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CA 2875904 C 2016/06/07

(11)(21) **2 875 904**

(12) **BREVET CANADIEN**  
**CANADIAN PATENT**

(13) **C**

(86) Date de dépôt PCT/PCT Filing Date: 2013/06/12  
(87) Date publication PCT/PCT Publication Date: 2014/01/03  
(45) Date de délivrance/Issue Date: 2016/06/07  
(85) Entrée phase nationale/National Entry: 2014/12/05  
(86) N° demande PCT/PCT Application No.: FI 2013/050637  
(87) N° publication PCT/PCT Publication No.: 2014/001619  
(30) Priorité/Priority: 2012/06/26 (FI20125714)

(51) CI.Int./Int.Cl. **B01D 11/00** (2006.01),  
**B01D 21/00** (2006.01), **B03B 5/60** (2006.01),  
**C22B 3/00** (2006.01), **E02D 27/32** (2006.01),  
**B65D 88/12** (2006.01)

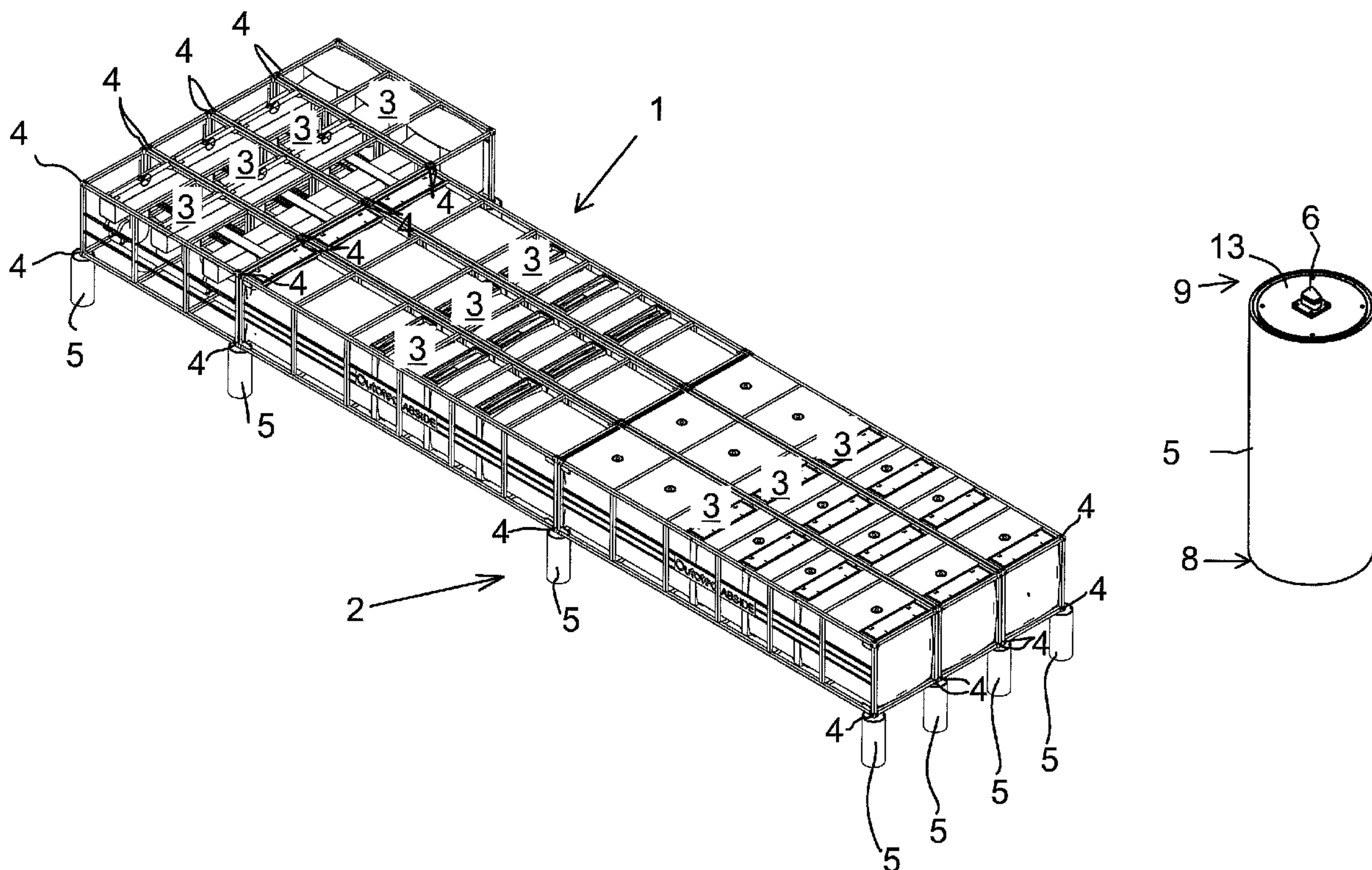
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(54) Titre : DECANTEUR POUR EXTRACTION PAR SOLVANT COMPRENANT UNE FONDATION

(54) Title: SOLVENT EXTRACTION SETTLER COMPRISING A FOUNDATION



(57) Abrégé/Abstract:

A solvent extraction settler (1) comprising a foundation (2). The solvent extraction settler (1) comprises self-supporting modules (3) each having the exterior dimensions, strength and corner fittings (4) conforming to shipping container standards. The foundation (2) comprises a plurality of pillars (5) on which the modules (3) are supported at a height above the ground level, thereby providing a space for piping and access below the settler. The pillars (5) comprise shipping standard compatible container lashing fittings (6, 7) to which the corner fittings (4) of the modules (3) can be connected.

## (12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
3 January 2014 (03.01.2014)

(10) International Publication Number  
WO 2014/001619 A1

## (51) International Patent Classification:

*B01D 11/00* (2006.01)      *B01D 21/00* (2006.01)  
*C22B 3/00* (2006.01)      *E02D 27/32* (2006.01)  
*B03B 5/60* (2006.01)      *B65D 88/12* (2006.01)

## (21) International Application Number:

PCT/FI2013/050637

## (22) International Filing Date:

12 June 2013 (12.06.2013)

## (25) Filing Language:

English

## (26) Publication Language:

English

## (30) Priority Data:

20125714      26 June 2012 (26.06.2012)      FI

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

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## (54) Title: SOLVENT EXTRACTION SETTLER COMPRISING A FOUNDATION

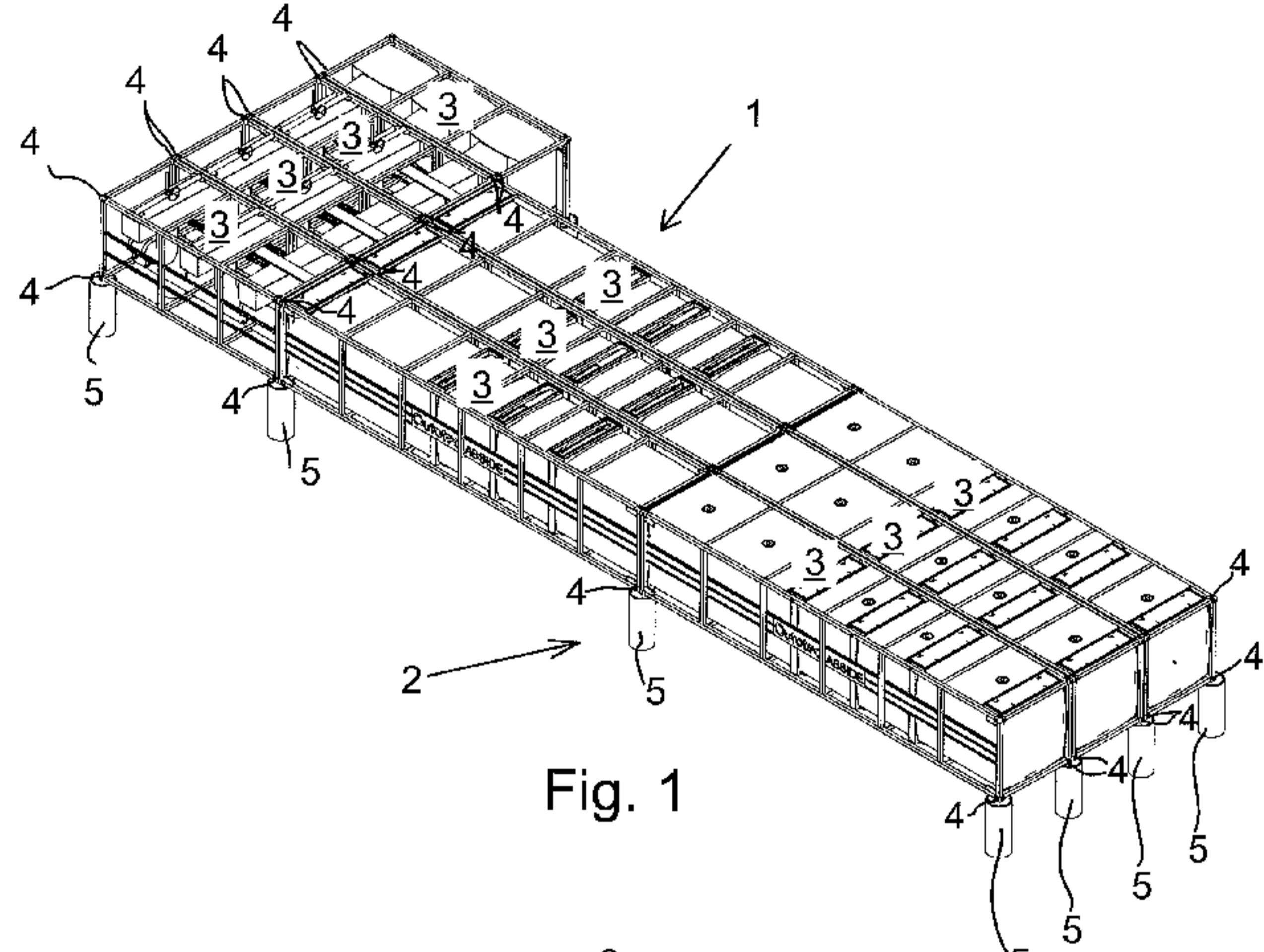


Fig. 1

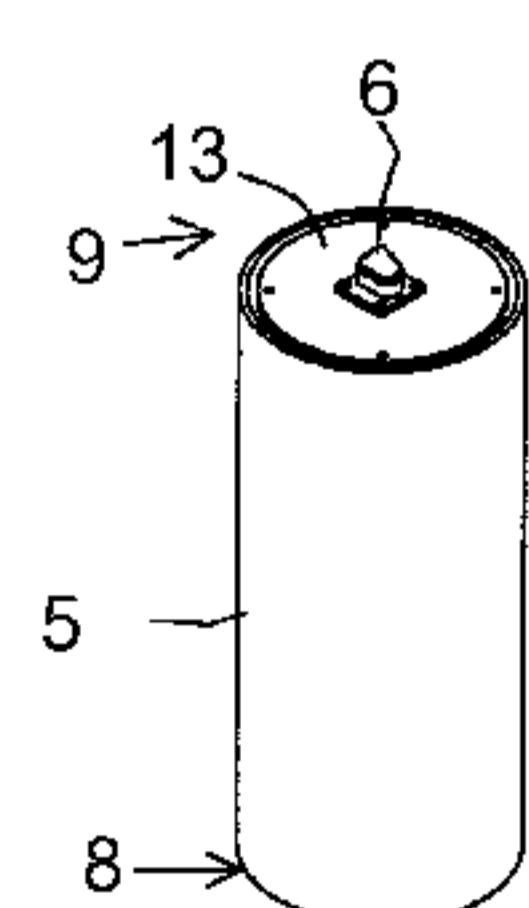


Fig. 3

(57) Abstract: A solvent extraction settler (1) comprising a foundation (2). The solvent extraction settler (1) comprises self-supporting modules (3) each having the exterior dimensions, strength and corner fittings (4) conforming to shipping container standards. The foundation (2) comprises a plurality of pillars (5) on which the modules (3) are supported at a height above the ground level, thereby providing a space for piping and access below the settler. The pillars (5) comprise shipping standard compatible container lashing fittings (6, 7) to which the corner fittings (4) of the modules (3) can be connected.

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**Declarations under Rule 4.17:**

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *of inventorship (Rule 4.17(iv))*

**Published:**

— *with international search report (Art. 21(3))*

**SOLVENT EXTRACTION SETTLER COMPRISING A FOUNDATION****FIELD OF THE INVENTION**

The present invention relates to a solvent extraction  
5 plant comprising a foundation.

**BACKGROUND OF THE INVENTION**

As taught in the article "Solvent Extraction Mixer-Settler Design", by M.L. Jansen and A. Taylor, ALTA  
10 Metallurgical Services Publication. Jansen, M. L.,  
Taylor, A, 1997, a typical arrangement of a mixer-settler consists of an agitated tank (mixer or mix box) in which the aqueous and organic solutions are  
15 contacted, followed by a shallow gravity settling basin (settler) where the solutions disengage into individual layers for separate discharge. The settler may  
be cylindrical or rectangular, though a rectangular shape is most commonly used in order to provide a more  
20 compact layout, and to minimize interstage piping runs.

The settler tank is normally built on the site. WO  
2007/135221 A1 discloses one method for manufacturing  
a mixer-settler on site. The wall structures are con-  
25 nected by vertical support columns to the bottom  
plate. The wall structure is formed by fastening a re-  
quired number of horizontal support beams to the ver-  
tical support columns at regular intervals. A required  
30 number of plate-like wall elements made of a chemical-  
ly resistant material are attached to the horizontal  
support beams inside the mixer-settler, so that they  
form a load-bearing structure in the spaces left be-  
tween the horizontal support beams. The plate-like  
35 wall elements are connected to the plate-like element  
covering the bottom plate of the mixer-settler. Such a  
settler is still a large tank which is square in plan

and its square area is about several hundred square meters.

In the above-mentioned article "Solvent Extraction Mixer-Settler Design", by M.L. Jansen and A. Taylor, ALTA Metallurgical Services Publication. Jansen, M. L., Taylor, A, 1997, there is further disclosed three alternative concepts of foundation or support for the settler. In the first one, the settlers are at the ground level. The other two concepts involve the elevation of the settlers on fill or concrete, steel or wooden supports, and are more applicable to flat sites. The problem in all these concepts is that they do not allow unobstructed access below the settler. Further, a lot of excavation and construction work must be made at the site which causes problems because of the crucial influence of local factors. It may be difficult to get local suppliers. The quality of the site work may vary. The solvent extraction plant is project specified. In each case the layout of the plant and the equipment are unique. Further, there is not a possibility for productization of the settlers.

### **OBJECT OF THE INVENTION**

The object of the invention is to eliminate the disadvantages mentioned above.

### **SUMMARY OF THE INVENTION**

The invention provides a solvent extraction settler comprising a foundation. The solvent extraction settler comprises self-supporting modules each having exterior dimensions, strength and corner fittings conforming to shipping container standards. The foundation comprises a plurality of pillars on which the modules are supported at a height above the ground level, thereby providing a space for piping and access

below the plant, and the pillars comprise shipping standard compatible container lashing fittings to which the corner fittings of the modules can be connected.

5

The advantage of the fact that the settler modules and also the pillars (with or without cast concrete) can be manufactured in the factory environment, which is different from the installation site environment, is 10 that it provides good quality. The settler modules being ISO shipping container standard compatible units provides all benefits of the normal shipping containers: they can be handled with normal transport equipment and there is no need for oversize transport 15 equipment. The settler element modules having the dimensions, strength and handling and securing means conforming to shipping container standards thus have all the benefits of the transportability of normal shipping containers. The settler modules can be transported on land by trucks and trailers and on container ships by sea. In ports they can be handled with normal container handling equipment. A complete solvent extraction plant, which may comprise one or more settlers, can be shipped in one delivery. The modules 20 have the strength and durability to withstand stacking 25 of a number of modules on top of one another. Concrete pillars which are arranged to support each corner of the modules allow flexible level positioning of the settler and enable construction of the entire solvent extraction plant on the planar ground. Pillars also enable access below the settler, and piping for the water circulation can also be arranged below the settler. A minimal amount of excavation work is required 30 at the installation site, speeding up the installation. The project lead time is short. Mounting of the modules on pillars allows easy assembly and disassembly 35 of the modules and settler. The modular system al-

lows flexible capacity since more capacity can be built while the plant is running simply by adding more pillars and modules onto said pillars.

5 In one embodiment of the settler, the pillar comprises a lower end which is supported on the ground, an upper end, and one or more container lashing fittings attached to the upper end of the pillar.

10 In one embodiment of the settler, the container lashing fitting comprises a stacking cone.

In one embodiment of the settler, the container lashing fitting comprises a twist lock.

15 In one embodiment of the settler, the pillar comprises one to four container lashing fittings, depending on the number of corner fittings to be connected onto the pillar.

20 In one embodiment of the settler, the pillar comprises a plastic tube, a concrete reinforcement arranged inside the plastic tube, cast concrete cast inside the plastic tube, and a metal base plate attached to the 25 upper end of the pillar, to which base plate one or more container lashing fittings are fixedly connected.

In one embodiment of the settler, the modules and their corner fittings conform to ISO shipping container standards. The container lashing fittings on the 30 pillars are ISO shipping standard compatible.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

The accompanying drawings, which are included to provide a further understanding of the invention and constitute a part of this specification, illustrate 35 embodiments of the invention and together with the de-

scription help to explain the principles of the invention. In the drawings:

Figure 1 is an axonometric view of a solvent extraction settler according to a first embodiment of the present invention,  
5

Figure 2 is a view of the layout of the foundation of the settler of Figure 1,  
10

Figures 3 to 6 show an axonometric view of four different types of pillars used in the foundation of Figure 2, the pillars being equipped with stacking cones as container lashing fittings,  
15

Figures 7 and 8 show another embodiment of the pillar equipped with a twist lock as a container lashing fitting, and  
20

Figure 9 shows a schematic longitudinal section of the pillar.

#### **DETAILED DESCRIPTION OF THE INVENTION**

Figure 1 shows one embodiment of a solvent extraction settler 1 which is used in hydrometallurgical liquid-liquid extraction processes for separating solutions mixed in a dispersion into different solution phases. The dispersion pump and mixers which are used to prepare the dispersion are not shown in the Figures. The settler 1 comprises a plurality of self-supporting modules 3. Each of the modules 3 has the exterior dimensions, strength and handling and securing means, i.e. corner fittings 4, which conform to ISO shipping container standards to enable ISO compatible transportability. In particular, each module 3 comprises a self-supporting framework structure having a shape of a rectangular parallelepiped with exterior dimensions  
25  
30  
35

and corner fittings 4 conforming to ISO shipping container standards. The corner fittings 4 are attached to each eight corners of the framework structure. Each module 3 conforms to the standard ISO 668 Series 1 5 "Freight containers - Classification, dimensions and ratings". The corner fittings 4 conform to the standard ISO 1161 Series 1 "Freight containers - Corner fittings - specification".

10 Figure 2 shows a layout of the foundation 2 designed for the module group of the settler shown in Figure 1. The settler 1 comprises a foundation 2 on which the modules 3 are supported at a height above the ground level, thereby providing a space for piping and access 15 underneath the settler 1. The foundation 2 comprises a plurality of pillars 5 having ISO shipping standard compatible container lashing fittings 6, 7 to which the corner fittings 4 of the modules 3 can be connected.

20 Figures 3 and 9 show that the pillar 5 comprises a lower end 8 which is supported on the ground, and an upper end 9. One or more container lashing fittings 6, 7 are attached to the upper end 9. As illustrated in Figures 25 3 to 6, the pillar 5 may comprise one to four container lashing fittings 6, 7, depending on the number of corner fittings 4 to be connected onto the pillar 5. A pillar 5 supporting one corner of the module comprises only one container lashing fitting 6 (Fig. 3). A pillar 30 5 supporting two corners of parallel modules comprises a pair of container lashing fittings 6 arranged side-by-side (Fig. 4). A pillar 5 supporting two corners of sequential modules comprises a pair of container lashing fittings 6 arranged in a row (Fig. 5). A pillar 5 35 supporting four corners of parallel and sequential modules comprises two pairs of container lashing fittings 6 (Fig. 6). The container lashing fittings may be

stacking cones 6 as shown in Figures 3 to 6 or alternatively they may be twist locks 7 as shown in Figures 7 and 8.

5 With reference to Figure 9, the pillar 5 comprises a plastic tube 10, a concrete reinforcement 11 of metal arranged inside the plastic tube 10, cast concrete 12 cast inside the plastic tube 10, and a metal base plate 13 attached at the upper end 9 of the pillar, to which 10 base plate 13 one or more container lashing fittings 6, 7 are fixedly connected.

The solvent extraction settler 1 is manufactured so that at the site of manufacture, such as in an engineering workshop, a plurality of self-supporting modules 3 is manufactured. Each module 3 has the exterior dimensions, strength and handling and securing means 4 conforming to ISO shipping container standards. The modules 3 are transported to the site of installation 20 as normal freight by transport equipment, such as trucks, trailers and container ships, capable of handling and transporting ISO compatible units. At the site of installation, pillars 5 are supported on the ground in a configuration according to the layout of 25 the intended settler. Finally, at the site of installation, the modules 3 are assembled into a complete settler 1 built of pillars 5, and the corner fittings 4 of the modules 3 are engaged to the container lashing fittings 6, 7 of the pillars 5.

30

It is obvious to a person skilled in the art that with the advancement of technology, the basic idea of the invention may be implemented in various ways. The invention and its embodiments are thus not limited to 35 the examples described above; instead, they may vary within the scope of the claims.

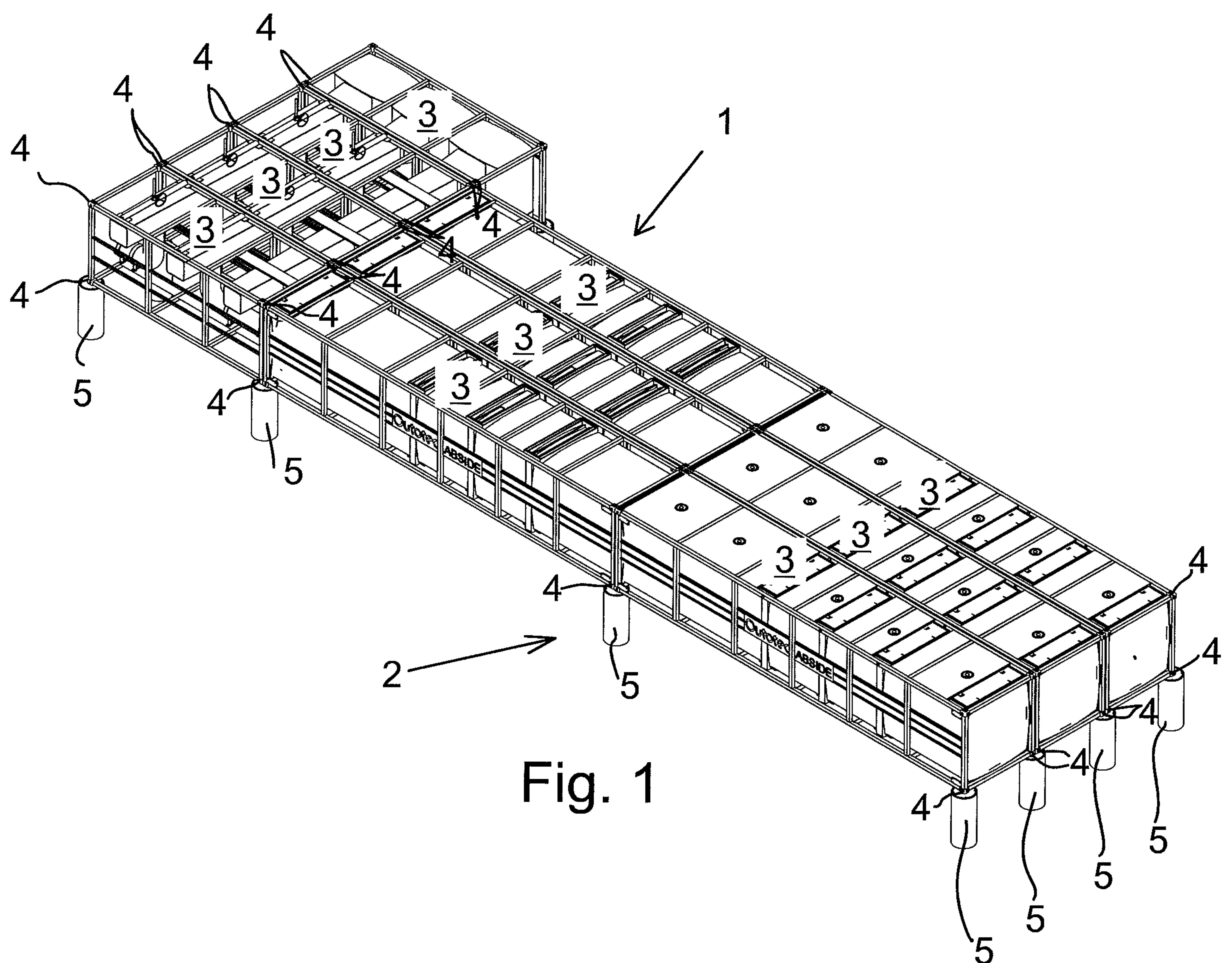
**CLAIMS**

1. A solvent extraction settler (1) comprising a foundation (2), characterized in that the solvent extraction settler (1) comprises self-supporting modules (3) each having the exterior dimensions, strength and corner fittings (4) conforming to shipping container standards; and that the foundation (2) comprises a plurality of pillars (5) on which the modules (3) are supported at a height above the ground level, thereby providing a space for piping and access below the settler, and that the pillars (5) comprise shipping standard compatible container lashing fittings (6, 7) to which the corner fittings (4) of the modules (3) can be connected.
- 15
2. The settler according to claim 1, characterized in that the pillar (5) comprises a lower end (8) which is supported on the ground, an upper end (9), and one or more container lashing fittings (6, 7) attached to the upper end (9) of the pillar (5).
- 20
3. The settler according to claim 1 or 2, characterized in that the container lashing fitting comprises a stacking cone (6).
- 25
4. The settler according to any one of the claims 1 to 3, characterized in that the container lashing fitting comprises a twist lock (7).
- 30
5. The settler according to any one of the claims 1 to 4, characterized in that the pillar (5) comprises one to four container lashing fittings (6, 7), depending on the number of corner fittings (4) to be connected onto the pillar.
- 35
6. The settler according to any one of the claims 1 to 5, characterized in that the pillar (5)

comprises a plastic tube (10), a concrete reinforcement (11) arranged inside the plastic tube (10), cast concrete (12) cast inside the plastic tube, and a metal base plate (13) attached at the upper end of the pillar, to which base plate one or more container lashing fittings (6, 7) are fixedly connected.

7. The settler according to any one of the claims 1 to 6, characterized in that the modules (3) and their corner fittings (4) conform to ISO shipping container standards; and that the container lashing fittings (6, 7) are ISO shipping standard compatible.

1/2



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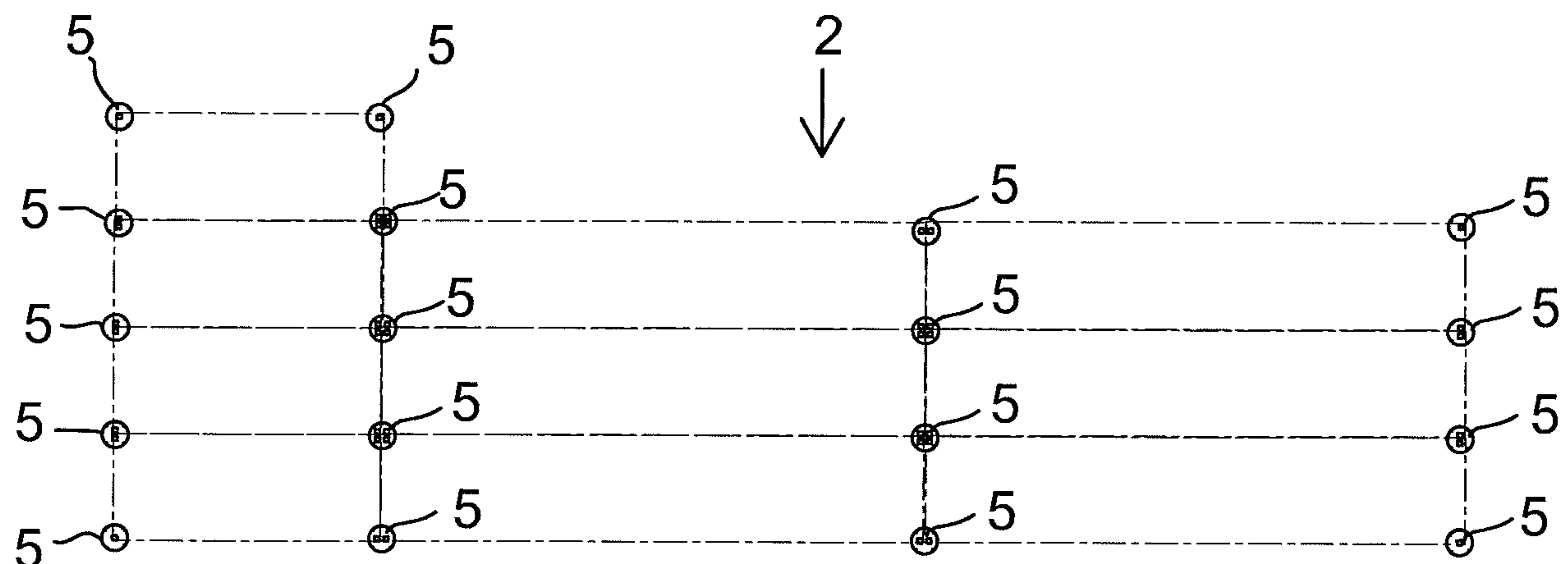


Fig. 2

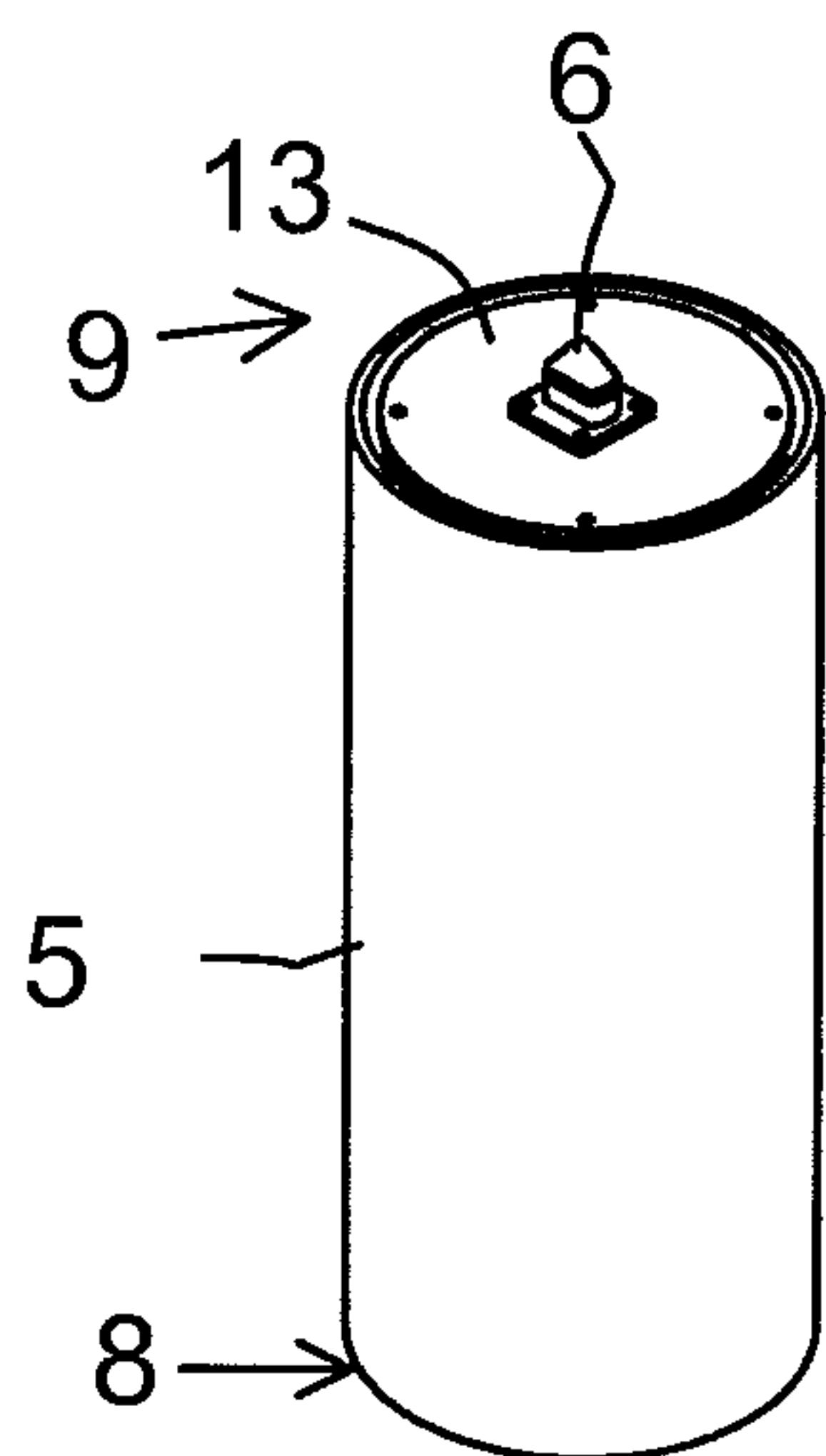


Fig. 3

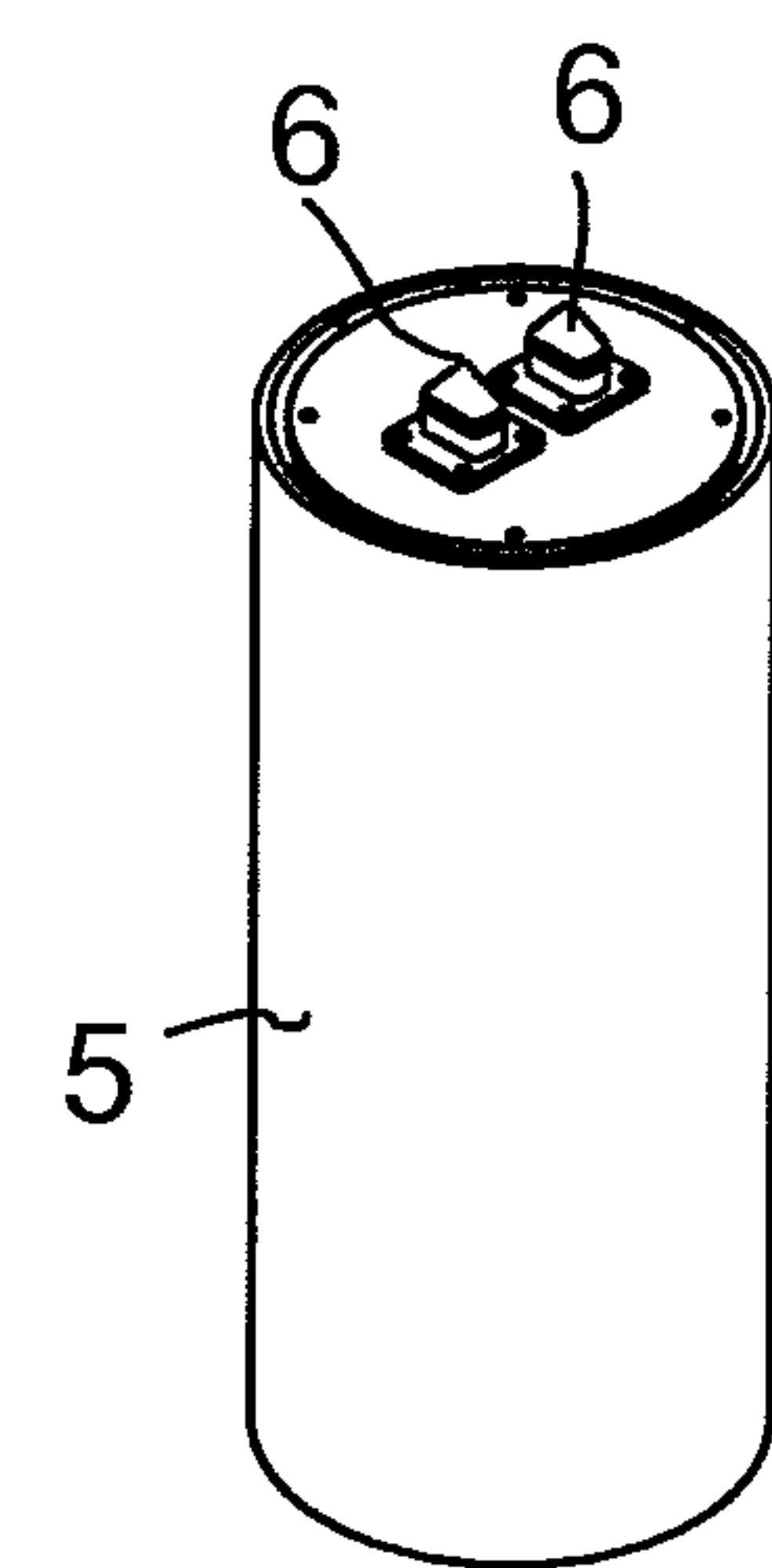


Fig. 4

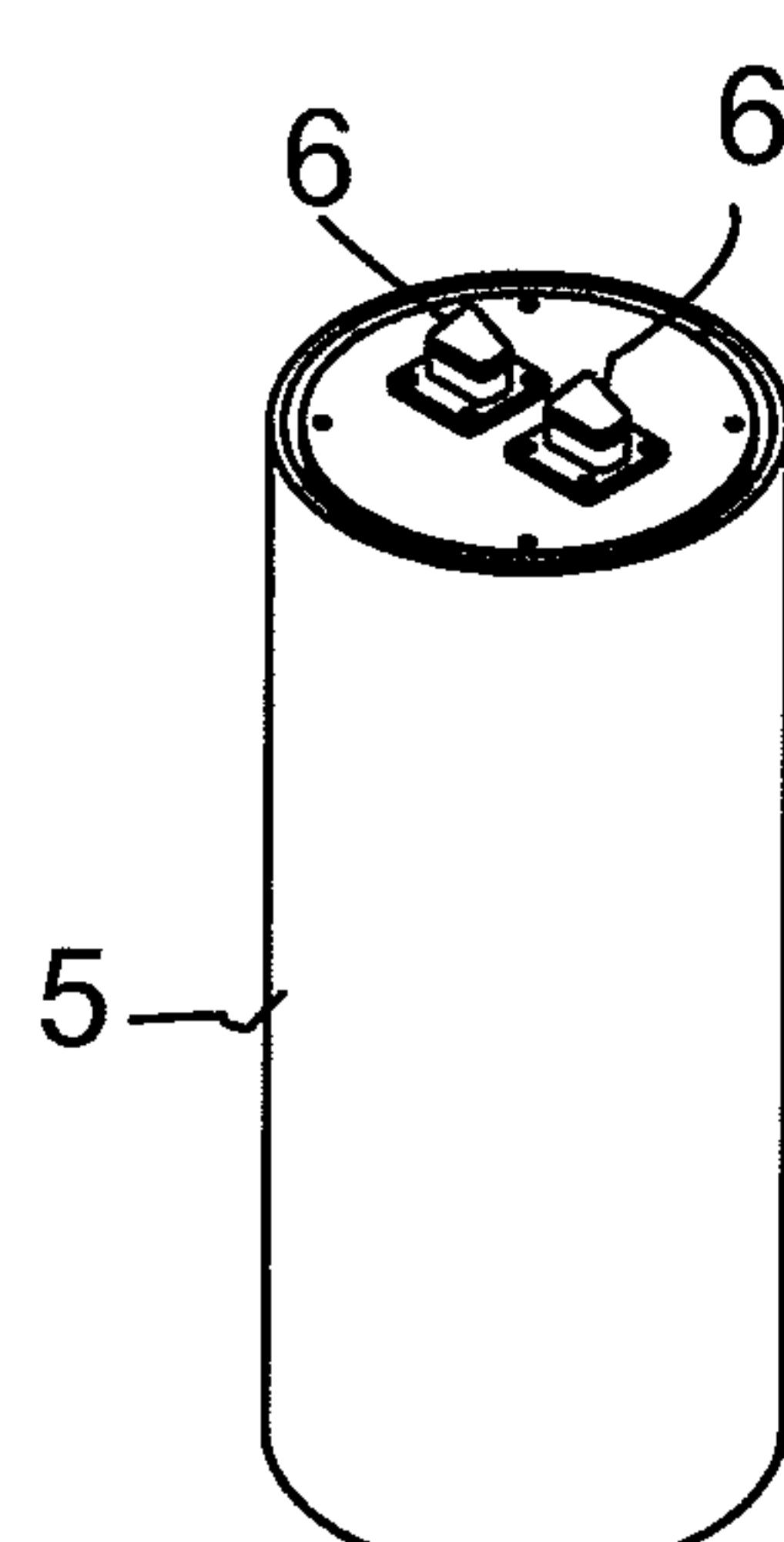


Fig. 5

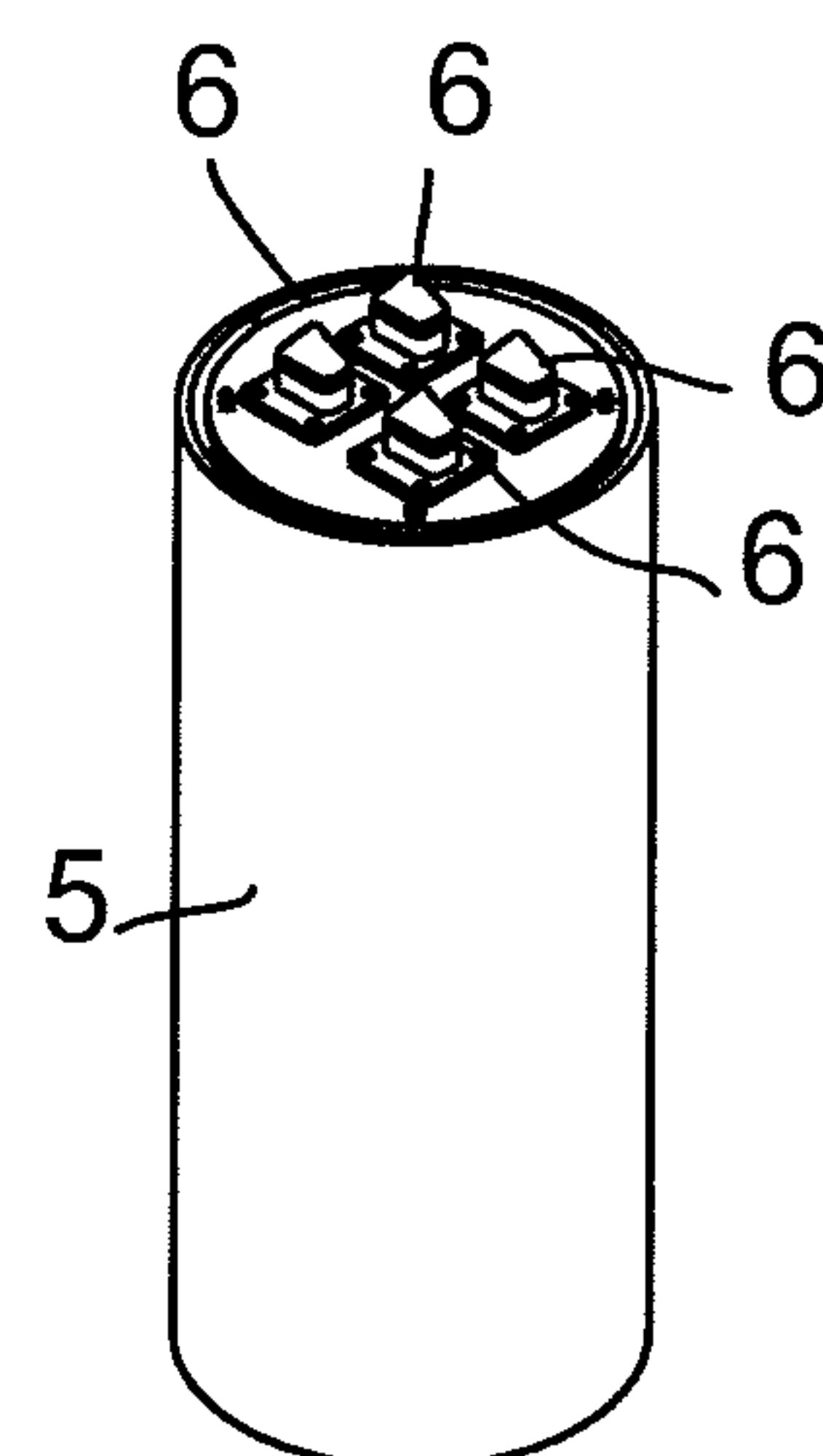


Fig. 6

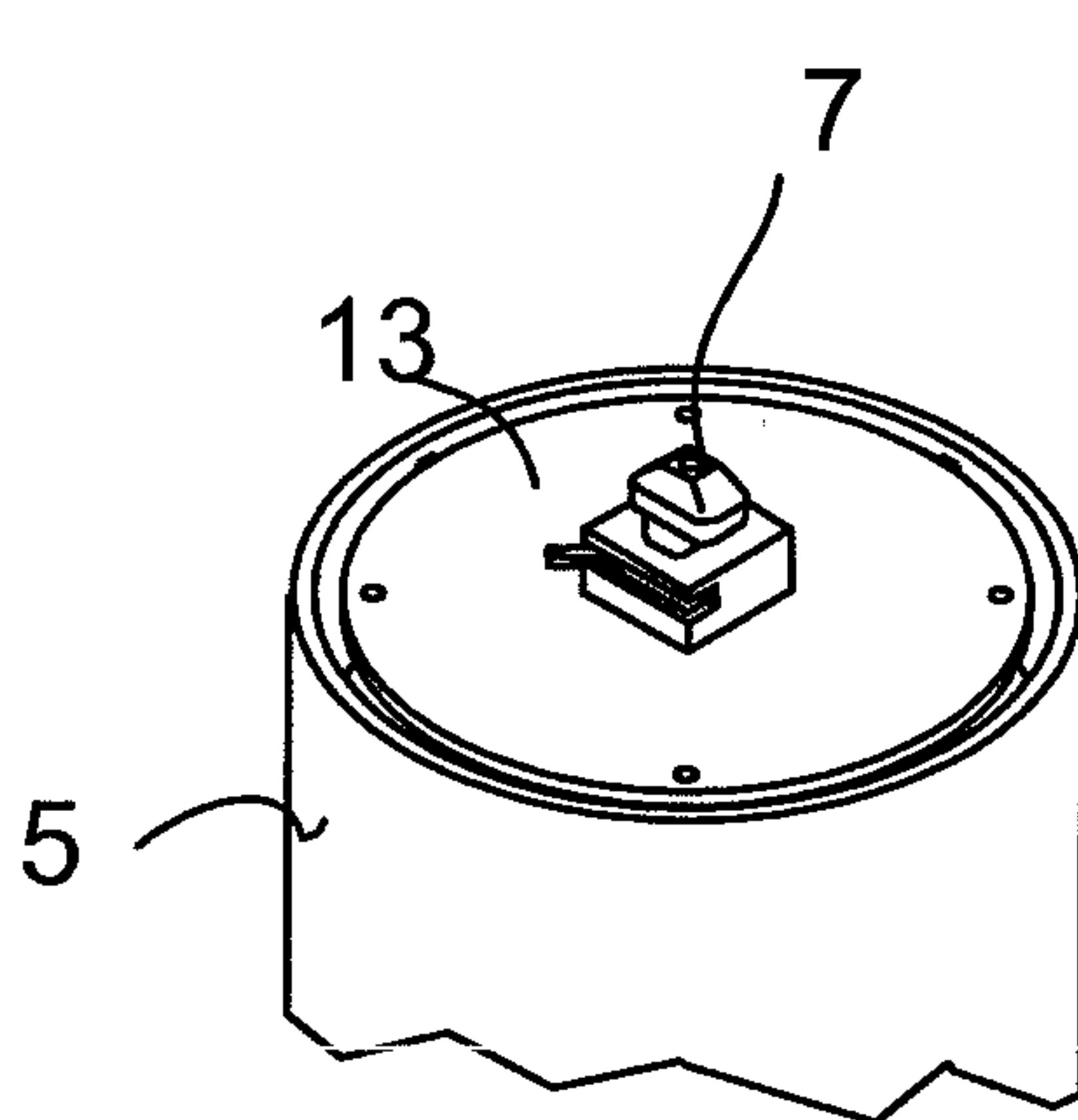


Fig. 7

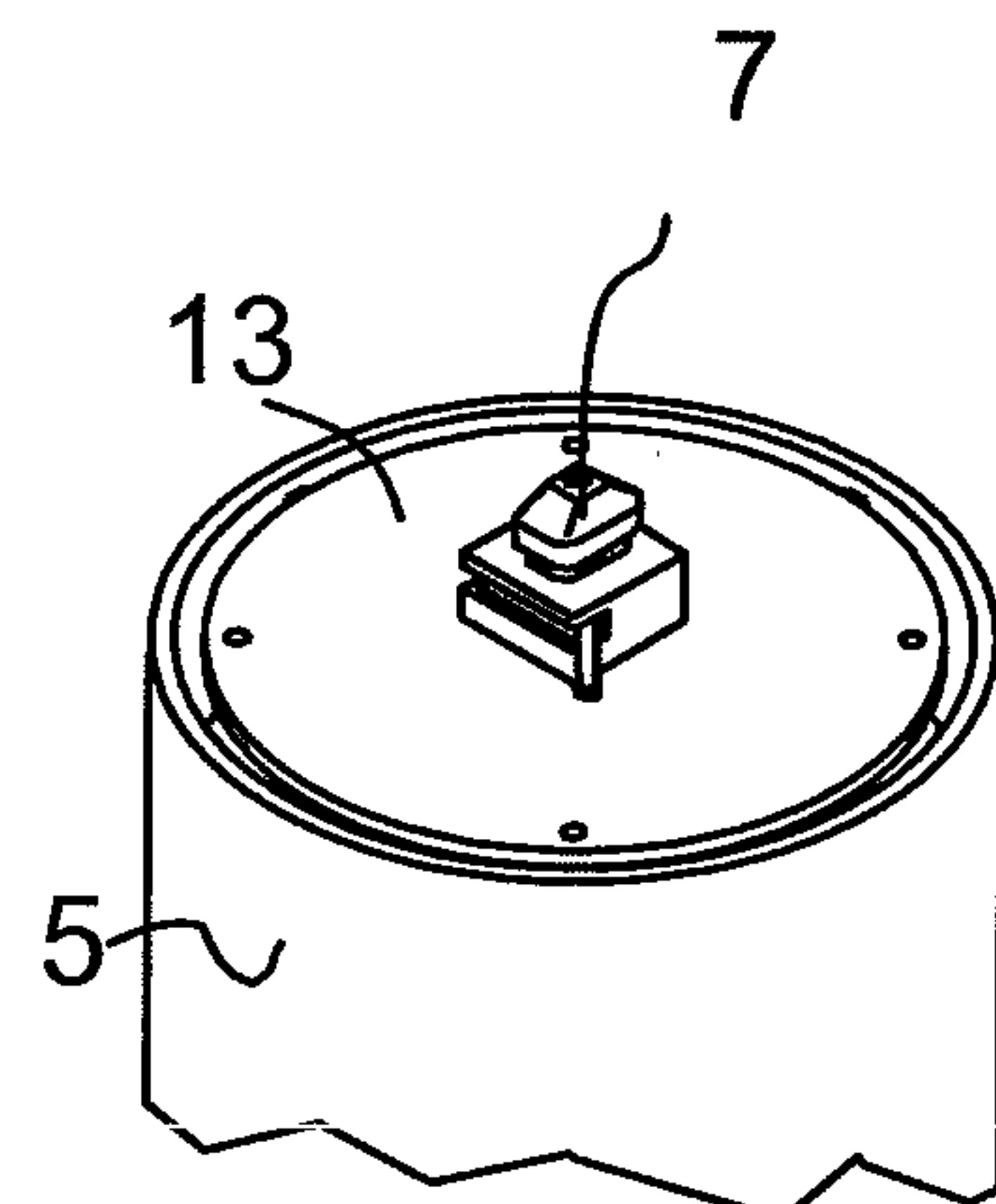


Fig. 8

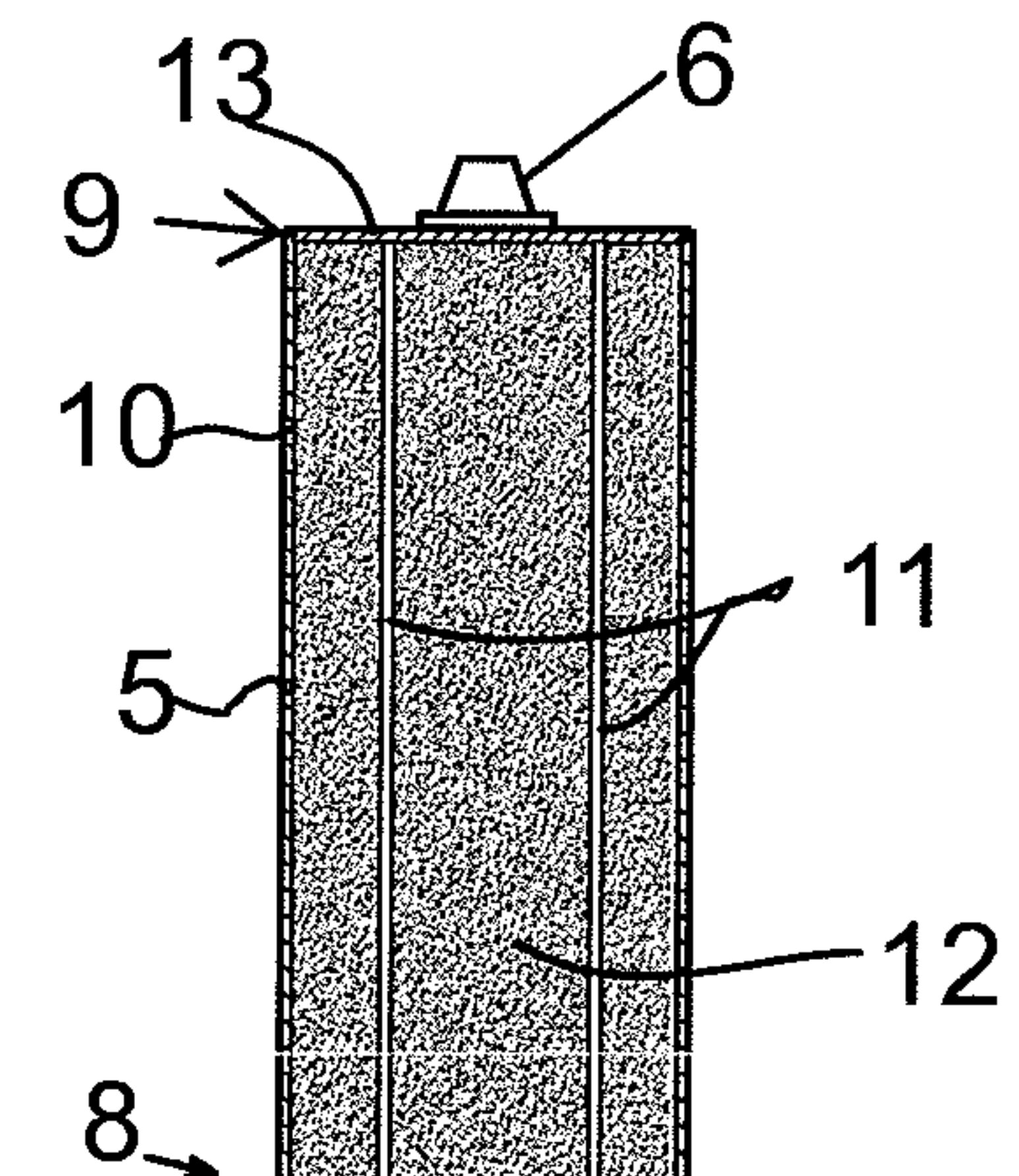


Fig. 9

