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(54) **Device for maintaining overpressure in a liquid-filled container**

Überdruckvorrichtung für Flüssigkeitslagerbehälter

Appareil de surpression pour réservoir rempli de liquide

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Description

[0001] The invention relates to a device for maintaining overpressure in a liquid-filled container, in which the temperature of the liquid and the external pressure to which said container is subjected, can vary, said device comprising: a foot portion and an upper cover having its circumferential edges spaced apart and being connected to one another by a circumferentially extending membrane manufactured from a flexible material such as rubber, so that the distance between the foot portion and the upper cover can vary, and a closed expansion space that can be connected to said reservoir is situated between said foot portion, the membrane and the upper cover, at least one spring being present for pushing the upper cover towards the foot portion so that the oil in the expansion space and the container connected to it, are kept under a certain overpressure.

[0002] A device of the type described above is shown in NL-A-1012940 as well as in US-A-2752516. There, in particular a pump driven by an electric motor, said pump being mounted in the suction pipe of a trailing hopper dredge is contemplated.

[0003] The electric motor is completely filled with oil. During operation of the motor or by atmospheric conditions, the temperature of the oil can increase and thus the oil will expand.

[0004] Further, the suction pipe, and therefore the pump having the electric motor, can be located at various depths under water. Maintaining a certain overpressure of the oil in the electric motor is desirable for preventing water from penetrating into it, which would damage the motor. The overpressure should have a low, reasonably constant value in order to prevent the shaft sealings of said electric motor from getting overloaded.

[0005] The device described above is employed for accommodating the volume increase and keeping the overpressure almost constant.

[0006] Manufacturing such a device has proven to cause certain problems and is therefore relatively expensive. In order to be able to maintain a sufficiently uniform pressure on moving said foot portion and said upper cover towards and away from one another, one necessarily has to use a number of springs. These are incorporated in pairs in five guide bushes being connected to said upper cover and extending towards said foot portion and being closed at the side of the upper cover. A rod extends through each guide bush connected with the foot portion, and has its other end provided with a support plate engaged by the pair of springs. The other end of the pair of springs engages a flange ring connected to the guide bush being located near the foot portion.

[0007] In order to prevent one or more bushes from getting clamped onto the support plate on movement of the upper cover in relation to the foot portion, the bushes should be mounted very accurately on the appropriate position in the upper cover. Namely, the axis of the rod to which the support plate is connected, should coincide exactly with the axis of the bush concerned. However, the welding operations can easily cause deviations in the dimensioning.

[0008] Further, the bolt holes provided in the circumferential edge of the upper cover, for connecting the circumferentiale edge to one edge of the membrane, should be exactly aligned with the bolt holes in the foot portion to which the other edge of the membrane will be connected.

[0009] Now the object of the invention is to change the device in such a way, that manufacture thereof is substantially facilitated and the cost of the device can be reduced almost by half.

[0010] According to the invention, this object is achieved in that the foot portion comprises a base plate, centrally provided with a pin extending square to it, around which a bush is slidable, having its end nearest to the base plate connected with a support plate extending parallel to the base plate and being connected to the upper cover, for supporting the at least one spring, said at least one spring being mounted around the bush and having its other side connecting a pressure plate which is centrally supported by a sleeve screwed onto the pin and being provided with an internal threading.

[0011] This yields a simple structure, in that only one single support plate is present, being engaged by all springs and being supported only in the middle by said sleeve. The ends of the springs can be laterally supported by outwardly protruding edges provided on the support plate and the pressure plate.

[0012] Here, the upper cover can easily be rotated in relation to the foot portion, so that the connection with the edges of the membrane will never cause difficulties.

[0013] In order to enable easy rotation of the sleeve on the pin, the sleeve is provided with a bolt head and a bearing is located between the bolt head and the pressure plate.

[0014] In particular, it can be provided for, that the membrane manufactured from rubber or a like flexible material consists of two identical parts being connected to one another at their longitudinal edges. Manufacturing such a membrane in this way is much simpler, as a result of which the membrane is much cheaper.

[0015] The invention is further explained by way of an embodiment shown in the drawing, in which:

Fig. 1 illustrates schematically a vertical cross-section of a device according to the invention, taken along line I - I in Fig. 2; and

Fig. 2 illustrates schematically part of the plan view of the device according to Fig. 1.

[0016] The device shown in the drawing comprises two main portions, namely a foot portion and an upper cover 2. The foot portion 1 is constituted by the base plate 3 having the pin 4 centrally mounted therein and a raised edge 5 extending along the outer circumference thereof and being provided with the flange edge 6. The flange

edge 6 is connected, in a way not further described, to the edge 7 of a membrane 8, which e.g. can be made of rubber or a like flexible material. The membrane 8 comprises two identical portions 9 being connected to one another at their longitudinal edges 10.

[0017] The other circumferential edge 11 of the membrane 8 is connected to a flange edge 12 of the upper cover 2, a flange edge 13 being located between the parts 11 and 12, being connected to a support plate 15 by a conical part 14. The conical part 14 contains openings 16.

[0018] The support plate 15 is provided with a bush 17 being supported by gussets 18 and being slidable on the pin 4 of the foot portion 1. Support plate 15 is provided with protruding edges, not further indicated, for laterally supporting the ends of a number of springs 19 and 20 located within one another. At the other side, the springs 19, 20 engage a pressure plate 21, likewise provided with protruding edges, which is centrally supported by a sleeve 22, provided with an internal thread, being screwed on the pin 4. The sleeve 22 is provided with a bolt head 23 for rotating it, and a bearing 24 is located between said bolt head 23 and the pressure plate 21.

[0019] For filling the device with oil and connecting it to the electric motor, not illustrated, a connecting piece 25 is provided, and the upper cover is provided with a venting plug 26 at its highest point.

[0020] For protecting the membrane 8, an annular plate 27 comprising two or more parts is mounted around the raised edge 5 of the foot portion 1, said plate being connected to the flange edge 6 of the foot portion 1. The circumferential edge of the plate 27 is connected to a standing plate 28. Plates 27 and 28 are provided with openings which are small to prevent solid parts contained in the water from damaging the membrane 8.

[0021] The upper cover is correspondingly provided with an annular plate 29 with a circumferential plate 30 fitting around plate 28. When moving the upper cover 2 away from the foot portion 1, the circumferential plate 30 will provide for, that the protection of the membrane 8 will remain guaranteed, in that the free circumferential edge of the circumferential plate 30 can not end up lying beyond the circumferential edge of the plate 28. This is indicated with dash lines in the left part of Fig. 1, which also illustrates the maximum distance across which the upper cover 2 of the foot portion 1 can be situated.

[0022] Depending on the temperature of the oil in the device and in the container, not illustrated in the drawing, in which the electric motor is located, a certain amount of oil will be under a certain pressure within the device. In case of an increase or decrease in temperature of the oil, the upper cover 2 will move away from and towards the foot portion 1, respectively, while the oil is kept under a certain overpressure by the influence of springs 19 and 20.

[0023] In order to achieve the desired oil pressure in the device at a certain temperature of the oil, the appropriate amount of oil will have to be brought into the device. To that end, a temperature scale 32 is mounted on an indicator 31 being arranged at the base plate 3 of the foot portion 1, said scale cooperating with an indicating strip 33 being mounted to the plate 29 connected to the upper cover 2. When the temperature indicated by the indicating strip 33 on the temperature scale 32 corresponds to the temperature of the oil in the device, the upper cover 2 will be located at the appropriate distance from the foot portion 1 and the appropriate amount of oil will be located within the device. At the same time, the temperature scale 32, together with the indicating strip 33, can serve to check if oil leakage has occurred.

[0024] Hoisting points 34 have been provided for being able to transport the device in a reliable way.

[0025] It will be obvious, that only one possible embodiment of a device according to the invention has been illustrated in the drawing and described above and that many changes can be made without departing from the scope of the invention as it has been indicated in the accompanying claims.

Claims

1. Device for maintaining overpressure in a liquid-filled container, in which the temperature of the liquid and the external pressure to which said container is subjected, can vary, **said device comprising:** a foot portion (1) and an upper cover (2) having its circumferential edges (6, 12) spaced apart and being connected to one another by a circumferentially extending membrane (8) manufactured from a flexible material such as rubber, so that the distance between the foot portion (1) and the upper cover (2) can vary, and between said foot portion (1), the membrane (8) and the upper cover (2) is formed a closed expansion space that is connected to said container, at least one spring (19, 20) being present for pushing the upper cover (2) towards the foot portion so that the oil in the expansion space and the container connected to it, are kept under a certain overpressure, **characterized in that** the foot portion (1) comprises a base plate (3), centrally provided with a pin (4) extending square to it, around which a bush (17) is slidable, having its end nearest to the base plate (3) connected with a support plate (15) extending parallel to the base plate (3) and being connected to the upper cover (2), for supporting the at least one spring (19, 20), said at least one spring mounted around the bush (17) and having its other side connecting a pressure plate (21) which is centrally supported by a sleeve (22) provided with an internal thread, said sleeve (22) being screwed onto the pin (4).

2. Device according to claim 1, **characterized in that** the sleeve (22) is provided with a bolt head (23) for rotating it, while a bearing (24) is located between said bolt head (23) and the pressure plate (21).

3. Device according to claim 1 of 2, **characterized in that** the membrane (8) manufactured from rubber or a like flexible material consists of two identical parts (9) being connected to one another at their longitudinal edges (10).

Patentansprüche

1. Vorrichtung zur Aufrechterhaltung von Überdruck in einem mit Flüssigkeit gefüllten Behälter, in dem die Temperatur der Flüssigkeit und der äußere Druck, dem der Behälter ausgesetzt sind, variieren können, wobei die Vorrichtung umfasst:

   einen Fußteil (1) und einen oberen Deckel (2), deren umlaufende Kanten (6,12) voneinander entfernt und durch eine sich umlaufend erstreckende Membran (8), die aus einem flexiblen Material wie z.B. Gummi hergestellt ist, miteinander verbunden sind, so dass der Abstand zwischen dem Fußteil (1) und dem oberen Deckel (2) variieren kann, und zwischen dem Fußteil (1), der Membran (8) und
   der obere Deckel (2) ein geschlossener Ausdehnungsraum gebildet ist, der mit dem Behälter verbunden ist,
   mindestens eine Feder (19, 20), die zum Drükken des oberen Deckels (2) gegen den Fußteil vorhanden ist, so dass das Öl in dem Ausdehnungsraum und dem damit verbundenen Behälter unter einem bestimmten Überdruck gehalten werden,

   dadurch gekennzeichnet, dass
   der Fußteil (1) eine Basisplatte (3) umfasst, die zentral mit einem Stift (4), versehen ist der sich im rechten Winkel zu ihr erstreckt, um den herum eine Buchse (17) verschiebbar ist, deren der Basisplatte (3) am nächsten liegendes Ende mit einer Trägerplatte (15) verbunden ist, die sich parallel zu der Basisplatte (3) erstreckt und mit dem oberen Deckel (2) verbunden ist, um die mindestens eine Feder (19, 20) zu stützen, wobei die mindestens eine Feder um die Buchse (17) herum befestigt ist und wobei deren andere Seite mit einer Druckplatte (21) verbunden ist, welche zentral durch eine Hülse (22), die mit einem Innengewinde ausgestattet ist, gestützt wird, wobei die Hülse (22) auf den Stift (4) geschraubt ist.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Hülse (22) zu ihrer Drehung mit einem Bolzenkopf (23) ausgestattet ist, und ein Lager (24) zwischen dem Bolzenkopf (23) und der Druckplatte (21) angeordnet ist.

3. Vorrichtung nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die aus Gummi oder einem ähnlich flexiblen Material hergestellte Membran (8) aus zwei identischen Teilen (9) besteht, die an ihren längsseitigen Kanten (10) miteinander verbunden sind.

Revendications

1. Dispositif pour maintenir une surpression dans un récipient rempli d'un liquide, dans lequel la température du liquide et la pression extérieure à laquelle est soumis ledit récipient peuvent varier, ledit dispositif comprenant : une portion de pied (1) et un couvercle supérieur (2) ayant ses bords circonférentiels (6,12) espacés et étant raccordés entre eux par une membrane (8) s'étendant sur la circonférence, fabriquée à partir d'un matériau plastique tel que du caoutchouc, de sorte que la distance entre la portion de pied (1) et le couvercle supérieur (2) peuvent varier et entre ladite portion de pied (1), la membrane (8) et le couvercle supérieur (2) est formé un espace de détente fermé qui est raccordé au récipient, au moins un ressort (19, 20) étant présent pour pousser le couvercle supérieur (2) vers la portion de pied de sorte que l'huile dans l'espace de détente et le récipient raccordé à celui-ci sont maintenus sous une certaine surpression,
   caractérisé en ce que la portion de pied (1) comprend une plaque d'embase (3), munie centralement d'un axe (4) s'étendant à angle droit par rapport à celle-ci, autour duquel peut coulisser une douille (17) ayant son extrémité la plus proche de la plaque d'embase (3) raccordée à une plaque de support (15) s'étendant parallèlement à la plaque d'embase (3) et étant raccordée au couvercle supérieur (2), pour supporter au moins un ressort (19,20), ledit au moins un ressort étant monté autour de la douille (17) et ayant son autre côté connectant une plaque de compression (21) qui est supportée de manière centrale par une chemise (22) fournie avec une tête interne, ladite chemise (22) étant vissée sur l'axe (4).

2. Dispositif selon la revendication 1,
   caractérisé en ce que la chemise (22) est munie d'une tête de boulon (23) pour sa rotation, tandis qu'un palier (24) est situé entre ladite tête de boulon (23) et la plaque de compression (21).

3. Dispositif selon la revendication 1 ou 2,
   caractérisé en ce que la membrane (8) fabriquée à partir de caoutchouc ou un matériau souple similaire consiste en deux parties identiques (9) raccordées entre elles sur leurs bords longitudinaux (10).

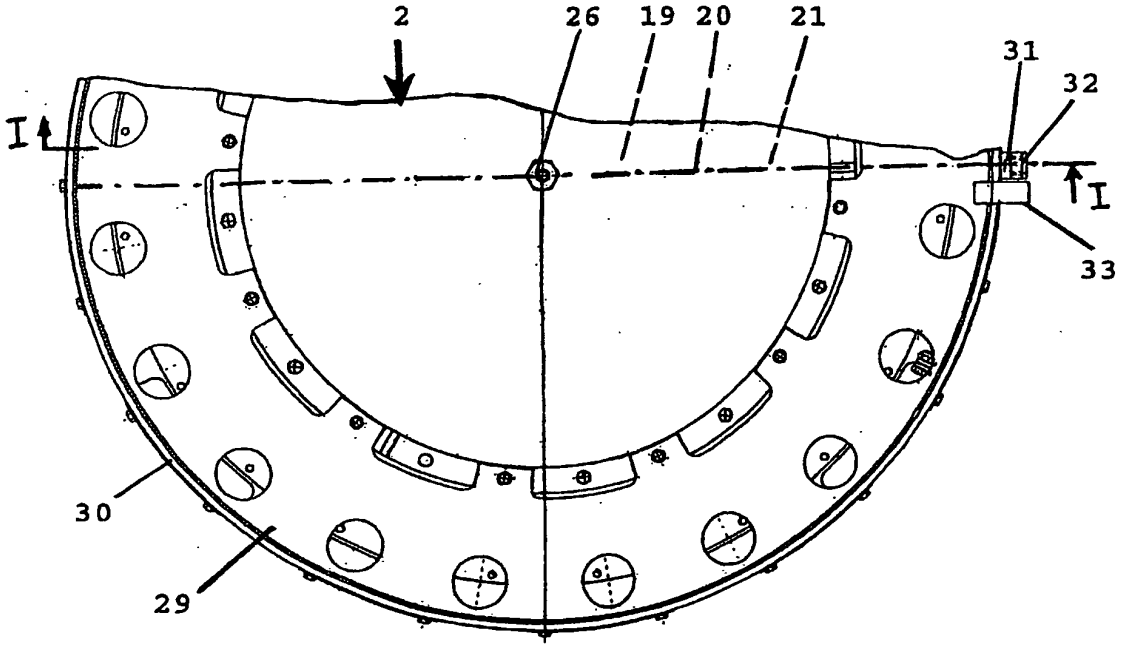
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FIG. 2

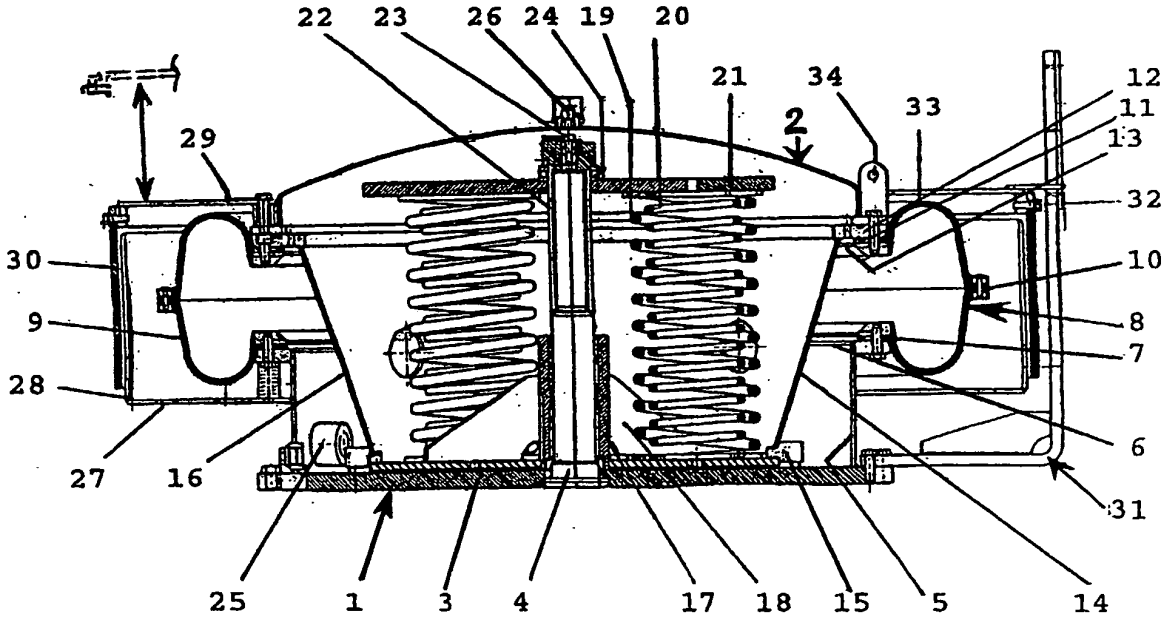
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FIG. 1