in the receptacle wall of the receptacle 10, and possibly at which the single-leaf door 30 is arranged. In general, the temperature control hollow wall 20 does not limit the receptacle interior at its upper end.

[0068] The temperature control hollow wall 20 may be surrounded on its outside, that is to say on the side averted from the receptacle interior, by an insulating hollow wall, in which insulation is located. The insulating hollow wall may surround the receptacle 10 almost completely from the base of the receptacle 10 up to the upper end of the

receptacle wall 16 (in this regard, see also Fig. 3). The insulating hollow wall insulates both the receptacle interior and in particular the temperature control hollow wall 20 toward the outside. The insulation arranged in the insulating hollow wall enables an inwardly directed tempering by means of the temperature-control medium toward the receptacle interior and/or the illumination device, which increases the energy efficiency of the device 1.

[0069] Tempering lines may be connected to the interior of the temperature control hollow wall 20. The device 1 may furthermore have ports and/or insulating lines for providing a vacuum in the insulating hollow wall, but these are not shown in the figures.

[0070] The tempering height may surpass both the predetermined fill level 40 and also the area where the disposable pouch 44 makes contact with the receptacle walls 16 of the receptacle 10.

[0071] The disposable pouch 44 is emptied after use, for example via an outlet arranged below the device 1, and can then be disposed of entirely. By using the disposable pouch 44 in a single-use process, cleaning of the device 1 can be eliminated, or can take place much more quickly.

[0072] A collecting trough 15 can serve as a collecting element if biological medium should escape from the device 1, for example due to a leak in the disposable pouch.

[0073] Air, a vacuum, an insulating wool, a glass wool, a rock wool or a similar insulating material can be used as insulation in the insulating hollow wall.

[0074] In the interior of the temperature control hollow wall 20, the device 1 has as few thermal bridges as possible, that is to say for example continuous metal connections from the receptacle interior to the exterior space, which would slow the tempering of the receptacle interior. The device 1 may have only statically necessary and/or statically required thermal bridges.

[0075] The temperature-control medium is located inside a closed tempering system, which includes the interior of the temperature control hollow wall 20. The temperature of the temperature-control medium can be regulated and/or controlled by way of an internal, electrically operated heating device, and optionally or alternatively by way of an external heat exchanger. Both a cooling and a heating of the temperature-control medium can take place by way of the external heat exchanger, independently of the internal electric heating device of the tempering system.

[0076] Fig. 4 shows, in a schematic illustration, a device 1 with the receptacle 10, in which a multi-part illumination device 50 is arranged. The illumination device 50 has a first, upper illumination unit 51 and a second, lower illumination unit 52. In general, the illumination device 50 may have a plurality of illumination units 51, 52, which may for example be arranged one above the other, as in the exemplary embodiment shown.

[0077] Fig. 4 shows a schematic illustration of the device, in which in particular the tempering unit and the double-walled receptacle wall described with reference to the foregoing figures are not shown. However, the device 1 can have all the elements of the device described with reference to the foregoing figures.

[0078] The illumination device 50 is arranged in the interior of the receptacle 10. The upper illumination unit 51 is arranged in an upper part of the receptacle 10, while the lower illumination unit 52 is arranged in a lower part of the receptacle 10, for example in the interior of a base shell of the receptacle 10. The upper illumination unit 51 is arranged in the upper part of the receptacle 10, at which the single-leaf door 30 for the insertion of the disposable container is also arranged (see for example Fig. 1). The upper illumination unit 51 may be substantially ring-shaped, the ring being arranged in the interior of the receptacle 10 along the circumference and thus along the inner side of the receptacle wall 16. Here, the center point of the ring of the upper illumination unit 51 substantially coincides with the cylinder axis of the receptacle 10.

[0079] Similarly, the lower illumination unit 52 is also substantially ring-shaped, namely along the inside of the lower part of the receptacle 10. The center point of the ring of the lower illumination unit 52 also lies substantially on the cylinder axis of the receptacle 10.

[0080] The upper illumination unit 51 has a plurality of upper illumination carriers 53, which are substantially rod-shaped and/or strip-shaped. The upper illumination carriers 53 are oriented substantially parallel to one another and are designed as vertically arranged strips. The upper illumination carriers 53 can each carry one or more light sources, which emit light into the receptacle interior of the receptacle 10.

[0081] Similarly, the lower illumination unit 52 also has a plurality of lower illumination carriers 54. The lower illumination carriers 54 are substantially rod-shaped and/or strip-shaped and are arranged in a substantially vertical direction along the inside of the receptacle 10. Both the upper illumination carriers 53 and the lower illumination carriers 54 serve to carry light sources of the illumination device 50. The strip width of the illumination carriers 53 and 54 in the horizontal direction is significantly smaller than the

strip length in the vertical direction. By virtue of this arrangement, the strip-shaped illumination carriers 53 and 54 can be adapted particularly favorably and easily to the round cylinder inner wall of the receptacle 10.

[0082] In the exemplary embodiment shown, the lower illumination carriers 54 have a smaller vertical size than the upper illumination carriers 53. The vertical size of the respective illumination carriers 53 and 54 may depend on the vertical height available in the interior of the respective part of the receptacle 10. For instance, the upper part of the receptacle 10, in which the upper illumination unit 51 is arranged, is taller than the lower part of the receptacle 10, in which the lower illumination unit 52 is arranged. In other exemplary embodiments, this may be reversed, or else the upper and lower illumination carriers 53 and 54 may be of substantially equal length.

[0083] Fig. 5 shows a highly schematic horizontal cross-section through the first, upper illumination unit 51. The upper illumination unit 51 is designed and intended to be inserted into the receptacle interior of the receptacle 10. In the horizontal cross-section, the receptacle 10 has a substantially circular receptacle wall 16. As stated above, this receptacle wall 16 may be designed as a temperature control hollow wall 20.

[0084] As shown in Fig. 5, the cross-sectional shape of the upper illumination unit 51 is adapted to the cross-section through the upper part of the receptacle 10. For instance, both the receptacle 10 and the upper illumination unit 51 have a substantially circular shape in the horizontal cross-section, the two circle diameters being of approximately equal size.

[0085] The upper illumination unit 51 has a plurality of curved, upper illumination carriers 53. Each of the upper illumination carriers 53 has an outwardly convex curvature, which approximately corresponds to the inwardly concave curvature of the inside of the receptacle wall 16. The upper illumination carriers 53 are arranged along the inside of the receptacle wall 16 over an angle segment of in each case almost 30°. The inner side of the receptacle wall 16 can thus be almost completely covered along the cylinder casing by the twelve illumination carriers 53 shown in Fig. 5. Together, the upper illumination carriers 53 form the upper illumination unit 51, which is ring-shaped in cross-section.

[0086] The lower part of Fig. 5 shows part of the cross-section on an enlarged scale, this part being marked by a dash-dotted circle in the upper part of Fig. 5.

[0087] This enlarged cross-section shows that the individual upper illumination carriers 53 are curved in horizontal cross-section. The illumination carriers 53 may have circuit

boards 56 (in this regard, see also Figs. 6A and 6B) for actuating the light sources, which circuit boards are usually initially produced without any curvature. The circuit boards 56 can likewise be arranged in a curved manner on the upper illumination carriers 53. To avoid damage to the circuit boards 56, the curvature of the circuit boards 56 out of the planar shape is as slight as possible. The upper and lower illumination carriers 53, 54 are therefore designed in such a way that, in the horizontal cross-section, they cover an angle segment of at most approximately 45° of the inside of the receptacle wall 16, preferably at most approximately 30°, particularly preferably at most approximately 20°.

[0088] As an alternative or in addition, non-curved circuit boards 56' can also be arranged on the upper and lower illumination carriers 53, 54, said circuit boards being laid for example in the curved illumination carriers 53, 54, as schematically denoted in Fig. 5 by the reference signs of the non-curved circuit boards 56'. To enable the best possible adaptation of the non-curved circuit boards 56' to the illumination carriers 53 and thus to the receptacle wall 16, the horizontal size of the upper, non-curved circuit boards 56' shown in Fig. 5 is designed to be much smaller than the diameter of the horizontal cross-section through the receptacle 10. For instance, a longest horizontal size b_h of the circuit boards 56' may be between 1% and 15% of the horizontal internal diameter d_h of the receptacle 10, preferably between 1% and 10%, particularly preferably between 1% and 5%.

[0089] This results in the vertical strip-shaped form of the illumination carriers 53 and 54 shown in Fig. 4.

[0090] A similar or identical situation can apply to the lower illumination carriers 54, which are not shown in Fig. 5.

[0091] Fig. 6A shows a schematic cross-section through part of an illumination unit, for example the upper illumination unit 51 or the lower illumination unit 52, in particular a horizontal cross-section through one of the illumination carriers. Here, a main body of the upper illumination carrier 53, for example, may be made of metal, in particular as a holder formed of a metal such as, for example, aluminum with a high thermal conductivity coefficient. On an outside 53a, the main body may be in direct mechanical contact, and thus in heat exchange, with the inside of the receptacle wall 16. A circuit board 56 is arranged on an inside or inner wall of the upper illumination unit 51, for example. A plurality of light sources 55, for example LEDs, are arranged on the circuit board 56. The light sources 55 are oriented in such a way that they emit light in the direction of the

receptacle interior, for example substantially toward the cylinder axis of the receptacle 10, which extends through the center point of the circular cross-section shown in Fig. 5.

[0092] A pouch wall of the disposable container 44 can bear substantially directly against the light sources 55. Since the wall of the disposable container 44 can be flexible, in particular made of a flexible material, the shape of the disposable container 44 can substantially adapt to the inner profile of the upper illumination unit 51. On and/or next to the upper illumination carriers 53, the upper illumination unit 51 may furthermore have one or more webs 57, which form a thermal bridge between the disposable pouch 44 and the receptacle wall 16.

[0093] Fig. 6B shows a schematic cross-section through part of an illumination unit having a main body, for example a horizontal cross-section through one of the lower illumination carriers 54 of the lower illumination unit 52. The lower illumination carrier 54, for example, may be made of metal (for example aluminum). On an outside 54a, the main body of the lower illumination carrier 54 may be in direct mechanical contact, and thus in heat exchange, with the inside of the receptacle wall 16. A circuit board 56 is arranged on an inside located opposite the outside 54a, with light sources 55 (for example LEDs) being arranged on said circuit board.

[0094] In general, both the upper illumination unit 51 and the lower illumination unit 52 may have one or more of the illumination carriers 53 and/or 54 as well as one or more of the webs 57. Fig. 6B does not show the wall of the disposable pouch 44. Figs. 6A and 6B are given as schematically illustrated examples, which do not have to concern details of the upper illumination unit 51 or of the lower illumination unit 52.

[0095] Both illumination units 51, 52 may be arranged in a substantially ring-shaped manner along the inner circumference of the receptacle 10.

[0096] The circuit boards 56 with the light sources 55 can be arranged on the upper and/or lower illumination unit 51 and/or 52 in a replaceable manner so as to be able to vary an emission spectrum of the light sources 55.

[0097] The device 1 with the illumination device 50 provides a technology platform by which different usage situations can be covered by mounting appropriate circuit boards 56, 56' and light sources 55, and by which a biological medium in the bioreactor can be irradiated with light, in particular including with UV light, IR light, laser light, modulated light, etc. A controller and/or an electrical lead for supplying power to the light sources 55 can be installed in the interior of the receptacle 10 via the stirring opening and/or the

cable guide 13. The upper and/or lower illumination unit 51 and/or 52, as a substantially flat profile, in particular an aluminum profile, can be adhesively bonded and/or screwed to the inside of the outer receptacle wall 16.

[0098] The tempering unit 20 can in particular be provided for tempering the receptacle wall 16 to a temperature between 10 and 60°C, in particular 27°C to 37°C. The upper part of the receptacle 10 shown in Fig. 4, in which the upper illumination unit 51 is arranged, may have two doors instead of the single-leaf door 30, by means of which the receptacle 10 can be fully opened at least in the upper part. A half-ring-shaped element of the upper illumination unit 51 is arranged inside each of the two doors.

[0099] Control cables and/or power cables for the illumination device 50 can be laid to the light sources 55 either through the stirring opening or through one of the windows.

[0100] The device may have a safety function, in the case of which the illumination device 50 is automatically switched off when the door(s) of the receptacle 10 is/are opened.

[0101] In alternative embodiments of the illumination device, which are not shown in the figures, the illumination device may have at least one flexible LED strip, which may be arranged along the inside of the receptacle, for example along the inner circumference. The LED strips may be arranged substantially horizontally along the inner circumference, and may for example end in each case at the door opening. LED strips may also be arranged horizontally and/or vertically on the inside of the single-leaf door, for example from one end of the door leaf to an opposite end of the door leaf.

List of reference signs

[0102]	
1	device
10	receptacle
12	base viewing window
13	cable guide
14	stirring device
15	collecting trough
16	receptacle wall
18	castors

	19	fixing feet
	20	temperature control hollow wall
	30	single-leaf door
	32	door viewing window
5	33	door blackout means
	34	door hinge
	35	door handle
	36	door opening
	40	fill level
10	42	biological medium
	44	disposable container or disposable pouch
	50	illumination device
	51	upper illumination unit
	52	lower illumination unit
15	53	upper illumination carrier
	53a	outside of the upper illumination carrier
	54	lower illumination carrier
	54a	outside of the lower illumination carrier
	55	light source
20	56	circuit board
	56'	circuit board
	57	web
	b_h	horizontal size of an illumination carrier
	d_h	horizontal internal diameter of the receptacle

Patentkrav

1. Anordning (1) til optagelse af en engangsbeholdes (44) med

- en optagebeholder (10) med i det mindste en væg (16) af optagebeholderen, hvilken væg begrænser et indre beholderrum i optagebeholderen (10) til optagelse af engangsbeholderen (44), og

- en tempereringsenhed til temperering af optagebeholderens væg (16);

hvor der på en mod det indre beholderrum vendt inderside af den af tempereringsenheden tempererede væg (16) af optagebeholderen er anbragt en belysningsanordning (50), der er udformet til at udstråle lys ind i optagebeholderens (10) indre beholderrum.

2. Anordning ifølge krav 1, hvor belysningsanordningen (50) har i det mindste en lyskilde (55), der er anbragt på en position på indersiden af optagebeholderens væg (16), som umiddelbart på en fra det indre beholderrum bortvendt yderside af optagebeholderens væg (16) tempereres af tempereringsenheden.

3. Anordning ifølge krav 1 eller 2, hvor belysningsanordningen (50) har en flerhed af lyskilder (55), der er anbragt fordelt over i det mindste 50 % af arealet af indersiderne af alle laterale vægge (16) af optagebeholderen; og/eller hvor belysningsanordningen (50) har en flerhed af aktiverbare LED'er som lyskilder (55).

4. Anordning ifølge et af de foregående krav, hvor belysningsanordningen (50) udstråler i det mindste 90 % af den udstrålede lyseffekt med en forudbestemt bølgelængde og/eller i et forudbestemt bølgelængdespektrum mellem 50 nm og 50 μ m.

5. Anordning ifølge et af de foregående krav, hvor belysningsanordningen (50) er udformet til at udstråle lys ved hjælp af udskiftelige lyskilder (55), som har forskellige udstrålingsspektre.

6. Anordning ifølge et af de foregående krav, hvor en udvendig form af en fra det indre beholderrum bortvendt yderside (53a, 54a) af belysningsanordningen (50) er tilpasset til en indvendig form af indersiden af optagebeholderens væg (16).

7. Anordning ifølge krav 6, hvor den udvendige form af belysningsanordningen (50) er udformet konvekst, og den indre form af optagebeholderens væg (16) er udformet konkavt.

5

8. Anordning ifølge et af de foregående krav, hvor belysningsanordningen (50) udstråler lys med en lyseffekt på indtil cirka $3000 \mu\text{mol}/\text{m}^2\text{s}$ ind i det indre beholderrum.

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9. Anordning ifølge et af de foregående krav, hvor belysningsanordningen (50) har en flerhed af lyskilder (55), der er anbragt på en stribe (53, 54), og hvor striben (53; 54) er anbragt i det væsentlige vertikalt langs optagebeholderens væg (16).

15

10. Anordning ifølge et af de foregående krav, hvor i en driftsposition af anordningen (1) engangsbeholderen (44) står i berøringskontakt med belysningsanordningen (50);

og/eller

hvor der over lyskilder (55) i belysningsanordningen (50) er anbragt et transparent harpikslag og/eller laklag med en tykkelse på indtil cirka 1 mm.

20

11. Anordning ifølge et af de foregående krav, hvor belysningsanordningen (50) har i det mindste en varmebro mellem lyskilder (55) i belysningsanordningen (50) og optagebeholderens tempererede væg (16).

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12. Anordning ifølge et af de foregående krav, hvor tempereringsenheden leverer en varmebortledningseffekt på indtil i det mindste 8 kW.

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13. Anordning ifølge et af de foregående krav, hvor optagebeholderens væg (16) i det mindste delvist er udformet som en tempereringshulvæg (20), og tempereringsenheden er udformet til at temperere det indre beholderrum med et i tempereringshulvæggen (20) anbragt tempereringsmedium.

14. Anordning ifølge et af de foregående krav, hvor optagebeholderen (10) er udformet til at optage engangsbeholdere (44) med et volumen på i det mindste cirka 500 liter.

15. Fremgangsmåde til optagelse af en engangsbeholder (44) med trinene:

- optagelse af engangsbeholder (44) i et indre beholderrum i en optagebeholder (10) med i det mindste en væg (16) af optagebeholderen, hvilken væg begrænser det indre beholderrum;
- belysning af den i det indre beholderrum anbragte engangsbeholder (44) ved hjælp af en belysningsanordning (50), der er anbragt på en mod det indre beholderrum vendt inderside af optagebeholderens væg (16); og
- temperering af optagebeholderens væg (16) ved hjælp af en tempereringsenhed.

5

10

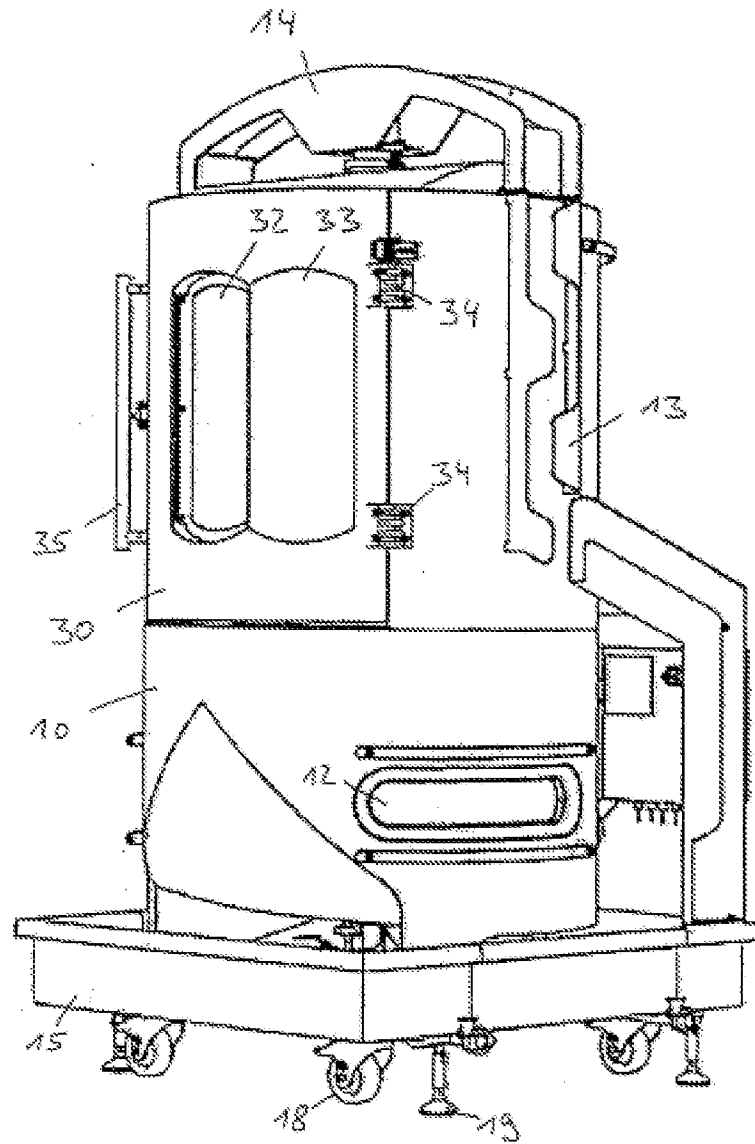


Fig. 1

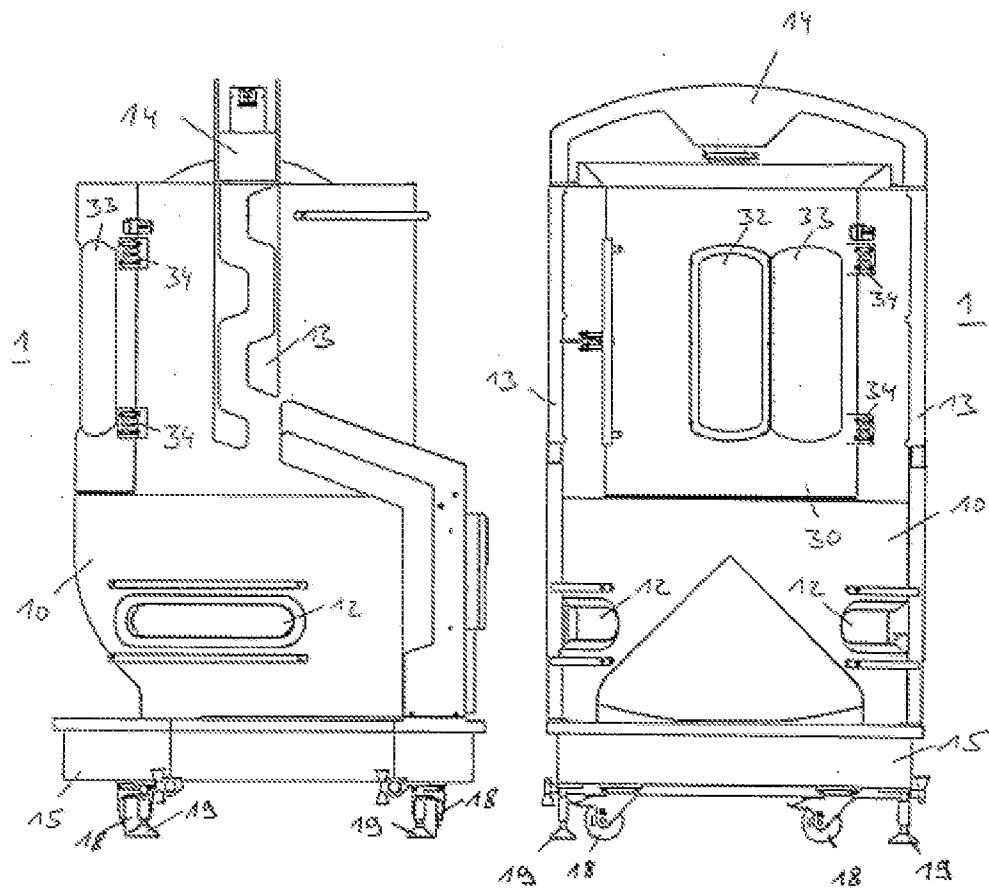


Fig. 2A

Fig. 2B

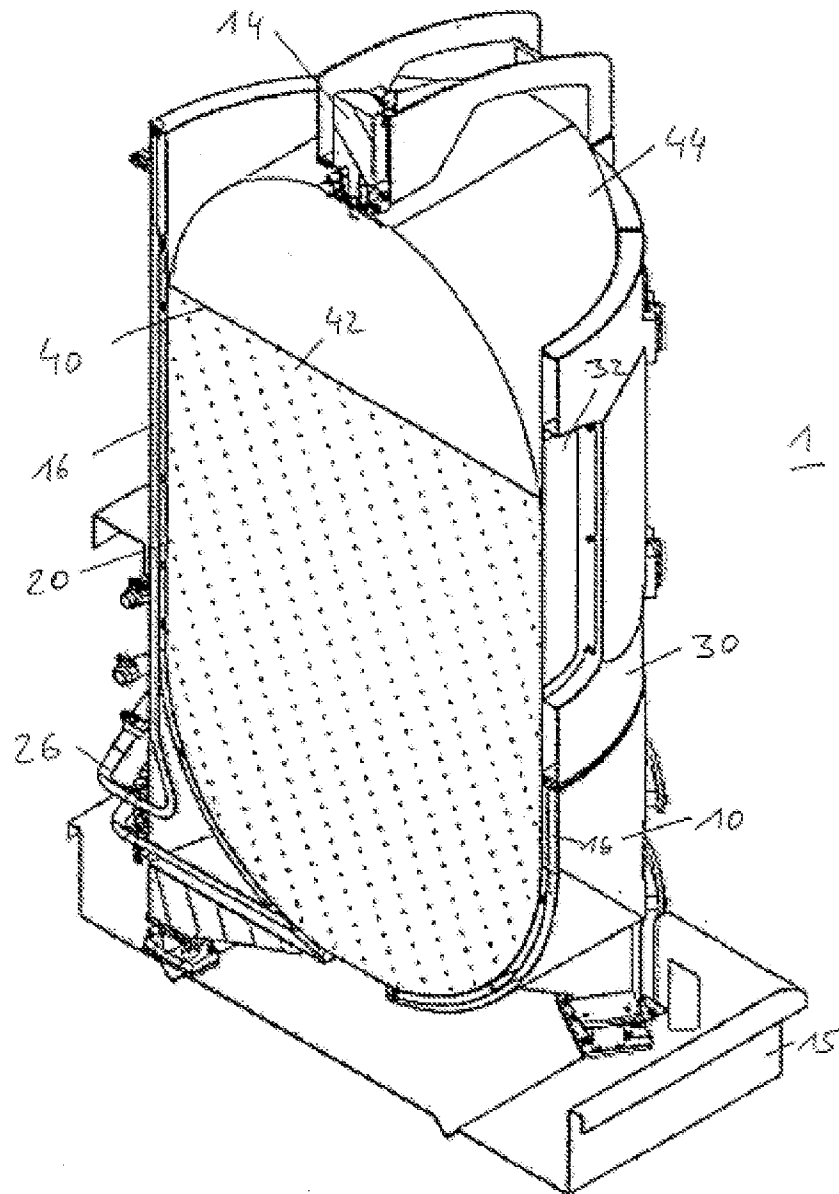


Fig. 3

FIG 4

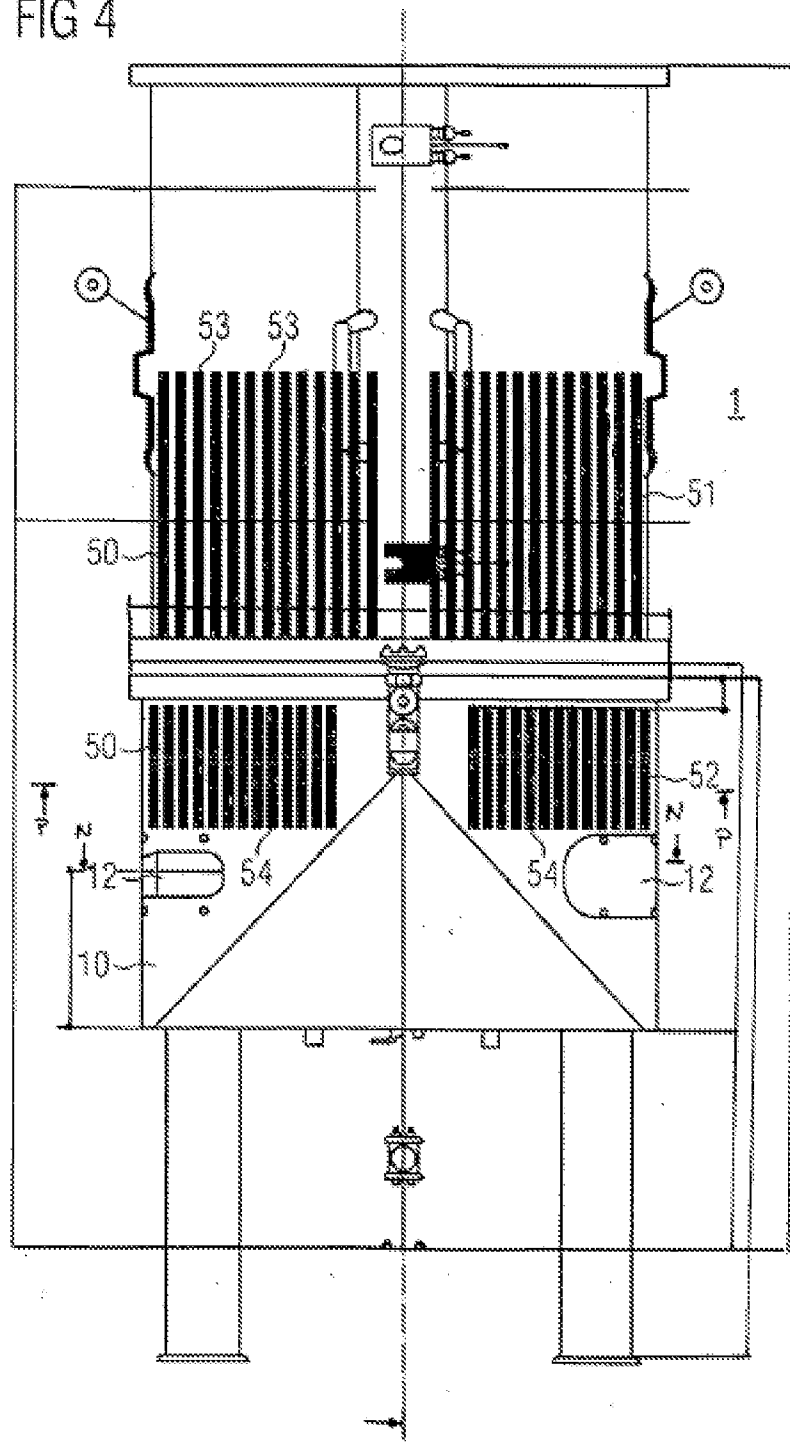


FIG 5

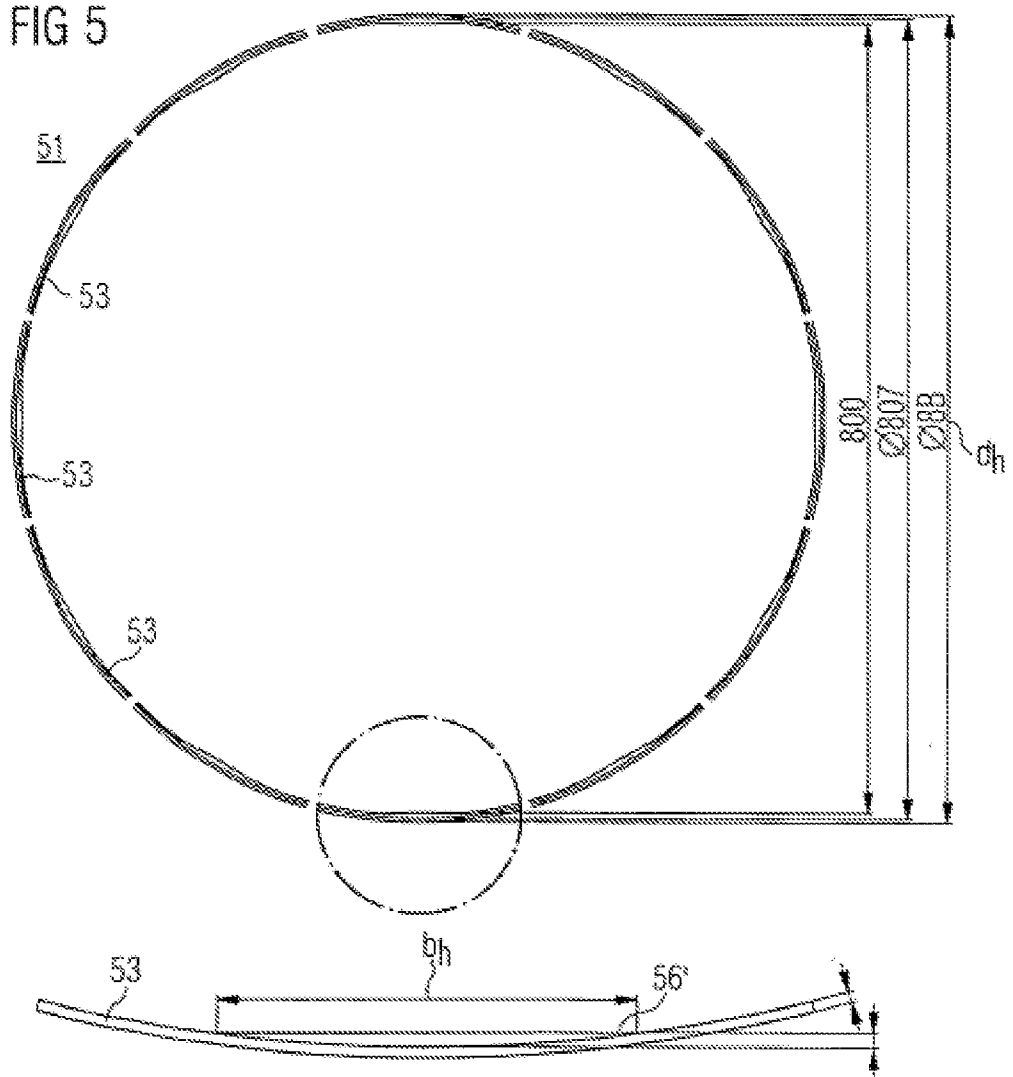
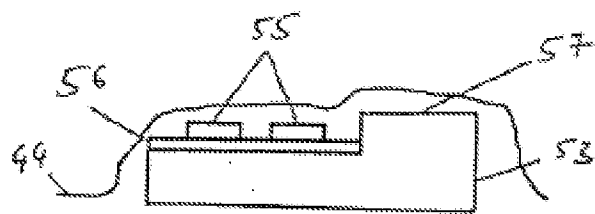


Fig. 6A

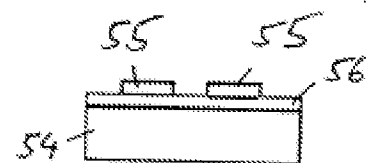


Fig. 6B