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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
21 June 2012 (21.06.2012)

WIPO | PCT

(10) International Publication Number
WO 2012/082002 A1

(51) International Patent Classification:
F42D 5/04 (2006.01)

(21) International Application Number:
PCT/PL2011/000131

(22) International Filing Date:
9 December 2011 (09.12.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
P.393262 14 December 2010 (14.12.2010) PL
P. 396580 8 October 2011 (08.10.2011) PL

(71) Applicant *(for all designated States except US)*: **JAKUSZ SYSTEMY ZABEZPIECZEŃ BANKOWYCH** [PL/PL]; Bogdan Jakusz, ul. Przemystowa 40, 83-400 Kościerzyna (PL).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **JAKUSZ, Bogdan** [PL/PL]; Ul. Długa 41, 83-315 Szymbark (PL). **SZYNALEWSKI, Waldemar** [PL/PL]; Ul. Wichrowe Wzgórze 7/13, 83-340 Sierakowice (PL).

(74) Agent: **CZABAJSKI, Jacek**; TRASET Biuro Patentowe S.C., Ul. Piecewska 27, 80-288 Gdańsk (PL).

(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, 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, KM, 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, 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, MD, 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, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

Published:

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

(54) **Title**: DETONATION CHAMBER ASSEMBLY

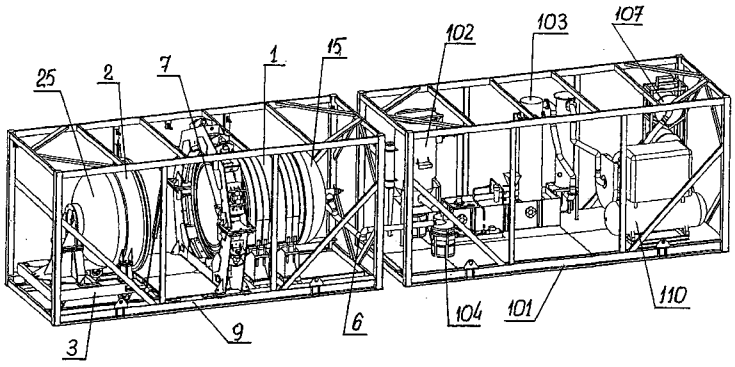

Fig. 1

(57) **Abstract**: The detonation chamber assembly comprises a two-part body of the chamber and a station for treatment of explosive gases. Each of both parts (1,2) of the chamber body has an outer mantle (11,21) and an inner mantle (12,22), being laid loosely in the outer mantle. A worktable (7) is mounted on a shock absorber (71) inside of the first inner mantle (12). Both parts (1,2) of the body, together with the remaining units, are mounted inside a three-dimensional support frame (9) fitted with lugs (10) for transportation. A station for treatment of explosive gases has its own housing and comprises a bag filter (102), an absorption column (103), a dedusting cyclone (104), a coalescing filter (105), a centrifugal fan (106) and an absortion filter (107). The housing of the gas treatment station is a three-dimensional support frame (101) fitted with lifting eyes (108) for transportation).

WO 2012/082002 A1

Detonation chamber assembly.

The subject of the invention is a detonation chamber assembly, which is a device designed for carrying out safely and in an environment friendly manner operations of destroying by detonation explosives and objects containing explosives, such as ammunition, combat means and their components, as well as operations of pressing, hardening and welding of ferrous and nonferrous materials in manufacturing processes of that kind. The assembly according to the invention contains a detonation chamber proper and a station, in the form of an absorber, for cleaning of the explosive gases produced.

A number of designs of detonation chambers together with absorbers for absorbing and cleaning explosive gases produced in the chamber are known. Assemblies of devices of that kind have been designed, among others, for neutralizing stocks of rifle ammunition intended for utilization or unexploded artillery shells.

In a solution known from the patent specification of an european application No. EP 1867947 a device for destroying objects that contain explosives is presented. According to

that solution a pressure vessel intended for improving the effectiveness of the shock wave attenuation is used for detonating dangerous objects of that kind. To this end a stage has been foreseen of placing in appropriate parts of the vessel two or more objects to be destroyed. Next, a stage of detonating the first objects has been foreseen, to be followed by a subsequent stage of detonating objects which should be detonated in a specified time after the first detonation. According to that known solution detonations occur inside a vessel having the outer form of a cylinder with heads closing it on both ends. One of the heads is fastened to the cylindrical surface of the cylinder in a way allowing it to be separated, which makes possible opening the cylinder and getting access to the inside of it after disconnection of said movable head.

Another known solution of a device for executing a process of detonating objects that contain explosives has been presented in the specification for an international application No. WO 2007/132634. According to that known solution the device for a shell detonation contains components that dampen the escaping of the detonation products outside. The device according to that known solution contains a robust pressure vessel in the form of a cylinder composed of an outer mantle and an inner mantle, as well as a suction unit. The outer mantle has a pressure resistant shell and, on the upper wall, a first suction component and a second suction component, which connect the inner and outer mantles together. The inner and outer mantles contain a communication channel, which connects their inner spaces together. The first suction channel and the second suction channel are situated in the place where the blast inside the inner mantle can be sucked

off and the gas transported from the inner mantle through inner openings and a gap between the outer wall of the inner mantle and the inner wall of the outer mantle.

In another solution, presented in a US invention specification No. US 2009/0260509, a pressure vessel has been described whose purpose is to ensure a protection against dangerous fragments of objects containing explosives and warrant a high level of safety in a simple solution. The pressure vessel according to that known solution contains an outer mantle and an inner mantle, which takes on the main impact during a detonation. The inner mantle is situated inside the outer mantle. The body of the device of that known solution has a form of a cylinder with two heads and is divided into a fixed part and a movable part. The movable part is placed on a carriage and may be moved away from the fixed part in order to remove the detonation products and load a next object or objects to be detonated. The vessel in that known solution is provided with an exhaust for gas products and connector pipes for bringing water, air, oxygen and other media inside.

Known devices of the kind under consideration have inside them supporting structures for placing objects or materials to be detonated. A number of solutions have chambers fitted with units for cleaning or absorbing gases produced in explosions.

A number of solutions of devices for absorbing or cleaning explosive gases are known.

According to a solution known from a PL patent specification No. PL 165720 cleaning of explosive waste gases, containing beside ammonia also hydrogen, carbon oxide and methane, consists in adding to the stream of those gases a stream of flammable gases, advantageously methane in the form

of natural gas. From the gas mixture obtained in such way ammonia is removed by known methods and the remaining gas components are sent for utilization by combustion, with use made of the heat produced.

According to another solution, presented in a PL patent specification No. 158001, a multi-stage absorber and neutralizer has a multi-chamber tank divided into two parts by a partition. The first part of the tank, intended for absorption, contains an absorbent and is divided by partitions into chambers, above which absorption columns are placed. A neutralizing column is situated above the other part of the tank, intended for neutralization.

In another solution, known from an US patent specification No. US 5,310,416, a process and device for absorption of explosive gases in a mass transfer reactor column have been presented. The separation process and the device are based on passing explosive gases or fumes through a mass transfer reactor filled with an absorbent and containing an electroconducting filling. The filling of the mass transfer reactor must not be conductive to a degree sufficient to ignite the filling. Under those conditions a filling which is not electrostatically conducting can be used as an absorbent

In other known solutions the absorption column in a gas absorption system is preceded by devices for removing solid particles, using e.g. a bag filter.

The purpose of the invention is to design a detonation chamber assembly together with a gas cleaning station, which could be transported and put close to a work place, for instance near a store of ammunition to be destroyed. After destruction of the whole unnecessary stock of ammunition, it

should be possible, owing to the design of the detonation chamber assembly and gas cleaning station, to easily dismantle the device and transport it to another place of destination, for destroying for instance another stock of unnecessary ammunition. Thus, developing a mobile detonation chamber assembly, environment friendly, i.e. fitted with the required components for cleaning and/or absorbing the explosive gases produced, is the purpose of the invention.

The task has been carried out by working out a device with features as specified in claim No. 1. Examples of advantageous embodiments are subjects of subsequent claims.

According to the invention the detonation chamber assembly contains a detonation chamber proper and a station for cleaning the explosive gases, connected to the chamber. The chamber has the form of a two-part cylinder, closed on both ends with two heads. The body of the chamber contains a fixed part and a movable part, the latter mounted on a carriage. Each of both chamber parts has an outer mantle and an inner mantle, laid loosely on supports in said outer mantle. The inner mantle of the fixed part is laid on first supports inside the outer mantle of said fixed part. The inner mantle of the movable part is laid on second supports inside the outer mantle of that movable part. In each part of the chamber body the mantles are separated from each other by an air gap. The movable part of the body is fitted with a hydraulic unit for driving the carriage. The chamber is equipped with a hydraulic unit for coupling the two parts of the body, the plane of centering of the supports in both inner mantles coinciding with the longitudinal symmetry axis of the chamber.

The detonation chamber assembly is provided with a station for cleaning of explosive gases and a conduit which supplies compressed air, to remove explosive gases from inside the chamber after detonation and lead them to a station for treatment of the explosive gases. The station for cleaning of the explosive gases contains inside its housing, on the side of the explosive gases outlet, a bag filter whose outlet is connected to the absorption column inlet.

A worktable is mounted inside the first inner mantle of the chamber fixed part. The top of the worktable is placed on a shock absorber.

Both parts of the chamber outer mantle are mounted inside a first three-dimensional support frame, whereas the station for cleaning of explosive gases is situated inside a second three-dimensional support frame. Both support frames are fitted with transport eyes.

The first and second support frames have dimensions matching those of a typical 20 feet transport container. That solution makes it possible to easily transport the detonation assembly to a new work place.

The worktable shock absorber may have in an advantageous embodiment of the invention the form of a container filled with a loose bed of steel balls.

In a solution according to the invention the first inner mantle of the fixed part and the container of the worktable shock absorber are slidably mounted on a vertical centering guide fastened to the fixed part of the chamber. This allows keeping the worktable in the central position during a cyclic detonation of successive lots of objects inside the chamber.

Inside the chamber, after having loaded onto the worktable the objects to be destroyed, the process of detonation is

initiated with the aid of an additional explosive charge fired from the outside. That explosion initiates subsequent detonations of the objects placed on the worktable inside the chamber, which leads to destruction of those objects.

On completion of the detonation the detonation chamber is divided by separating the movable part of the body from the fixed part. After emptying the inside from the detonation remnants another lot of objects is loaded together with a next initiating charge, the chamber is closed again and the next detonation is carried out. A hydraulic unit for connecting together both parts of the body is foreseen in order to keep the chamber in the closed position. The assembly for connecting both parts of the chamber together is made in the form of a circumferential clamping ring encircling a flange of the fixed part, said clamping ring accommodating at least one radially slidable clamping jaw. An advantageous embodiment of the invention may have eight clamping jaws slidably mounted in the clamping ring. The clamping jaw section resembles a channel, whose arms have the inner spacing equal to the total thickness of flanges of the fixed and movable parts of the body.

The head of the chamber fixed part is fitted with a release valve for removal of gases from the chamber inside, while the head of the movable part is fitted with a connection for a compressed air conduit. This makes possible pressing explosive gases out of the detonation chamber.

Connection of the detonation chamber outlet to the inlet of a dedusting cyclone in the gas cleaning station, and connection of the absorption column in that station to a coalescing filter are foreseen. The coalescing filter outlet

is connected via a centrifugal filter to at least one absorption filter.

In the treatment station the absorption column is equipped with its own force pump and a compressor which feeds a bag filter. The filling of the absorption column is sprinkled with a solution exhibiting an alkaline reaction.

The problem of improving the efficiency of detonation energy damping has been solved in the detonation chamber assembly according to the invention by proposing a loose laying of the first and second inner mantles within the outer mantles in the fixed and movable parts of the chamber. As found during technical tests carried out, the loose laying of those inner mantles on supports within the outer mantles has made it possible to take over a part of the detonation energy already inside the chamber and utilize it for moving the inner mantle within the outer mantle. It was found that a much smaller part of energy of a detonation of comparable power is felt outside of the detonation chamber. Besides, it was proposed to place the top of the worktable on a container with a shock absorbing filling, advantageously in the form of steel balls, which had also a favorable influence on reduction of the external and internal effects of detonation.

Apart from the above, it was proposed to place the entire chamber together with the accessories, such as the power hydraulics unit, in a three-dimensional support frame with the external outline of a 20 feet container, in which the movable part of the body may be moved away from or close to the fixed part. In that way a first part of a mobile device was obtained, which can be transported, as any container, by rail or road to successive places of use. The invention solves the

problem of cleaning, including absorption, of explosive gases, as environmental protection requirements make it necessary to remove from the detonation chamber after detonation the explosive gases and neutralize them. The gas treatment station according to the invention is mounted in a three-dimensional support skeleton frame with the external outline of a 20 feet container, making a mobile device which solves that technical problem. In that way a second part of a mobile detonation chamber assembly was obtained, which can be transported, as any container, by rail or road to successive places of use, according to the needs.

Both containers, one with the detonation chamber and the other with the gas treatment station form a unit, which can be transported by rail or road to successive places of use, for instance to another store of superfluous ammunition to be destroyed.

The subject of the invention is shown as an example embodiment in the enclosed drawings, where the respective figures present:

Fig. 1 - detonation chamber assembly in an example working position in the workplace,

Fig. 2.- perspective view into the inside of the detonation chamber fixed part,

Fig. 3 - view as in fig. 2 into the inside of the detonation chamber movable part,

Fig. 4 - diagrammatic section of the detonation chamber along the longitudinal symmetry axis,

Fig. 5 - section of the chamber according to fig. 4 in the open position,

Fig. 6 - side view of the gas cleaning station assembly,

Fig. 7 - diagram of the circuit for explosive gases in the gas cleaning station.

As shown in the enclosed fig. 1, the detonation chamber assembly in an advantageous embodiment consists of two skeleton containers connected together with conduits for transport of explosive gases.

It is shown in enclosed figures, fig. 1, fig. 2, fig. 3, fig. 4 and fig. 5, that the detonation chamber has the form of a two-part body of cylindrical shape, closed on both ends with two heads. The body of the chamber contains a fixed part 1 and a movable part 2. The movable part 2 is mounted on a carriage 3. Each of both parts 1, 2 of the body has an outer mantle 11, 21 and an inner mantle 12, 22. Between those mantles 11,12 and 21,22 there is a space in the form of an air gap 4. That is shown in the drawings fig. 4 and fig. 5. The chamber body is fitted with a hydraulic unit 5 for feeding drive components of the carriage 3 of the body movable part 2, and with a known hydraulic unit for coupling both parts 1,2 of the body after pushing them close to each other. The chamber is also equipped with an unit 6 for leading explosive gases out.

The detonation chamber contains in the fixed part 1 of the chamber body, within the outer mantle 11, the first inner mantle 12. The first inner mantle 12 is loosely laid within the outer mantle 11 of the fixed part 1 on a first support 13. In the fixed part 2 of the chamber body, within the outer mantle 21, there is the second inner mantle 22. The second inner mantle is also loosely laid on a second support 23. That is shown in the enclosed figures, fig. 4 and fig. 5. The supports 13, 23 in both parts 1, 2 of the chamber are positioned so that the plane of centering of these supports

13, 23 for the first and second inner mantles 12, 22 coincides with the longitudinal symmetry axis of the chamber. After each detonation the inner mantles 12, 22, laid loosely within the outer mantles 11, 21 of the chamber parts 1, 2, take again the central position in conformance with the longitudinal symmetry axis of the detonation chamber.

A worktable 7 is mounted inside the first inner mantle 12 of said fixed part 1 of the chamber. Its purpose is to support objects to be detonated, be it ammunition intended for utilization, unexploded shells or other objects containing explosives. The top of the worktable 7 is placed on a shock absorber 71 in an example form of a container filled with a loose bed of steel balls. The top of the worktable 7 and the shock absorber 71 are shown in the figures, fig. 4 and fig. 5. It is shown in these figures that the first inner mantle 12 of the fixed part 1 and the container of the worktable 7 shock absorber are slidably mounted so that they can be vertically shifted along a vertical centering guide 72. The centering guide 72 in this example embodiment has the form of a vertical mandrel fastened to the fixed part 1 of the chamber. Mounted on that mandrel are the inner mantle and the worktable 7 foundation. The guide 72 forms an additional protection against shifting of the inner mantle 12, together with the worktable 7, along and across the fixed part 1 of the chamber. The worktable 7 is also shown in fig. 2 inside the fixed part 1 of the chamber.

The detonation chamber is provided with a hydraulic unit 5 for feeding components for coupling both parts 1, 2 of the body. The assembly for connecting together both parts 1, 2 of the body is made in the form of a circumferential clamping ring 8 encircling a flange 14 of the fixed part. That is shown

in fig. 2, fig. 3, fig. 4 and fig. 5. The clamping ring 8 accommodates at least two radially slidable clamping jaws 81. In the clamping ring 8 of the example embodiment described there are eight slidably mounted clamping jaws 81. That does not exclude a use of another number of clamping jaws in other example embodiments.

Each clamping jaw 81 has in its working part a fastening channel. This is shown in fig. 2. Said clamping jaw 81 has the cross section resembling a channel. The arms of that channel have the inner spacing equal to the total thickness of the fixed part 1 flange 14 and the flange 24 of the movable part 2 of the body. The clamping jaw 81 protects both parts 1, 2 of the chamber body against separation due to the internal detonation.

Both parts 1, 2 of the chamber body, together with the remaining assemblies, are mounted inside a three-dimensional support frame 9, whose external dimensions are adapted to the road or rail transport requirements. Said support frame 9 according to the invention is in the example embodiment under consideration equipped with lugs 10 which facilitate fastening of the whole support frame 9 together with the detonation chamber to lifting equipment. The support frame 9 has the outer form of a 20 feet container.

In the design according to the invention the head 15 of the chamber fixed part 1 is fitted with a gas exhaust conduit 6 for removal of gases from inside the chamber. The head 25 of the movable part 2 of the chamber is provided, according to the invention in the example embodiment described, with a connection for a conduit 26 for compressed air to be let into the chamber in order to force the explosive gases out on completion of the working cycle.

The second support frame 101, made also from steel sections in the form of a container, accommodates the station for cleaning of explosive gases; that is shown in the enclosed figures, fig. 1 and fig. 6. The second support frame 101 has the form of a cuboid, with openings that form eyes 108 for lifting the whole frame together with the utilization station assembly mounted inside. The frame 101, similarly as the support frame 9 for the detonation chamber, has the external dimensions and the fastening means conforming to those used in standard 20 ft containers, which makes it possible to transport the entire detonation chamber assembly in the form of two skeleton containers on trucks or by rail to the assigned places of use. Thus, the support frame 101 has the following example dimensions: the length of 6,1 m, width of 2,4 m and height of 2,6 m. However, use of support frames 9, 101 having other dimensions is not excluded. The gas cleaning station is adapted for operation at a temperature between +5°C and +40°C, with explosive gases having a maximum temperature of 120°C, and with an alkaline agent in the form of 5% solution of NaOH. The gas cleaning station is equipped with a control and monitoring system 111.

Figure 7 shows a diagram of the circuit for explosive gases in the gas cleaning station. The gas cleaning station has a bag filter 102 mounted at the inlet for explosive gases A. The outlet of the bag filter 102 is connected to the inlet of an absorption column 103. Explosive gases as well as air sucked in by a cyclone are directed to the filter. The cyclone 104 is intended for separation of solid particles suspended in the gas being cleaned. Bags of filtering packs, made of water- and oil-proof polyester fabric, with example dimensions of ø160 x 1060 mm, have been adopted in the bag filter 102. Use

of other kinds of the bag filter 102 in other example embodiments is not excluded. The filtering surface is cleaned by applying into the bag filter a pulsed stream of compressed air. The rate of air impacts is controlled by setting the times or a pressure difference. The filter is equipped with a controller together with a pressure difference transducer.

The outlet of gases A from the detonation chamber is also connected in parallel with the inlet of a dedusting cyclone 104 for separation of heavier solid particles from the system. The cyclone 104 acts as a dust remover and serves for cleaning dusts and other contaminants produced by detonation of neutralized materials off the detonation chamber. Thus, independently of the connection of the detonation chamber outlet with the bag filter 102 for catching the remaining solid particles in the form of dusts, the detonation chamber outlet is also connected with the inlet of the dedusting cyclone 104. The outlet of the absorption column 103, which is a successive serial component of the gas cleaning station according to the invention, is connected via at least one coalescing filter 105.

The gas free of solid particles (dusts) goes to the absorption column 103, whose task is to eliminate from the flow of treated gases nitrogen oxides, sulfur oxides and other acid gaseous pollutants, and to catch dusts in the form of solid particles. A 5% solution of NaOH has been used as the absorption liquid. In order to intensify the mass transfer process the column 103 is filled with Raschig rings (ø25x25), made of plastic. Owing to use of the filling a significant increase of the inter-phase contact surface between the absorption liquid and the purified gas was achieved. A countercurrent flow of the gases and the absorption liquid is

used. A sprinkler placed above the layer of filling distributes the liquid uniformly over the entire section of the column. The liquid flowing down the filling surface goes into contact with the gas let into the bottom part of the column.

The coalescing filter 105 is another component of the gas cleaning station. The coalescing filter 105 is intended for catching droplets of NaOH carried away by the gas flow. A candle filter has been used as the filtering pack. The liquid caught in the filter flows to its bottom and goes next to the tank of the absorption column 103 after opening of valves on the drain pipes. Downstream of the coalescing filter a fan is placed. This is a directly driven high-pressure centrifugal fan.

The filling of the absorption column 103 is sprinkled with a 5% solution of NaOH in order to remove acid gases as well as solid particles that remained after filtration. Another outlet of the coalescing filter 105 is connected, via the centrifugal fan 106, with an absorption filter 107. In the example embodiment under consideration the absorption filter contains three unit filters connected in series. The filters are filled with active carbon impregnated with sulfur. The fan 106 forces the flow of gases cleaned in the whole absorber assembly via conduits 112. The cleaned gases B leave the absorption filter 107. A system of three absorption filters 107 connected in series has been used in the example embodiment described. These are small filters with active carbon for cleaning of air and gases. The filters have been adopted in order to remove volatile pollutants, solvents and odors from the cleaned gas. However, when filled with a special sulfur impregnated carbon,

they also remove quicksilver and lead vapors from the gas flow.

In the example embodiment described the absorption column 103 is equipped with its own force pump 109 for moving the 5% solution of NaOH. The pump is a part of accessories of the absorption column 103. In said example embodiment this is a magnetic pump, which, however, does not exclude use of another kind of forcing device. The pump is used for forcing the motion of the 5% NaOH solution in the absorption column.

The gas cleaning station in the example embodiment described is equipped with a compressor 110 used for feeding of the bag filter 102.

After detonation of explosive materials and stabilization of conditions in the detonation chamber a release valve is opened and the explosive gases A are led to the cleaning system in the form of the gas cleaning station according to the invention. At the same time compressed air is fed into the detonation chamber, which makes it possible to ventilate the chamber after the detonation. The explosive gases A go into the bag filter 102 for removal of solid particles suspended in the gas, to enter next in a countercurrent the absorption column 103, whose bed is composed of Raschig rings with example dimensions of ø 25mm, l=25 mm, the bed having been sprinkled with a 5% solution of NaOH. The absorbent operates in a closed cycle. Use of other kinds of bed in other example embodiments made according to the invention is not excluded. After having gone through the bed of column 103 the gases A flow via conduits 112 into the coalescing filter 105, which acts as a droplet separator to eliminate particles of NaOH solution aerosol from the gas flow. Adsorption on a sulfur

impregnated active carbon is the last stage of cleaning of gases A. That process occurs in the assembly of adsorption filters 107. After detonation and release of explosive gases A, produced by detonation, into the cleaning station the ashes remaining in the detonation chamber should be removed. For that purpose the dedusting cyclone 104 is used, which is connected to the cleaning system and makes use of suction produced by the centrifugal fan 106. Larger particles of the detonation produced ash suspended in air fall on the bottom of the cyclone 104 container, smaller particles are removed into the bag filter. Air C free of dust goes to the same system as the explosive gases.

List of figure denotations

1. Fixed part.
2. Movable part.
3. Carriage.
4. Air gap.
5. Hydraulic feed unit.
6. Gas exhaust conduit.
7. Worktable
8. Clamping ring.
9. First support frame.
10. Lug.
11. Outer mantle of the fixed part.
12. First inner mantle.
13. First support.
14. Flange of the fixed part.
15. Head of the fixed part
21. Outer mantle of the movable part
22. Second inner mantle.
23. Second support.
24. Flange of the movable part.
25. Head of the movable part
26. Compressed air conduit.
71. Shock absorber.
72. Centering guide.
81. Clamping jaw.
101. Second support frame.
102. Bag filter.
103. Absorption column.
104. Dedusting cyclone.
105. Coalescing filter.
106. Centrifugal fan.
107. Absorption filter.
108. Eye.
109. Force pump.
110. Compressor.
111. Control and monitoring system.
112. Conduits.
A. Explosive gases.
B. Cleaned gases.
C. Compressed air.

Claims.

1. A detonation chamber assembly comprising a detonation chamber and a station for cleaning of explosive gases, where the chamber has the form of a two-part body of cylindrical shape closed with two heads, where the body comprises a fixed part and a movable part, the movable part having been mounted on a carriage, each of both parts of the body having an outer mantle and an inner mantle laid loosely on supports within said outer mantle, and an air gap existing between those mantles, where the movable part body is provided with a hydraulic unit for carriage shifting, whereas the chamber is provided with a hydraulic unit for coupling both parts of the body, in both parts of the chamber the plane of centering of the inner mantle supports coinciding with the longitudinal symmetry axis of the chamber, the detonation chamber assembly having been equipped with a station for cleaning of explosive gases and a conduit for compressed air supply, the station for cleaning of explosive gases containing inside the housing, at the inlet for explosive gases coming from the detonation chamber, a bag filter whose outlet is connected to the absorption column inlet, characterized in that in the first inner mantle (12) of the fixed part (1) of the chamber a worktable (7) is mounted, the top of the worktable (7) having been mounted on a shock absorber (71), whereas both parts (1,2) of the chamber outer mantle are mounted inside a first three-dimensional support frame (9), while the station for cleaning of explosive gases is situated in a second

three-dimensional support frame (101), both support frames (9,101) having been provided with transport lugs (10).

2. A chamber assembly of claim 1, characterized in that the first support frame (9) and second support frame (101) have the external dimensions of a 20 feet transport container.
3. A chamber assembly of claim 1 or 2, characterized in that the shock absorber (71) of the worktable (7) has the form of a container with a filling in the form of a loose bed of steel balls.
4. A chamber assembly of claim 1 or 2 or 3, characterized in that the first inner mantle (12) of the fixed part (1) and the container of the worktable (7) shock absorber (71) are slidably mounted on a vertical centering guide (72) so that they can be vertically shifted along it, and the guide having been fastened to the fixed part (1) of the chamber
5. A chamber assembly of one of claims from 1 to 4, characterized in that the hydraulic assembly for connecting together both parts (1,2) of the body is made in the form of a circumferential clamping ring (8) encircling a flange (14) of the fixed part (1), where in that clamping ring (8) at least one radially slidable clamping jaw (81) is mounted.
6. A chamber assembly of one of claims 1 through 5, characterized in that eight clamping jaws (81) are slidably mounted in the clamping ring (8).
7. A chamber assembly of one of claims 1 through 6, characterized in that the clamping jaw (81) has the section of shape resembling a channel whose arms have the

inner spacing corresponding to the total thickness of the fixed part (1) flange (14) and the flange (24) of the movable part (2) of the body.

8. A chamber assembly of one of claims 1 through 7, characterized in that the head (15) of the fixed part (1) of the chamber is fitted with a connection with a release valve of an gas exhaust conduit (6) for removal of gases from inside the chamber, while the head (25) of the movable part (2) of the chamber is fitted with a connection for a compressed air conduit (26).

9. A chamber assembly of one of claims from 1 to 8, characterized in that the conduit for removal of gases from the detonation chamber is connected to the inlet of a dedusting cyclone (104) in the gases cleaning station, where the absorption column (103) inlet is connected to a coalescing filter (105), whose outlet is connected via a centrifugal fan (106) with at least one absorption filter (107).

10. A chamber assembly of claim 9, characterized in that the absorption column (103) in the explosive gases cleaning station is equipped with its own force pump (109) and contains a filling sprinkled with a solution which exhibits an alkaline reaction.

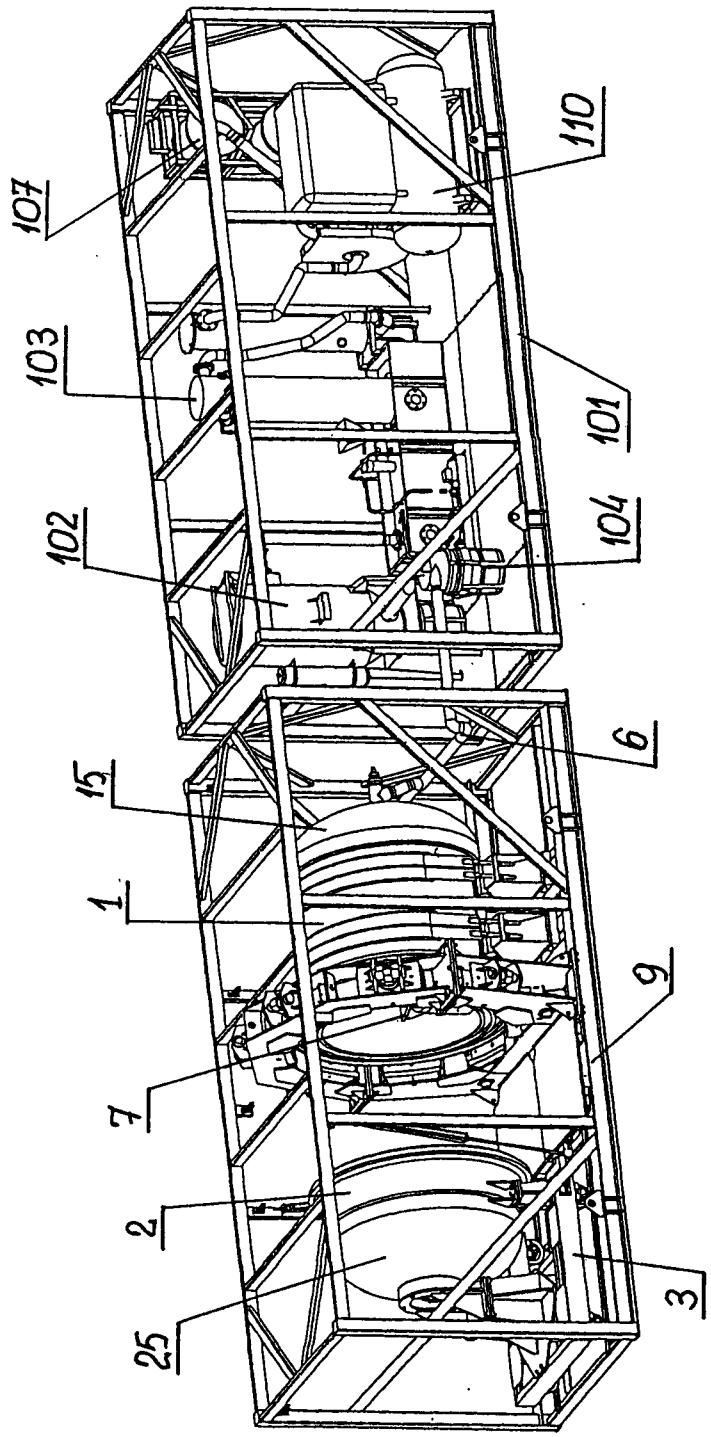

Fig. 1

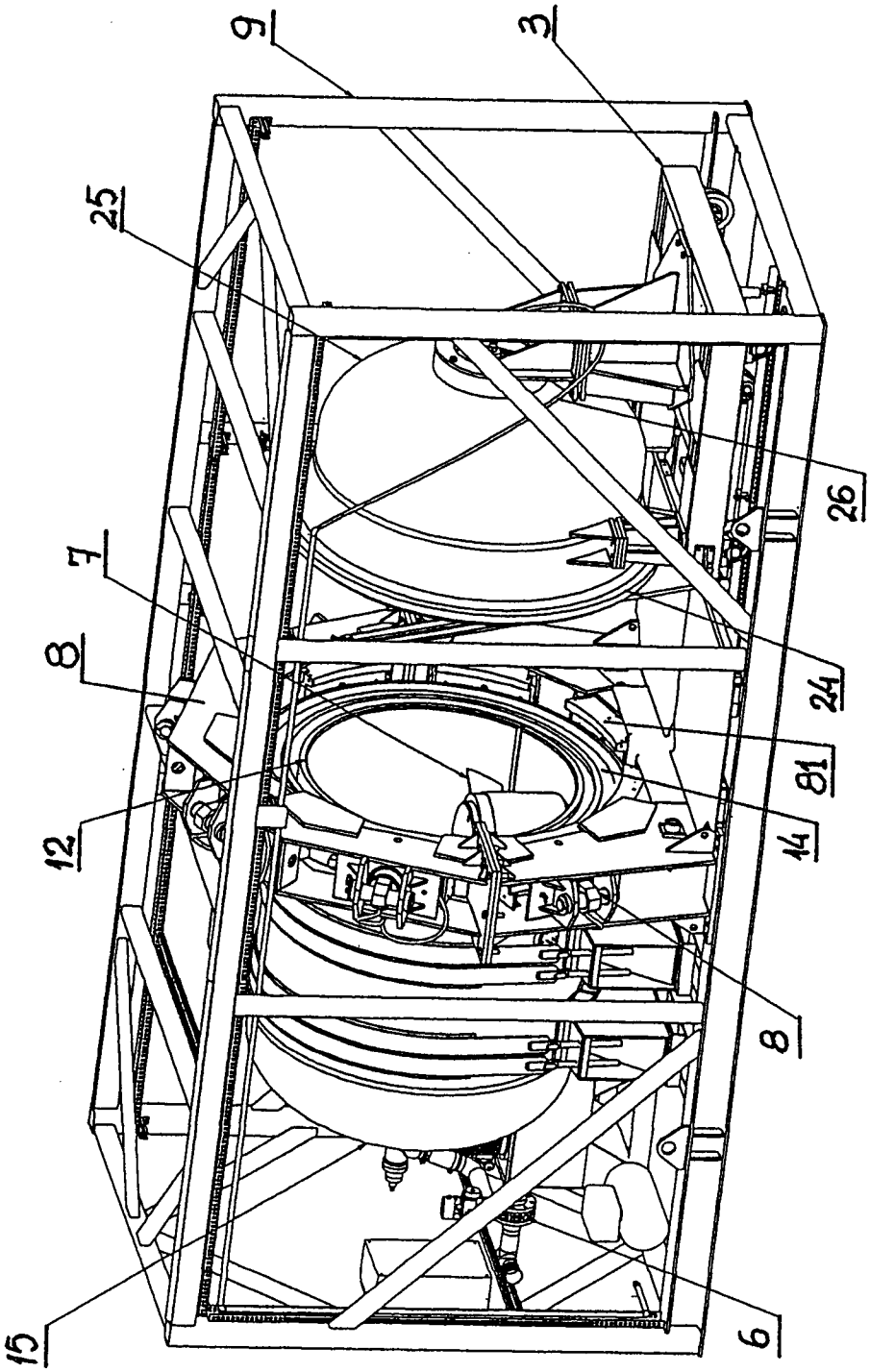

Fig. 2

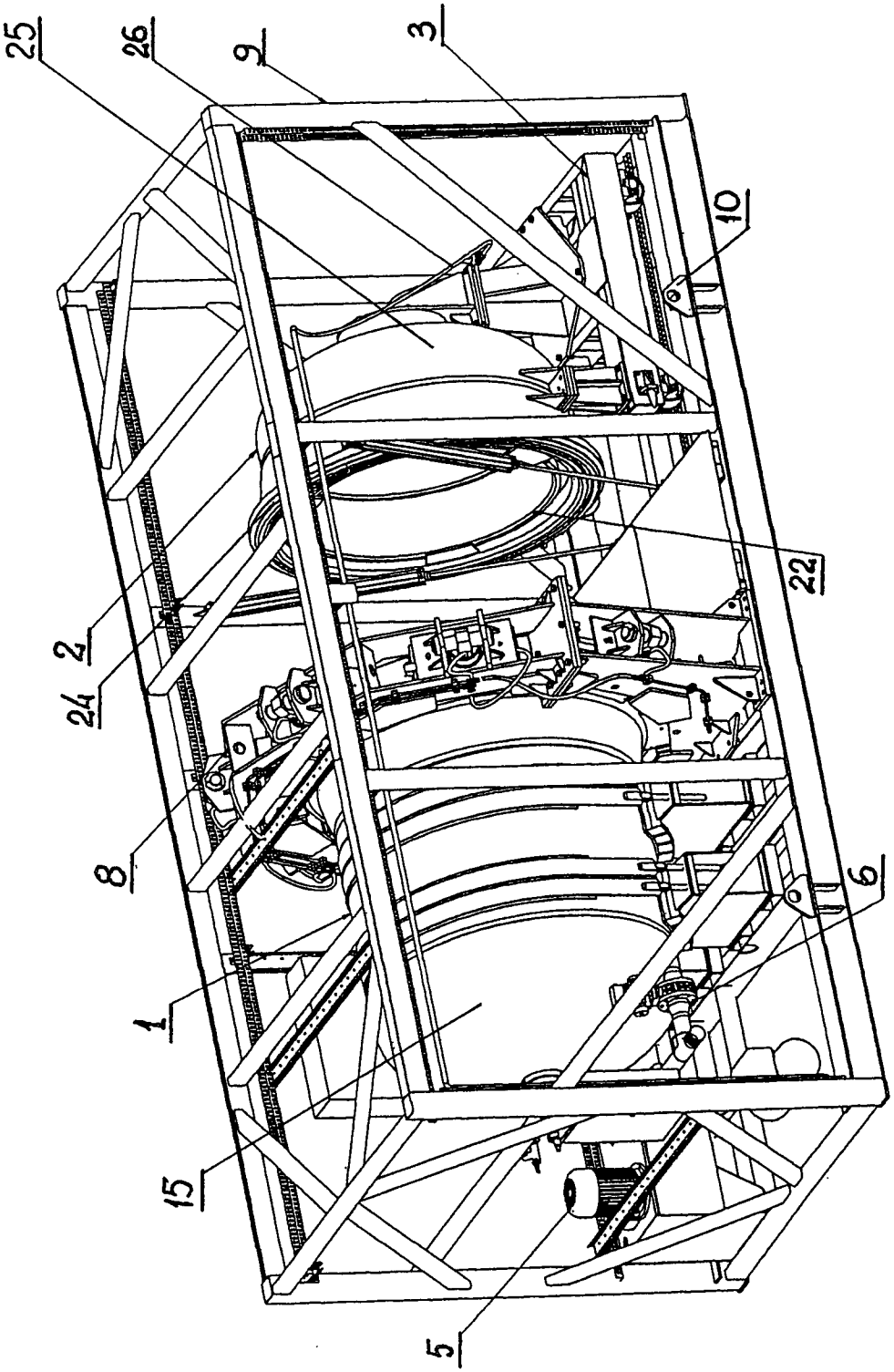

Fig. 3

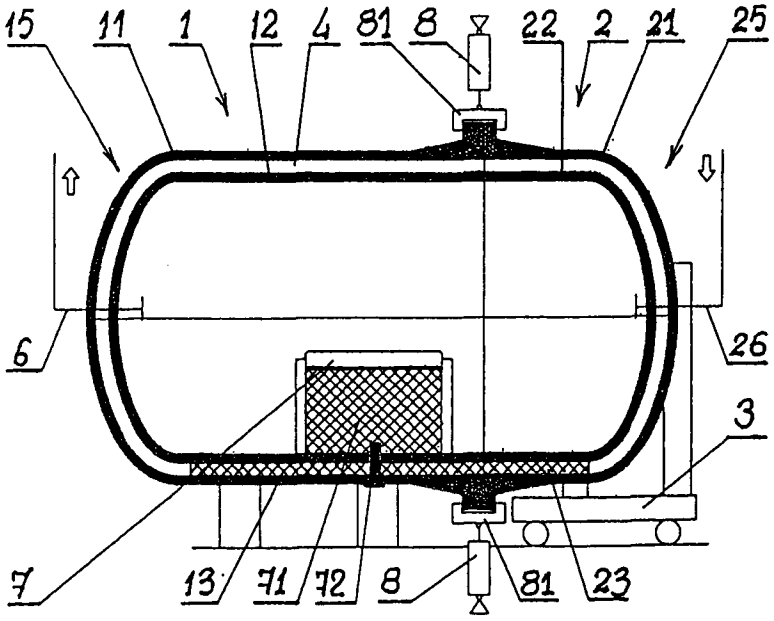
15
11
1
12
4
81
8
22
2
21
25
6
26
3
7
13
71
72
8
81
23

Fig. 4

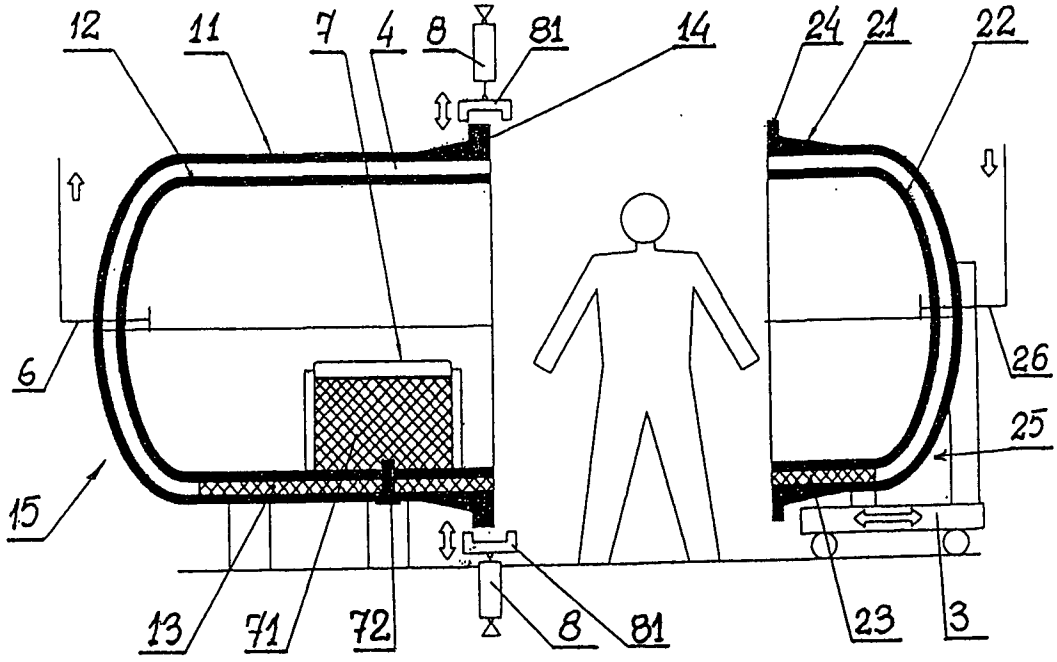
12
11
7
4
8
81
14
24
21
22
6
26
25
15
13
71
72
8
81
23
3

Fig. 5

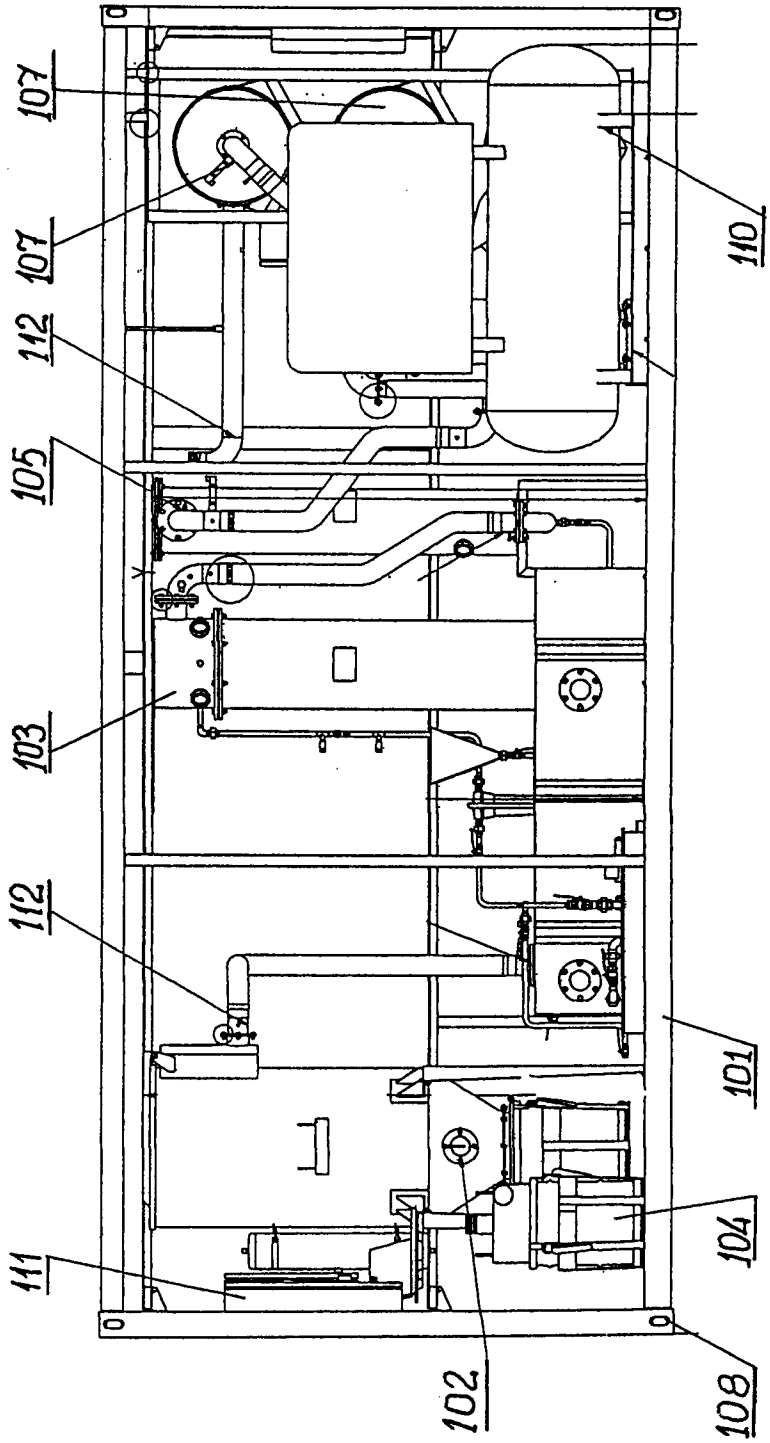

Fig. 6

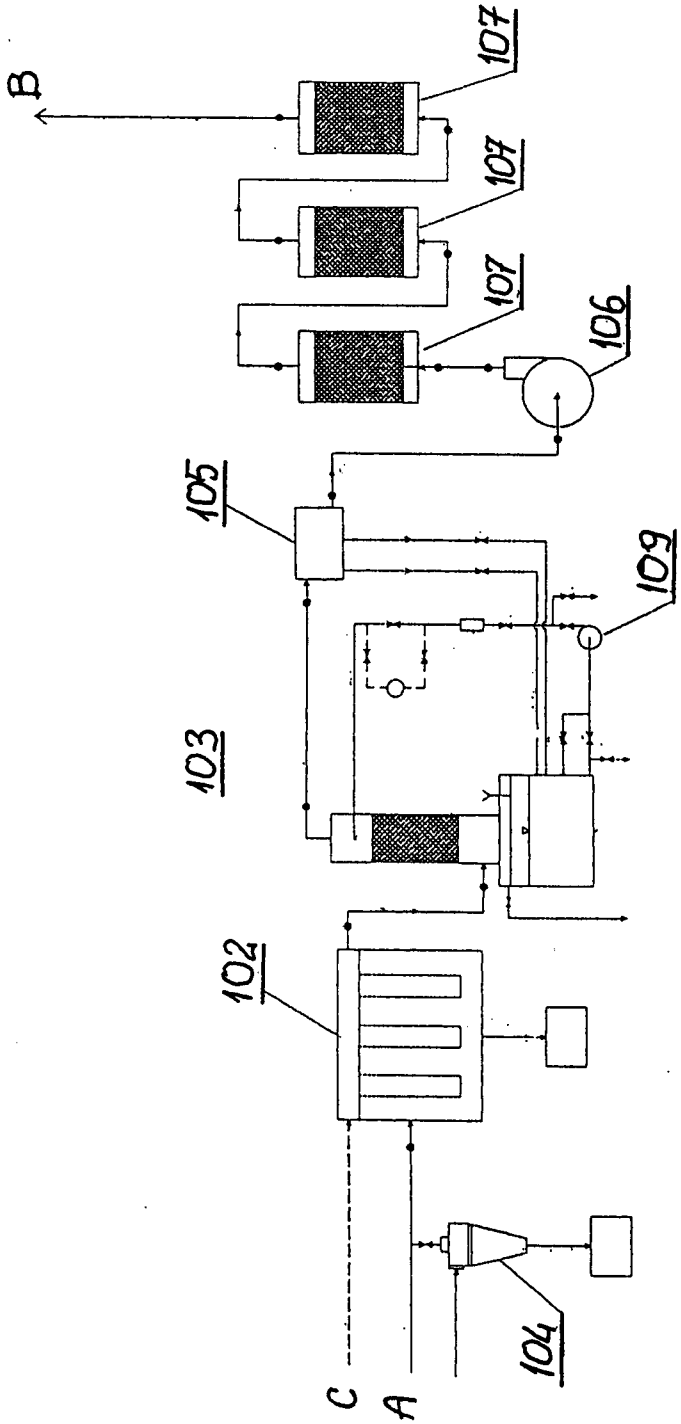

Fig. 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/PL2011/000131

A. CLASSIFICATION OF SUBJECT MATTER
INV. F42D5/04
ADD. F42D5/045

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)
F42D F42B

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.
Y	US 2009/229451 A1 (ASAHINA KIYOSHI [JP] ET AL) 17 September 2009 (2009-09-17) cited in the application paragraphs [0021], [0027] - [0035], [0037] figures 1, 2	1-10
Y	WO 01/48437 A1 (DONOVAN JOHN L [US]) 5 July 2001 (2001-07-05) page 7, line 11 - page 8, line 10 page 13, lines 6-14 figures 1, 5	1-10
Y	FR 2 627 260 A1 (FRANCE STE SOLAIRE [FR]) 18 August 1989 (1989-08-18) page 2, lines 28-31 page 4, lines 14-22 figure 2	2

-/--

[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

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 March 2012	23/03/2012

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	Van Leeuwen, Erik

INTERNATIONAL SEARCH REPORT

International application No
PCT/PL2011/000131

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 613 453 A (DONOVAN JOHN L [US]) 25 March 1997 (1997-03-25) column 1, lines 7-11 column 4, lines 60-64 figure 7	3
Y	EP 0 315 616 A1 (OLCON ENGINEERING AB [SE]) 10 May 1989 (1989-05-10) column 3, line 23 - column 4, line 16 figure 2	4
Y	US 5 135 130 A (ANDREWS JAMES S [US]) 4 August 1992 (1992-08-04) column 2, lines 35-40 figures 5-7	5-7
Y	PL 158 001 B1 (PRZEDSIEB WDRAZANIA UPOWSZECH [PL]) 31 July 1992 (1992-07-31) cited in the application * page 3, the fourth paragraph * figure 1	10
A	US 4 781 145 A (AMLINSKY ROMAN A [SU] ET AL) 1 November 1988 (1988-11-01) column 1, lines 5-7 column 6, lines 28-33 column 8, lines 27-36 figures 5, 6	1,9

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/PL2011/000131

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009229451 A1	17-09-2009	JP 3987871 B1	10-10-2007
		JP 2007303738 A	22-11-2007
		US 2009229451 A1	17-09-2009
		WO 2007132634 A1	22-11-2007
WO 0148437 A1	05-07-2001	AU 4901301 A	09-07-2001
		CA 2359895 A1	05-07-2001
		CN 1340148 A	13-03-2002
		EP 1159580 A1	05-12-2001
		JP 2003518605 A	10-06-2003
		WO 0148437 A1	05-07-2001
FR 2627260 A1	18-08-1989	NONE	
US 5613453 A	25-03-1997	AT 255214 T	15-12-2003
		AU 697732 B2	15-10-1998
		CN 1206453 A	27-01-1999
		DE 69630895 D1	08-01-2004
		DE 69630895 T2	28-10-2004
		EP 0883779 A1	16-12-1998
		ES 2210376 T3	01-07-2004
		JP 3120181 B2	25-12-2000
		JP H11506053 A	02-06-1999
		US RE36912 E	17-10-2000
		US 5613453 A	25-03-1997
		US 5884569 A	23-03-1999
		US 6173662 B1	16-01-2001
		US 6354181 B1	12-03-2002
		WO 9724558 A1	10-07-1997
EP 0315616 A1	10-05-1989	EP 0315616 A1	10-05-1989
		SE 457992 B	13-02-1989
US 5135130 A	04-08-1992	NONE	
PL 158001 B1	31-07-1992	NONE	
US 4781145 A	01-11-1988	CS 8605161 A1	12-09-1989
		DD 273935 A3	06-12-1989
		DE 3676810 D1	14-02-1991
		EP 0239645 A1	07-10-1987
		JP S63501934 A	04-08-1988
		SU 1413779 A1	23-10-1989
		US 4781145 A	01-11-1988
		WO 8700453 A1	29-01-1987