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(54) Title: THERMOPLASTIC MODULAR WATER TANK MADE OF TWO IDENTICAL COMPONENTS WITH QUADRANGULAR PYRAMIDAL SHAPE

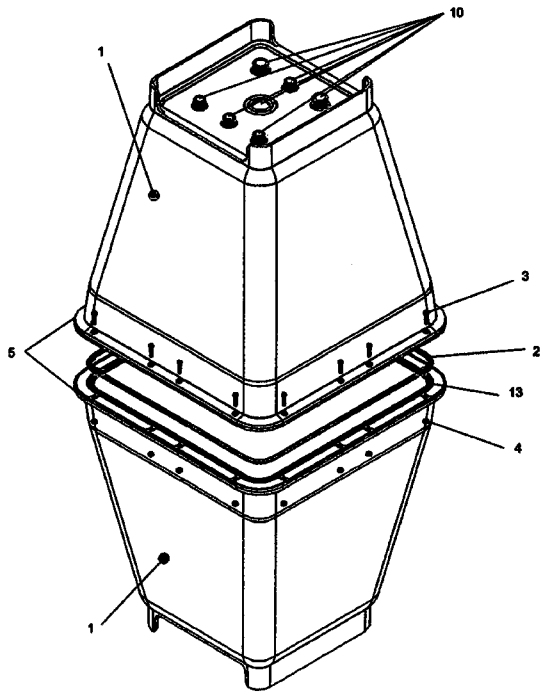


Fig. 1

(57) Abstract: Water tank made of thermoplastic material for the purpose of storing and heating water, consisting of modular components (1) of a shape that facilitates its moulding and de-moulding and enables multi- injection, continuous production processing, at high production rates. The water tank comprises two equal modular components (1) with a quadrangular pyramidal shape which are symmetrically coupled to each other by means of their side flanges (5), which flanges (5) are held flush against each other by means of an intermediate sealing joint (2) and subsequently tightened with screws (3) and nuts (4) which are symmetrically inserted into the flanges (5). If necessary, the said water tank' s storage capacity may be increased by means of coupling one or more tubular components (6) between the aforementioned two modular components (1).

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Published:

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

DESCRIPTION

NON-PRESSURISED THERMOPLASTIC MODULAR WATER TANK

This invention consists of a non-pressurised water tank made of a thermoplastic material for storage and optional heating of water or other liquids.

A variety of designs for this type of water tank are currently available in the marketplace. In general, such tanks are rectangular or cylindrical in shape and the most common type of water tank is made of metallic materials which, albeit resistant to high pressure, are rather costly to produce; in turn, non-pressurised water tanks made of polymers are also available but the features of their moulding requirements and manufacturing techniques do not enable high production rates to be achieved. In both instances, a number of technical issues concerning their storage and haulage arise on account of the fact that both types of water tanks are usually manufactured as a single container which is separately produced per each client's required size specifications as a function of the required capacity to be installed, with subsequently higher manufacturing, storage, and delivery costs.

There have been several attempts to overcome the aforementioned shortcomings; however, and as far as we are aware of, none of those attempts has either managed to successfully and fully eliminate the aforementioned disadvantages or is capable of meeting present challenges.

A growing awareness of the need to switch to alternative energy sources has lead to increasing rationalisation of consumption of scarce water resources. As a consequence, there is growing interest in tapping the advantages of catching wasted rainwater running down from roofs into gutters. Thus, once collected in

non-pressurised water tanks, such rainwater catchments may optionally be pumped into water supply facilities for subsequent use in water closets or for other uses, whether for household consumption or even for industrial use.

The advantages of using water catchment tanks to collect rainwater are further enhanced by the possibility of using the said water tanks as a means of storing water reserves over the summer months, which would be of particular interest in farming areas, while many urban areas, which are located in the interior of the country, are beset with low levels of water catchment as a consequence of low rainfall and consequently reduced levels of water reserves held in dams or water catchment basins, which may result in supply shortages to homes during peak consumption times, especially during the summer, and may equally benefit from the said water tank. In order to obviate such water supply shortages, it is common to find instances where water is collected in non-pressurised water tanks overnight or at dawn or during low consumption times, which water is then subsequently distributed at times when water reserves are insufficient to reach such homes, owing to excessive numbers of users or insufficient water pressure to supply particular homes.

In those instances, as well as in the instances originally referred to, existing water tanks presently on offer are, in general, of a shape and size which require construction of infrastructure of some import for their installation, a position which thereby foregoes the benefits of alternately installing simpler tanks in strategic locations which usually go unused in the home, such as, for instance, underneath roof trusses, interior sills or balconies, or other such architectural features where water can be stored in reserve or heated by means of heat exchangers for household consumption purposes.

Objectives of the Invention

The objective of this invention is to address the aforementioned shortcomings of the solutions currently in use while meeting market needs by means of supplying consumers with water reserve components together with their constituent parts in configurations that facilitate their moulding, thereby enabling the cost-effective and continuous mass production of a tank for storage of water, or for water storage and heating, which water tanks may only require a space of limited size for their installation, while allowing for their easy storage and haulage of their entire constituent parts from the factory to the end consumer thanks to their particular geometrical characteristics and constituent features, and which tanks may be directly assembled at the selected place of installation by the user, and which storage capacity may be expanded upon installation by means of adding one or more intercalary tubular components as a function of the desired application and selected positioning of the said water tank, which may be vertically or horizontally installed as a function of the features of the available space for installation.

It is also the intention of this invention to equally allow for simultaneous installation of one or more water tanks connected in serial or in parallel, with connection made possible by means of tubular parts fitted to preset inlet and outlet slots manufactured with standard thread which are sealed with caps; such threaded and sealed slots may alternatively be fitted with adequate joints for purposes of connecting other equipment to the water tank, such as, level control valves, excess flow exhaust valves, non-return valves, serpentine heat exchangers, thermostats, etc...

Short Description of Technical Drawings

For purposes of facilitating an understanding of the constituent parts of this invention while equally providing for a better understanding of its purpose, the invention is hereby described in detail by means of practical examples of its use and with reference to the attached technical drawings, which examples are merely provided for purposes of illustration and are in no way limiting of its scope of application, where:

Fig. 1 - Exploded isometric view of the water storage and heating tank depicted in its minimal configuration, consisting of only two conical components (1), which constituent parts and main assembling parts for purposes of its mounting are illustrated in the drawing;

Fig. 2 - Exploded isometric view of the water storage and heating tank depicted in an expanded configuration, consisting of two conical components (1) intercalated with a central tubular component (6), which constituent parts are illustrated in the position in which they are to be assembled, together with the necessary assembling parts;

Fig. 3 - Cross-sectional schematic view of the water tank depicted in the configuration referred to in Figure 1, but closed with duly tightened screws, showing some of the type of devices which may be fitted inside it, such as serpentine heat exchangers (15), a valve fitted with level control cut-off (16), a cold water inlet pipe (17) and hot water outlet pipe (18);

Fig. 4 - Cross-sectional schematic view of the water tank depicted in the configuration referred to in Figure 2, but closed off with duly tightened screws, depicting some of the equipment referred to in the preceding paragraph inside it;

Fig. 5 - Detail cross-sectional view of the coupling system connecting two modular components (1), which joints are identical for purposes of connecting a modular component (1) and a tubular component (6), illustrating a screw (3) and a nut (4) used for purposes of tightening the flaps (5) of two water tanks; the Figure equally illustrates, in detail, the zone of the water tank which is filled up with hardening thermoplastic material (9) and the profile of the external (8) and internal (7) vases which constitute the modular components (1);

Fig. 6 - Isometric view of the water tank assembled horizontally with two modular components (1), a tubular component (6), and a support footing (19);

Fig. 7 - Isometric view of the full disassembled water tank installation kit, ready for packaging;

Fig. 8 - Simplified isometric view of a water tank in its final configuration after having been set up at the place of installation including protection lid, locking belt (21), and support for fitting a command and control unit (11) associated, for instance, with the control system of a water heating system using solar thermal collectors, not depicted in the Figure;

Description of the Invention

This invention consists of a modular non-pressurised water tank for storing and heating water which consists of a set of modular components made of injected thermoplastic material, which modules may be connected as a function of desired storage capacity, and:

Due to the fact that this invention's water tank comprises modular components, its production does not depend on the size specification of the water tank itself on account of the fact

that central tubular components (6) can be added to it, as evidenced further on, for purposes of increasing storage when assembling such water tanks by means of intercalating one or more of the said tubular components (6) between the said water tanks, thereby simplifying the entire expansion process while minimising space requirements for the manufacturing, storage, and transport of such tanks, with consequent reduction in production costs.

In order to better describe the object of this invention, as well as demonstrate its ability to provide increased technical benefits, Figure 1 illustrates two identical modular components (1), one of which operates as the top part of the water tank while another operates as the bottom part thereof, which, subsequent to their joining by means of a set of coupling and tightening joints (2, 3, and 4), constitute a water tank; the said coupling and tightening joints consist of a set of screws (3) and tightening nuts (4) set along the perimeter of the side flaps (5) of the said modular components (1), and, when tightened, the said screws (3) compress the said sealing joint (2) firmly into the hollow section of a drain (13) which runs along the entire perimeter of the said side flaps (5).

Further to having been specifically designed to facilitate production and provide users with the means to easily and intuitively assemble them, the modular components (1) which form the water tank incorporate a set of adapters (10) built with standard thread for purposes of enabling connection of technical devices through them, which devices may be fitted inside the water tank or be connected to the said tanks through joints, and, due to the fact that the modular component (1) which constitutes the upper half of the water tank is identical to the component which constitutes its lower half, the possibility of connecting such devices or of joining interconnected water tanks through the said threaded adaptors (10) is thereby doubled, i.e., such connections may be fitted to either the top and bottom of the water tank when

mounted vertically, or to both sides of the water tank, when mounted horizontally; moreover, the threaded adapters (10) are sealed internally with caps (no. 12 of Figures 3 and 4), which caps are inserted during the manufacturing of the modular components (1) but may be broken when assembling the water tank, retaining only the unnecessary threaded adapters capped, as required by users. Nevertheless, should such sealing adapters be accidentally broken, or should it be necessary to reseal them again after having broken them, the said adapters may easily be recapped once more with any standard sealing cap used in plumbing applications.

In addition to illustrating two identical modular components (1) forming the top and bottom parts of the water tank, Figure 2, which is otherwise identical to Figure 1, illustrates a central tubular component (6) which application allows users to increase the storage capacity of the water tank; the said central tubular component (6) is connected to the modular components (1) by means of a set of tightening screws (3) and nuts (4) and, in the instance depicted in Figure 2, by two sealing joints (2) for purposes of ensuring their watertight connection to the modular components (1) that form the top and bottom parts of the water tank.

Each of the modular components (1) forming the top and bottom parts of this invention's water tank, (as can be noted in Figures 3 and 4 and in the detail illustration depicted in Figure 5)) consists of an inner vase (7) and an outer vase (8), both vases being made of injected thermoplastic material, which are separated by an intermediate layer of thermohardening insulating material (9) for purposes of reducing heat loss, for which insulation is also injected. Since the inner vase (7) is first separately produced, it may be made of thermoplastic material other than the material employed to make the outer vase (8) in order to thereby suit the specifications of particular applications, by namely supplying the inner vase (7) in a

plastic material of a quality or composition that is adequate to specifications applicable to liquids other than water or to granulate solids to be stored in the water tank.

As concerns Figure 3, as described above in conformance to the invention, it illustrates a water tank configuration that is suitable for storage and heating of water, consisting of a pair of identical modular components (1) made of thermoplastic material which are symmetrically joined by a set of screws (3) and tightening nuts (4) set along the perimeter of a built-in side flap (5) running along the perimeter of the modular components (1); by tightening the said screws, the sealing joint (2) is held flush against a threaded drain (no. 13 of Fig. 1) which is built into the inner perimeter of the side flap (5).

The said modular components (1) are fitted with threaded adapters (10) for purposes of enabling connection of heating devices, electrical resistance devices (14), or serpentine heat exchangers (15) fitted inside the water tank, together with safety devices, namely a level control cut-off and cold water inlet valve (16), a cold water inlet pipe (17), a hot water outlet pipe (18), and a temperature control device, which are not illustrated in the Figure.

The said tubular component (no. 6 of Figures 2, 4, 6, 7, and 8) is to be fitted between any two modular components (1) with a view to increase the storage capacity of the said water tank, for which purpose such components may be joined to each other or, alternatively, two, three, or more of the said components may be joined and subsequently intercalated in order to thereby reach a desired level of storage capacity; moreover, the ends of the said tubular component (6) feature two built-in flaps (5) which are precisely identical to and absolutely symmetrical with the flaps of modular component (1), for which purpose they are, therefore, fitted to the said components and tightened in the

exact same manner by means of a set of tightening screws (3) and nuts (4) and two sealing joints (2).

As is the case with component (1), the said tubular component (6) is also manufactured as a double-walled modular component, inside of whose walls thermal insulation is injected, and is similarly manufactured by a multi-injection, continuous process at high production rates; furthermore, alternative components (6) fitted with threaded mouths (10) on one of their faces may be manufactured according to specifications without prejudice to or alteration in the aforementioned manufacturing process.

The minimal configuration of a water tank includes:
a set of identical modular components (no. 1 of Figures 1 and 3) of a quadrangular pyramidal shape with sectioned vertices cut in such a way as to form a flat quadrangular face with rounded corners, fitted with built-in raised flaps on two opposite sides to support and protect its sealed inlets (no. 10 of Figures 1 and 3); the said modular components (1) are separately made of thermoplastic material being joined upon assemblage of the water tank by means of holding flush their high-resistance peripheral flaps (no. 5 of Figures 1 and 3) to each other, which flaps, when tightened by means of screws (no. 3 of Figures 1 and 3) and nuts (no. 4 of Figures 1 and 3), compress a sealing joint (no. 2 of Figures 1 and 3) between them, which joint, in turn, fits into the hollows (no. 13 of Figures 1 and 3) of a drain cut into the interior of the said tightening flaps, running along their entire periphery, in order to thereby guarantee watertight connection between modular components (1) and thereby form a simple water tank of minimal storage capacity. Nevertheless, it is possible to increase the storage capacity of the said water tank of minimal storage capacity by means of intercalating a square tubular component (no. 6 of Figures 2 and 4) between water tanks, for which purpose the said component features built-in flaps that are identical to the flaps of component (1).

When delivered to end users in a condensed package (in conformance to Figure 7), the said water tank which constitutes the object of this invention is ready for assemblage and, in its minimal configuration, is delivered inclusive of the following items: two components of type (1), one component of type (6), two square joints (2), 16 screws (3) and 16 nuts (4), one serpentine heat exchanger (no. 15 of Figures 3 and 4), two support footings for purposes of mounting the water tank horizontally (no. 19 of Fig. 6), and an accessories box containing all necessary assemblage accessories (20), including screws, applicable tightening screw driver, and other accessories.

In conformance with the object of this invention, Figure 8 illustrates a water storage and heating water tank made of thermoplastic material mounted in its final configuration for provision of larger storage capacity, including a closing lid and a command and control unit (11) inserted into its respective attachment bearing (21), which control unit (11) allows users to thereby manage the operation of water heating systems, such as, for instance, heating systems based on thermal solar collectors, which are not illustrated in the Figure.

In addition to its conformance to technical designs that feature a geometric configuration capable of providing for easy moulding and de-moulding and for multi-injection production processing of its constituent parts, this invention provides the following additional technical benefits:

a) Cost-effective production deriving from the employment of multi-injection moulding under continuous production processing, at high production rates;

b) Ease of handling, storage, packaging, and haulage of the unassembled components of the water tank, thereby facilitating production logistics at and from the factory to end users;

c) Assemblage of the water tank may be easily and intuitively accomplished by end users at the selected place of installation;

d) When assembling the said water tank, its storage capacity may be expanded by means of optionally adding (or not) at least one tubular component which is an integral part of the water tank in its minimal configuration;

e) In order to maximise the storage capacity of the water tank and the potential of the place of installation in terms of available space, the said water tank may be vertically mounted, in which case storage capacity may be expanded height wise by intercalating the required number of tubular components between modular components, or it may be horizontally mounted, in which case storage capacity may be expanded lengthwise by means of employing connecting tubular components, as would be the case with its installation in places which are long in length but low in height, such as underneath roof trusses, for instance;

f) The inlets and outlets to conduct the liquids stored inside the said water tank are standardised, being fitted with preset threaded sections which are sealed with caps during production but may be optionally left intact or, alternatively, broken for use, for which purpose they may be connected by means of standardised piping, thereby connecting one or more water tanks to each other, either stacked vertically or horizontally, or for purposes of fitting other equipment to control the filling up, level, heating, or emptying of the said water tank.

Further to the aforementioned benefits and advantages concerning water storage and heating, this invention consists of a versatile modular solution whereby the said water tank may be used as a simple reservoir for storage of a variety of liquids or, for instance, granulates.

TERMINOLOGY

1 - Modular component
2 - Sealing joint
3 - Tightening screws
4 - Tightening nuts
5 - Built-in side flap for connection and sealing
6 - Central tubular component
7 - Inner container of the modular component (1)
8 - Outer container of the modular component (1)
9 - Thermal insulation of the modular component
10 - Threaded connecting adapters
11 - Control and command unit
12 - Caps to seal threaded connection adapters
13 - Slot for insertion of the sealing joint
14 - Electrical resistance for heating water
15 - Serpentine heat exchanger
16 - Level control and cold water inlet cut-off valve
17 - Cold water inlet pipe
18 - Hot water outlet pipe
19 - Support footing for horizontal mounting
20 - Assemblage accessories box
21 - Command and control unit attachment base

CLAIMS

1. NON-PRESSURISED THERMOPLASTIC MODULAR WATER TANK for purposes of catching, storing, and heating sanitary water or other liquids or for storing granular solids, being adequate for mounting in balconies, under roof trusses, in interior patios or other such standardised architectural features of homes, and characterized by separate modular components made of thermoplastics produced by injection moulding which fit into each other in order to provide minimal storage space and transport requirements, which are supplied inclusive of all the necessary components, parts, and accessories for easy and intuitive assemblage and mounting at the selected place of installation, which installation may be accomplished by means of vertically or horizontally positioning the said water tank, which tank, in its minimal configuration, consists of two identical components manufactured in a quadrangular pyramidal shape (1) which are symmetrically joined by means of their peripheral flaps (5), which flaps are held flush against each other by means of a sealing joint (2) and subsequently tightened by a set of screws (3) and bolts (4) which are symmetrically screwed into the said lateral flaps (5), and which water tank's storage capacity may be expanded as required by means of coupling one or more tubular components (6) between the modular components (1) of the said water tank storage system.

2. NON-PRESSURISED THERMOPLASTIC MODULAR WATER TANK, which, in accordance with Claim 1, characterized by two identical modular components manufactured in the shape of conical and pyramidal quadrangular containers which are adequate for purposes of ensuring cost-effective, multi-injection moulding and de-moulding of all components at high production rates, with all components being produced with inner walls (7) and outer walls (8), which inner walls may be produced with plastic materials other than the material used to produce outer walls and which space between the said walls is filled up with injected insulation material (9).

3. NON-PRESSURISED THERMOPLASTIC MODULAR WATER TANK, which, in accordance with Claims 1 and 2, is characterised by the fact that the modular component (1) includes a set of threaded adapters (10) which are moulded and incorporated into the modular component (1) for purposes of enabling the fitting of connections to inlet and outlet water pipes or connections to other devices inserted inside the said tanks, or to the command and control units of the said devices (11) fitted to the exterior of the said water tank, and which threaded adapters (10) are sealed with caps (12) during their manufacturing but which (caps) may be broken when assembling the water tank without prejudice to their standard threading, while unused adapters may remain sealed with the said caps, and which the face to which the said adapters (10) have been fitted to is, in turn, protected with two lengthened sections which protrude from the opposed sides of the said modular component (1).

4. NON-PRESSURISED THERMOPLASTIC MODULAR WATER TANK, which, in accordance with Claims 1 and 2, is fitted with a modular component (6) characterised by being equally manufactured as a single unit on the same basis as component (1), which features inner walls and outer walls and which inner walls may be produced with plastic materials other than the material used to produce outer walls and which space between the said walls is filled up with injected insulation material (9), and which component (6) is configured in a tubular quadrangular shape of a perimeter equal to the perimeter of the mouth of component (1) and equally features a flap on both sides which matches the flap of component (1) precisely and, in addition, features grooves forming a hollow drain (13) into which a perforated joint (2) is inserted for purposes of tightening it by means of the said screws (3) and bolts (4), thereby guaranteeing that it is fully watertight.

5. NON-PRESSURISED THERMOPLASTIC MODULAR WATER TANK, which, in accordance with the former Claims, is characterised by its ability to be assembled by its end user at a selected place

for installation, upon which assemblage such users may fit it with whichever equipment they may deem fit to install inside the water tank and may optionally increase the storage capacity of the water tank, or not, subject to their specific requirements and availability of space at the selected place for installation, by means of either opting to position the water tank vertically, which option allows them to increase its storage capacity by means of stacking complementary tubular components (6) on top of each other, or by opting to position the water tank horizontally, which option allows them to increase its storage capacity by means of adding the said tubular components alongside the water tank, for which purpose adequate support footings (19) are supplied as an integral part of the basic product kit and which footings are to be fitted to the lateral extensions of the tops of the modular component (1).

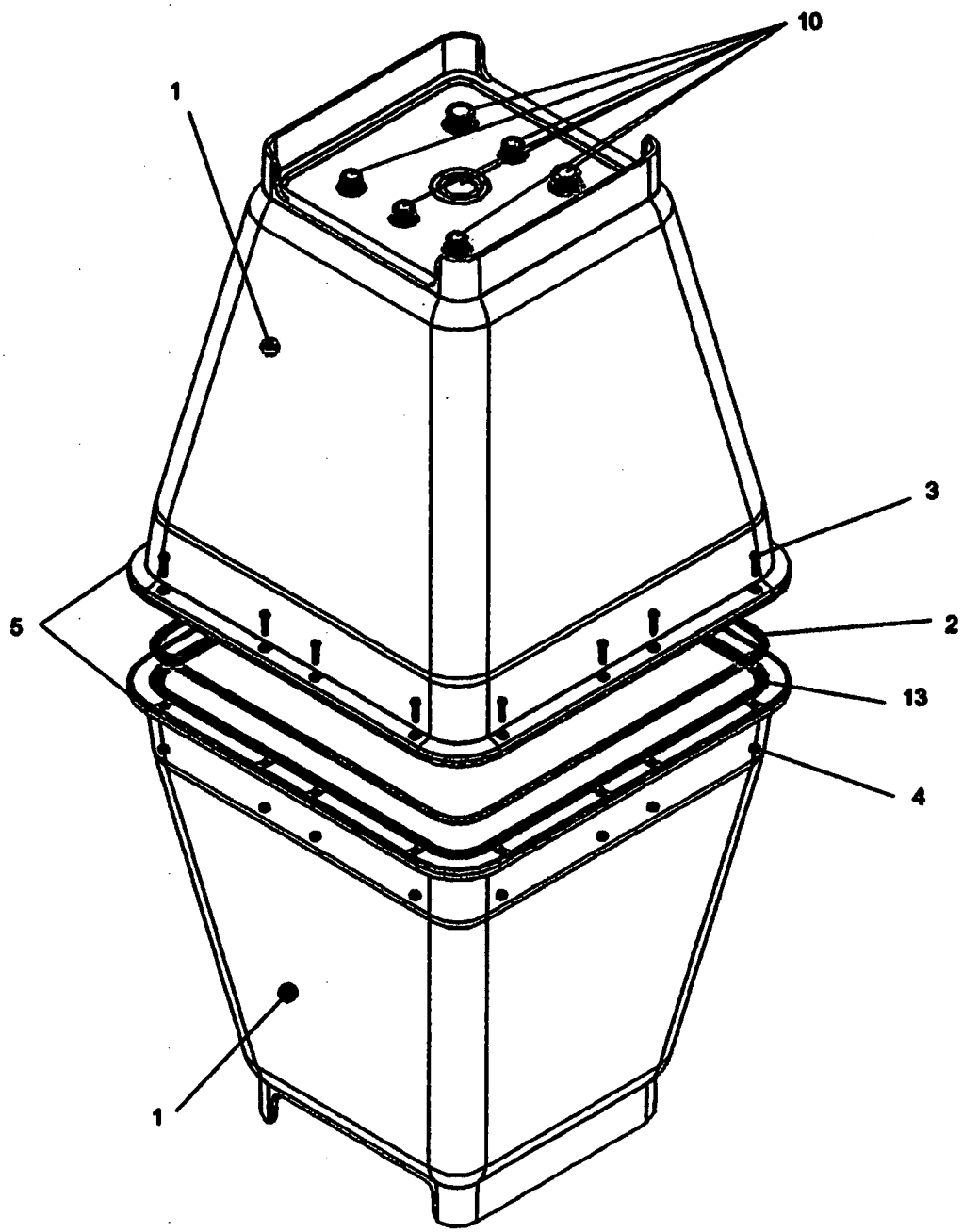


Fig. 1

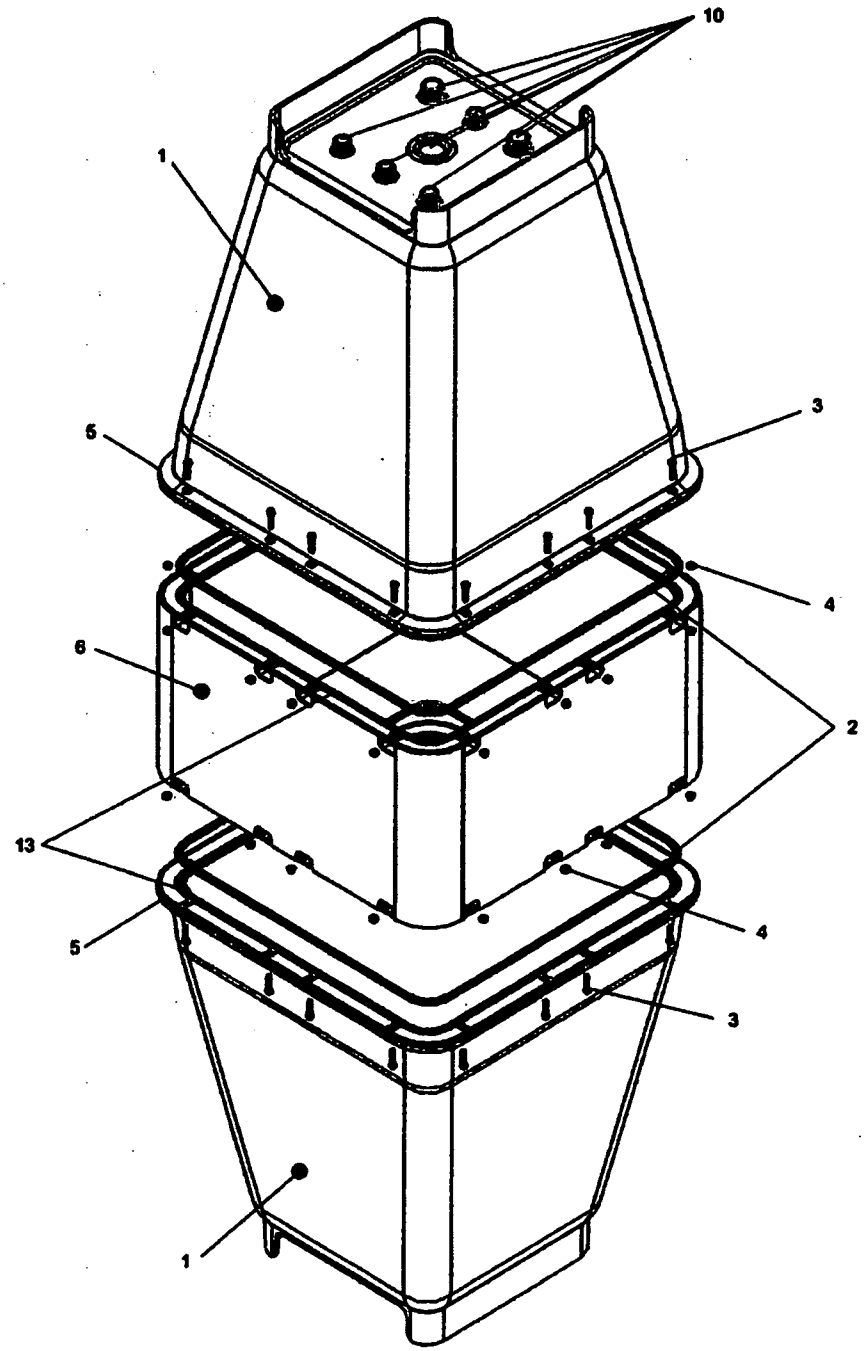


Fig. 2

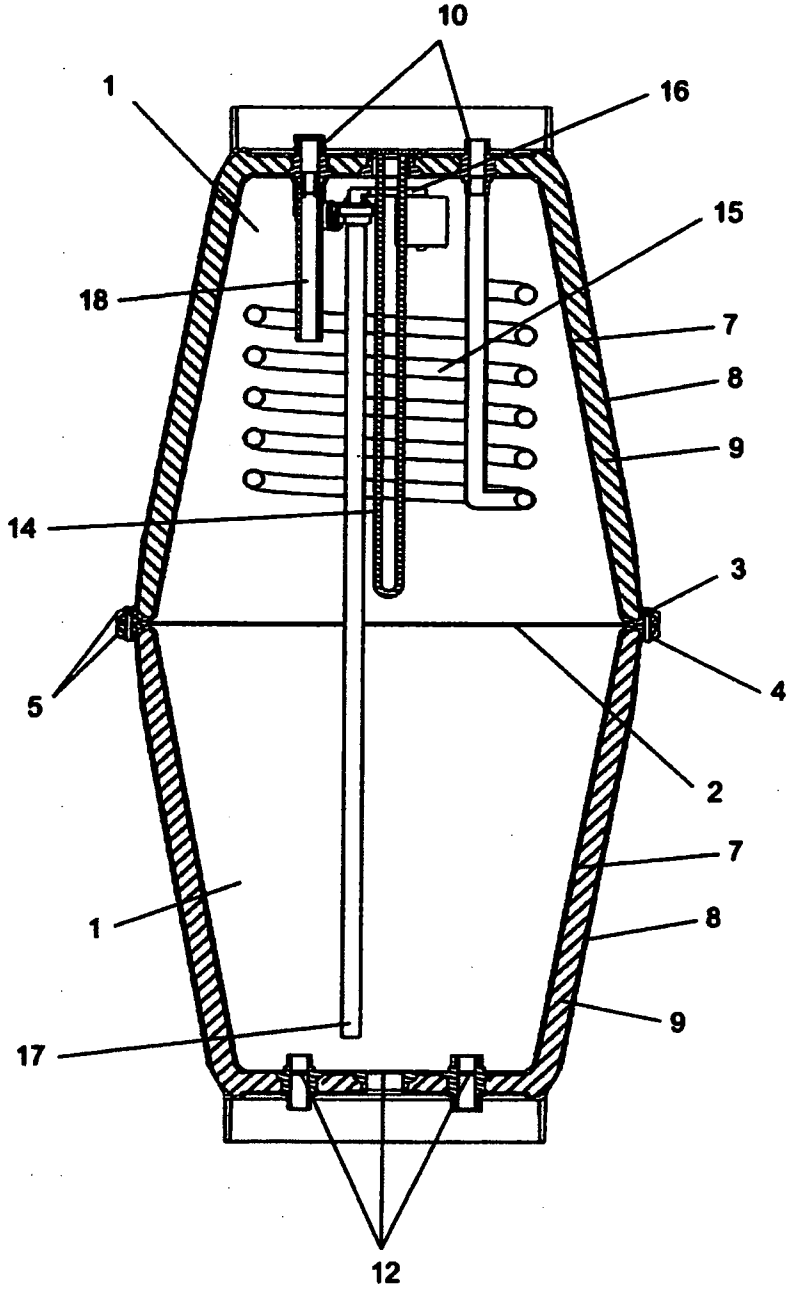


Fig. 3

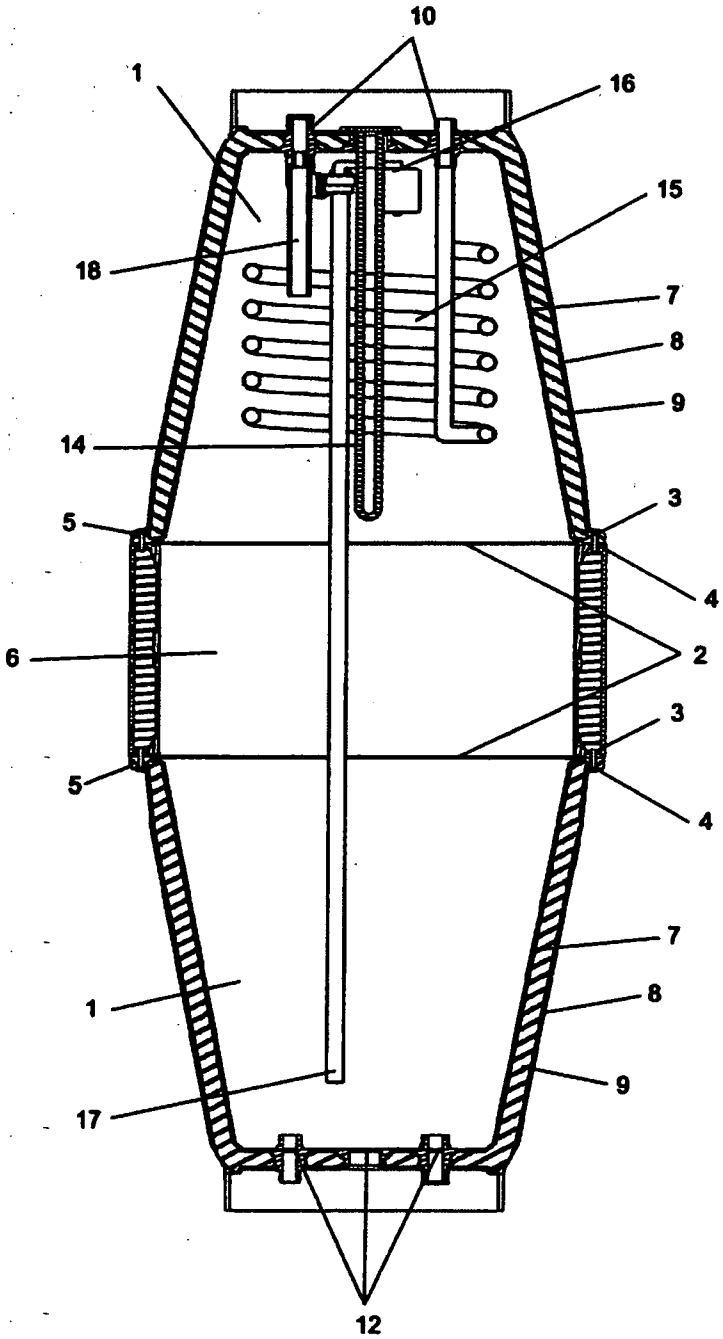


Fig. 4

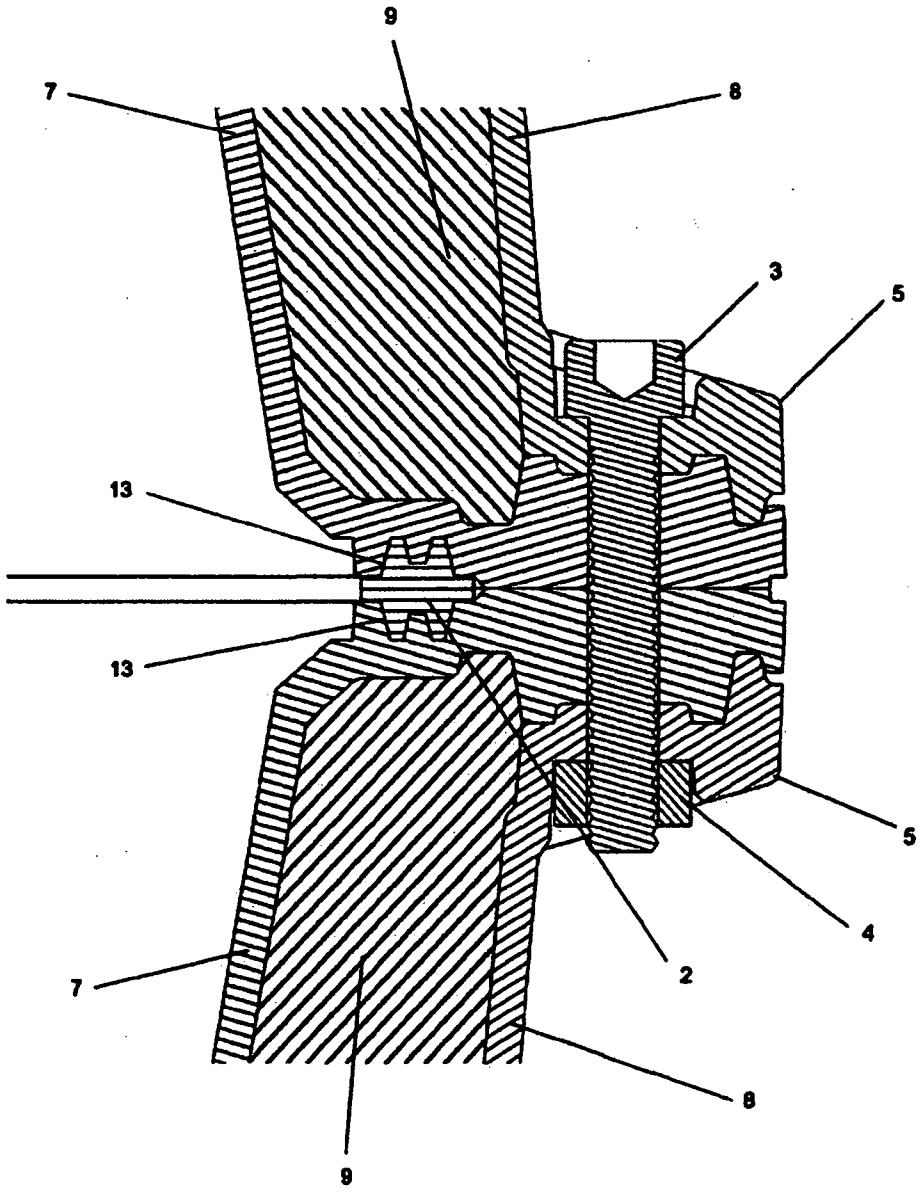


Fig. 5

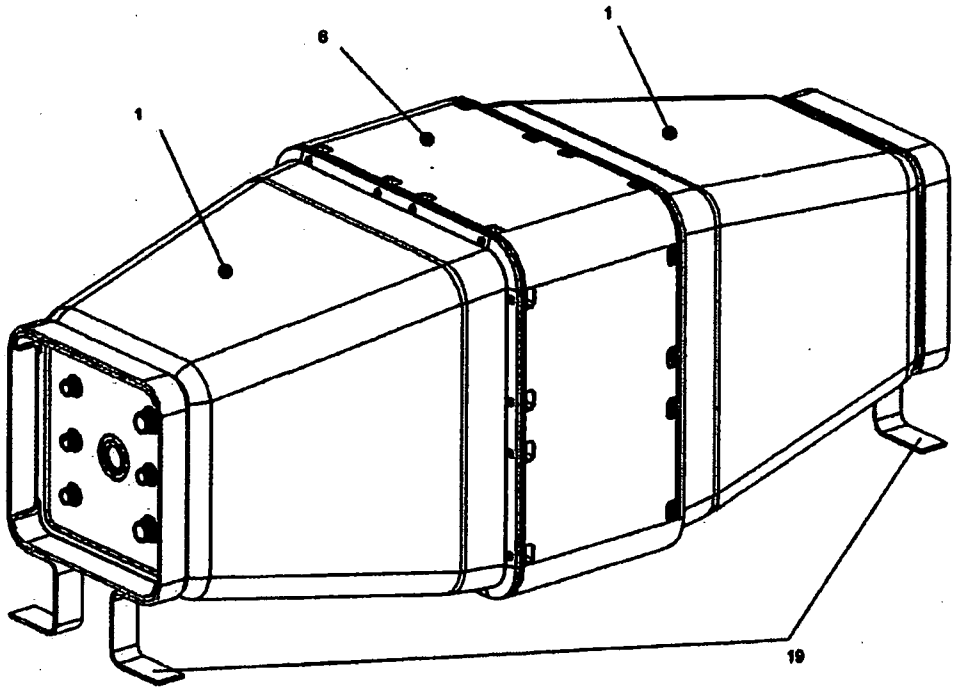


Fig. 6

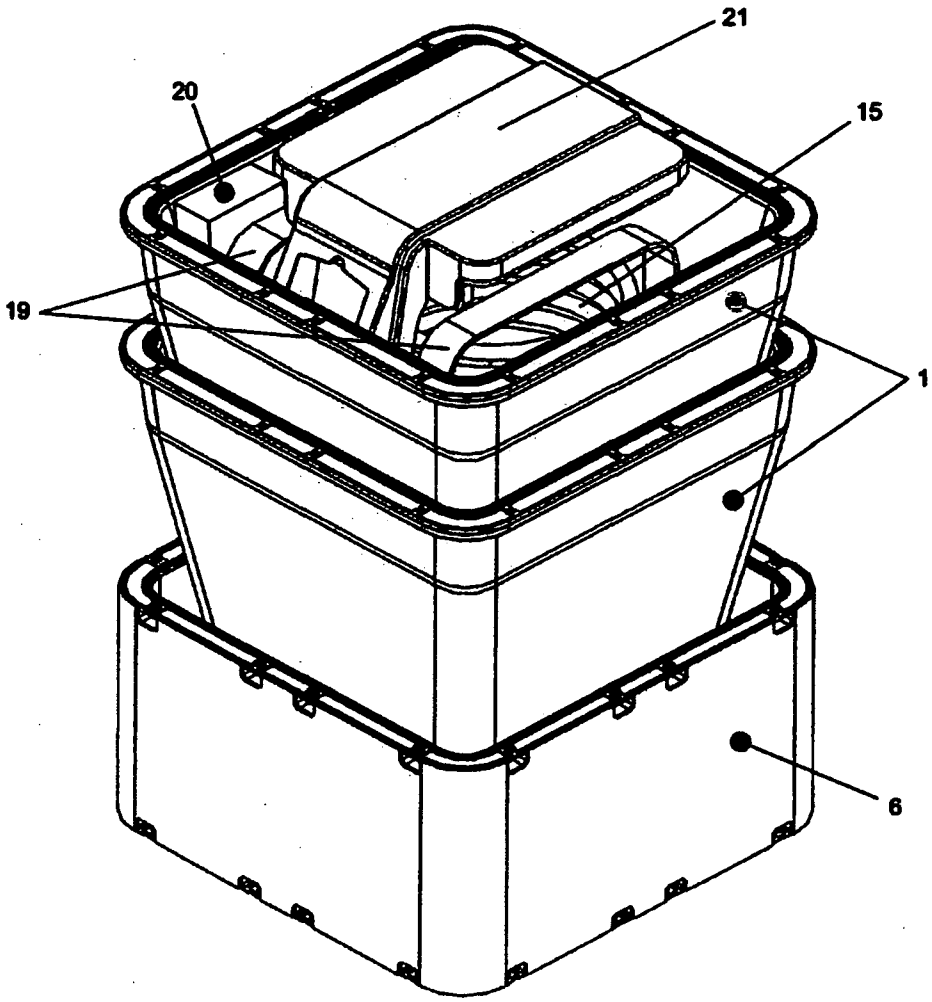


Fig. 7

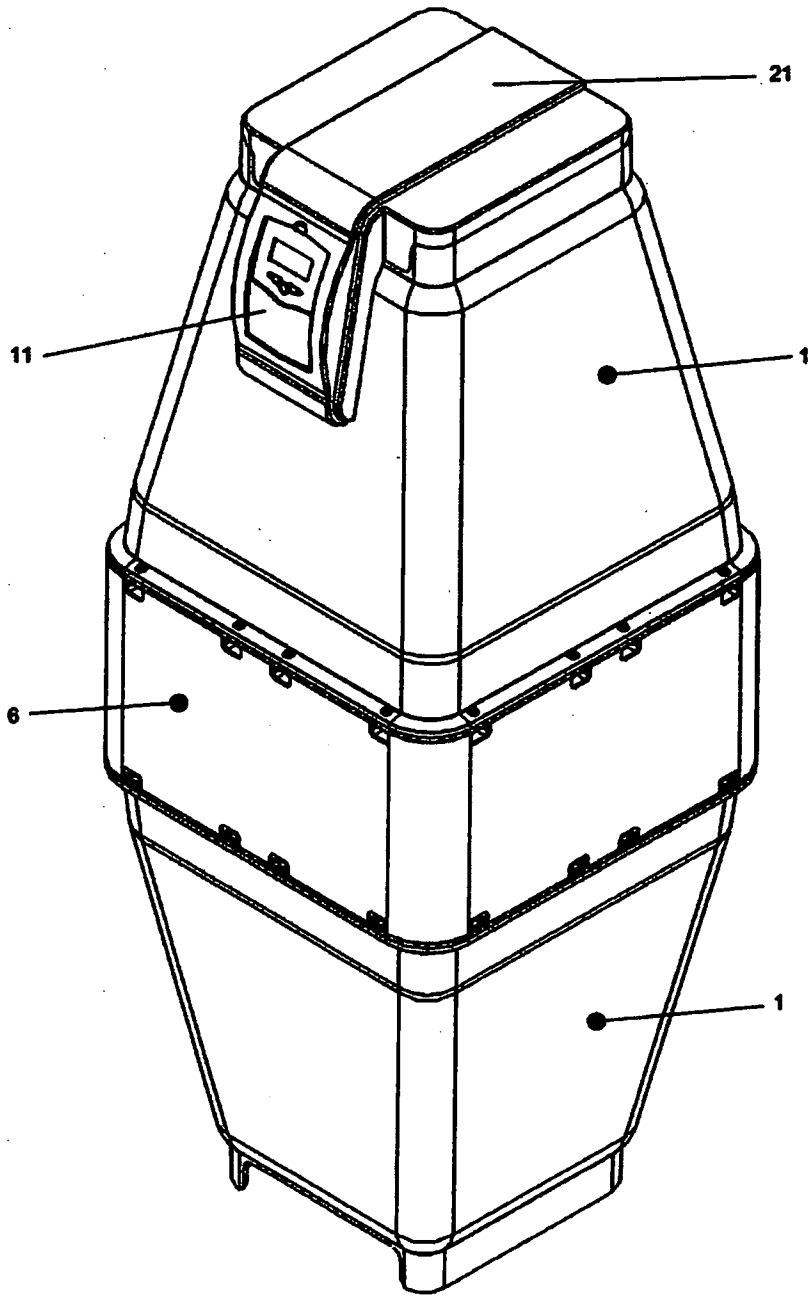


Fig. 8

INTERNATIONAL SEARCH REPORT

International application No
PCT/PT2009/000011

A. CLASSIFICATION OF SUBJECT MATTER
INV. E03B3/03 B65D11/16 B65D88/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E03B B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	DE 94 16 968 U1 (DUROTHERM KUNSTSTOFFVERARBEITU [DE]) 15 December 1994 (1994-12-15) page 4, paragraph 2	1 2,4,5
X	DE 295 03 546 U1 (KOBER AG [DE]) 14 June 1995 (1995-06-14) the whole document	1
Y	DE 87 04 982 U1 (RHEIN-CONTI KUNSTSTOFF-TECHNIK GMBH, 6900 HEIDELBERG, DE) 27 May 1987 (1987-05-27) the whole document	2
Y	EP 1 533 252 A (ZETAPLAST S R L [IT] ZETAPLAST S P A [IT]) 25 May 2005 (2005-05-25) the whole document	4,5

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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Date of the actual completion of the international search	Date of mailing of the international search report
20 May 2009	03/06/2009

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Fax: (+31–70) 340–3016	Geisenhofer, Michael

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INTERNATIONAL SEARCH REPORT

International application No
PCT/PT2009/000011

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 43 25 409 A1 (KRUK ROBERT [DE]) 2 February 1995 (1995-02-02) the whole document	4
Y	US 5 730 179 A (TAYLOR JONATHAN DWAYNE [US]) 24 March 1998 (1998-03-24) the whole document	5
A	EP 0 870 877 A (GRAF OTTO PETER [DE]) 14 October 1998 (1998-10-14) the whole document	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/PT2009/000011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 9416968 U1	15-12-1994	AT 950 U1	26-08-1996
		BE 1008443 A7	07-05-1996
		FR 2725963 A3	26-04-1996
		NL 1001462 C1	24-04-1996
DE 29503546 U1	14-06-1995	NONE	
DE 8704982 U1	27-05-1987	NONE	
EP 1533252 A	25-05-2005	AT 424357 T	15-03-2009
DE 4325409 A1	02-02-1995	NONE	
US 5730179 A	24-03-1998	NONE	
EP 0870877 A	14-10-1998	AT 194861 T	15-08-2000
		AU 727030 B2	30-11-2000
		AU 6075098 A	15-10-1998
		BR 9801019 A	14-12-1999
		CA 2234378 A1	11-10-1998
		DE 59702051 D1	24-08-2000
		ES 2148868 T3	16-10-2000
		ID 21303 A	20-05-1999
		US 5878907 A	09-03-1999