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(54) Storage facility for explosive substances

(57) This invention treats a storage facility for explosive substances for the safe examination of the explosive substances. The storage facility for explosive substances comprises enclosures 1, the storage facility is separated from the normal building by means of flexible structures 2. Between the storage area 5 for explosive substances and exit doors 6, 8 are installed blocking walls 7, above area 5 is installed ballistic surface 9 that contains a bearing mesh 13, insulation material 14 located on top and covering material 15 fixed to it. Ballistic surface 9 is produced from eight triangular surfaces 16. Insulation material 14 is a seven-layer composite thermal, waterproof and radiation insulation material, while the covering material 15 is a weather-proof and ultraviolet resistant material.

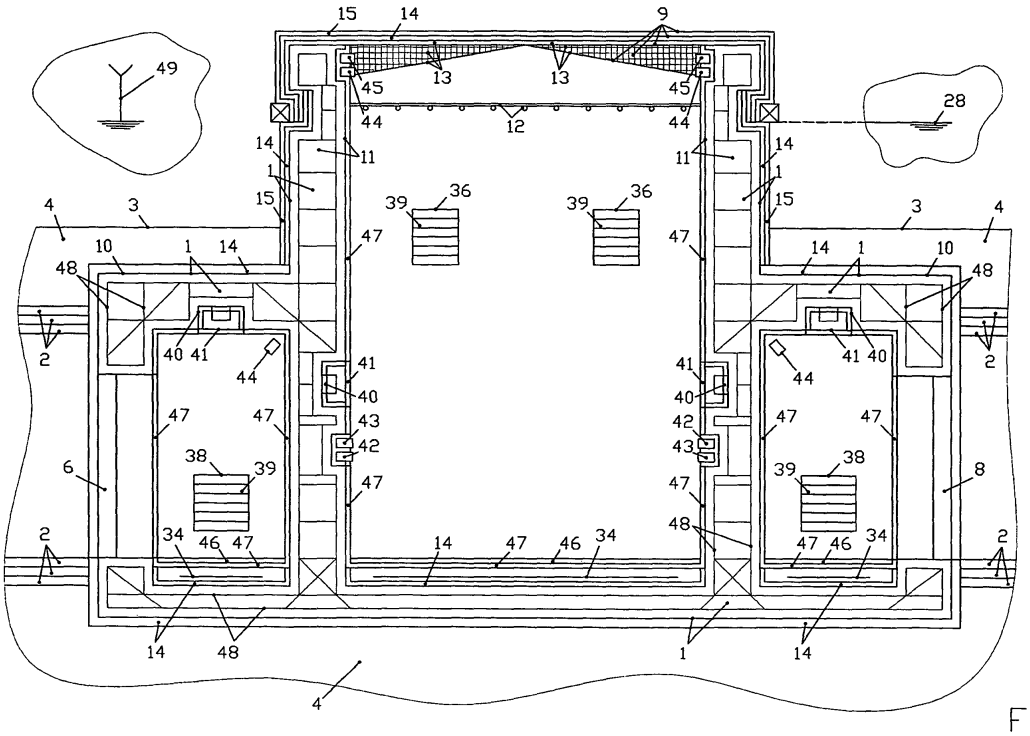

Fig 1

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Description

Technical field

[0001] The invention belongs in the construction field, treating more specifically a storage facility designed to a building for explosive substances to be examined.

Prior art

[0002] The patent application "Explosion-proof finishing layer" (GB 2201183(A), H. Salzer, published on 24.08.1988) has published an explosion-proof finishing layer for the panels of the building. The panels contain lattices, which consist of mutually connected flanged meshes. The flanges are installed inside the building and are supported with suppression elements. The suppression elements used are zigzag plates or deformable tubes. When the explosive explodes, the deformation of the suppression elements absorbs a substantial share of the explosion energy and directs it against the panels, whereby the scope of destruction is substantially smaller.

[0003] The closest to the invention by its technical nature is the patent application "A building for hazardous explosive substances" (US 3832958 (A), DYNO INDUSTRIER AS, published on 03.09.1974), where the building has walls with air gaps, the hollows inside being filled with sand and the walls fixed on a circle-shaped base plate. The roof of the building contains a mesh structure anchored to the inner wall, while the upper part of the roof is covered with materials that consist of elements or are fibre-reinforced. The upper part of the covering is a layer of sand.

[0004] The drawback of these known solutions are the inadequate conditions for the storage of explosive substances, whereby the safeness of explosive materials during examination work is not guaranteed.

Description of the invention

[0005] This invention treats a storage facility for explosive substances for the safe examination of explosive substances. The storage facility for explosive substances is created with reinforced concrete enclosures separate from the normal building and the storage facility is isolated from the normal building with flexible structures. Between the storage area of explosive materials and the exit doors of the storage facility there are barrier walls. Above the storage area for explosive substances, a ceiling is mounted, which is executed as a ballistic surface, while under the ballistic surface is a safety mesh installed, fixed to the walls of a shock wave guide. The ballistic surface contains a bearing mesh, insulation material on top of it and a covering material fixed to it. The ballistic surface is made from eight triangular surfaces, which rest diagonally on the corners and on steel wires stretched to the side tips of the shock wave guide. The insulation material of the ballistic surface is a composite thermal, waterproof and radiation insulation material consisting of seven layers, and the covering material is a weatherproof and ultraviolet-resistant material.

List of figures

[0006]

Figure 1 shows a general view of the storage facility for explosive substances;

figure 2 is a layout with the enclosures, storage area, barrier walls and exit doors of the storage facility for explosive substances;

figure 3 depicts the ballistic surface, seven-layer insulation material and covering material of the ballistic surface.

Embodiment of the invention

[0007] The storage facility for explosive substances is created separately from the normal building with reinforced concrete enclosures 1, taking into account that the strength of enclosures 1 would hold the explosion pressure of the explosives in the quantity designed for storing (in the given case the most powerful explosive RDX in the quantity of 50 kg). The storage facility of explosive substances is separated with flexible structures 2 and are installed below ground level 3 into grained mineral soil 4 to avoid damages to the normal building in case of an explosion of the explosive. Between area 5 for the storage of explosive substances and the exit door 6, a barrier wall 7 is built, which will block the spread of the shock wave. An emergency exit door 8 and a barrier 7 wall that blocks the spread of the shock wave, built in front of emergency exit 8, are built similarly as a mirror image on the other side of area 5 for the storage of explosive substances. The main exit door 6 and the emergency exit door 8 are built as impact and fire-proof doors.

[0008] The ceiling above area 5 of the explosive substances, built as a ballistic surface 9, is elevated higher from roof 10 of the storage facility by the height of the storage facility, guiding the shock wave from a possible explosion of the explosive substance vertically up into the air. The ends of the sides of the shock wave guide 11 are produced in the form of a ridge with a 4% inclination towards the corners. Such shape of the shock wave guide 11 ensures the flow of rainwater off the ballistic surface and diffuses the shock wave.

[0009] A safety mesh 12 of steel wires is installed under ballistic surface 9, fixed to the walls of shock wave guide 11 and blocking unauthorised entrance to the storage facility. The loop size of safety mesh 12 is selected so that in most cases the shock wave could penetrate the mesh. The safety mesh is connected along the diagonals, so that if the mesh breaks, it will break from the connections points of the mesh along the diagonals and bend

up, but will remain attached to the walls of the shock wave guide 11.

[0010] Ballistic surface 9 that forms the ceiling of area 5 for the storage of explosive substances consists of bearing mesh 13 from galvanized steel wire, composite thermal, waterproof and radiation insulation material 14 and weather-proof and ultraviolet resistant covering material 15 that is glued air-tightly to the composite material. Ballistic surface 9 is produced from eight triangular surfaces 16 that rest diagonally on the corners and on steel wires 17 stretched to the side tips of shock wave guide 11. The central part of steel wires 17 is connected so that the connection will be become loose at the impact of the shock wave, the triangular parts 18 of the bearing mesh will bend and the shock wave is free to escape into the air. The triangular parts 16 of the ballistic surface mounted to the bearing mesh 13 from steel wires also bend to the sides of guide 11 at the impact of the shock wave.

[0011] Composite thermal, waterproof and radiation insulation material 14, with total thickness 10 mm, is produced in seven layers: the first layer 19 is produced from aluminium foil with the thickness 30 microns and processed against oxidation; the second layer 20 is produced from fire-retarding polyethylene that contains hollows 21 with dry air, with diameter 10 mm and height 4 mm; the third layer 22 is produced from aluminium foil; the fourth layer 23 is produced from a layer of fire-retarding and water-repellent foam polyethylene with the thickness 3 mm; the fifth layer 24 is produced from aluminium foil with the thickness 30 microns; the sixth layer 25 is produced from a layer of fire-retarding polyethylene that contains hollows 21 with dry air, with diameter 10 mm and height 4 mm; the seventh layer 26 is produced from aluminium foil with the thickness 30 microns and processed against oxidation.

[0012] The eight triangular ballistic surface parts 16 of the composite thermal, waterproof and radiation insulation material 14 are installed on one another with 5-10 cm overlap and the edges are taped with a special tape 27 that contains aluminium foil. All the aluminium foil parts 19, 22, 24, 26, including the aluminium foil of the tape 27 are connected electrically with the earthing 28 of the storage facility.

[0013] The weather-proof and ultraviolet resistant covering material 15 of the ballistic surface contains polyester fabric 29, which is plasticized with a layer of fireproofing polyvinyl that is again covered from beneath and on the top with a layer of acrylic 31. The covering material 15 of the ballistic surface is produced from eight triangular parts 32, which are positioned with edges overlapping by 10-20 cm. The overlapping areas are taped air-tightly to one another.

[0014] The eight triangular parts 16 of the ballistic surface are fixed to the outside of the sides of shock wave guide 11. In case of an explosion of the explosive substance, the triangular parts 16 of the ballistic surface will open at the impact of the shock wave and will turn to the outer sides of the shock wave guide 11.

[0015] The thermal insulation capacity of ballistic surface 9 (in case of temperature difference between external and internal surface -20 °C and 20 °C) is R=5.70 m^2*K/W at minimum (maximum thermal conductivity 0.175 W/m^2*K). In colder climates the composite material of the ballistic surface can also be installed in two layers. The weight of ballistic surface 9 is 0.15 g/cm^2 at maximum, which has practically no influence on the pressure of the shock wave, and the explosion gases can escape from the storage facility relatively freely.

[0016] The storage facility is supplied with local supply and extraction ventilation system 33, which adjusts the air temperature, the levels of dust and relative humidity in the storage facility. Ventilation system 33 is also supplied with wet filters, which remove dust from the supply air. The temperature of the storage facility is maintained by ventilation system 33 and heating system 34 within the range of 5 °C to 15 °C and relative humidity at 55%-60%, and dust-free.

[0017] The air supply units 35 and extraction units 36 of ventilation system 33 are supplied with fire-retarding valves 37, which close as a result of an explosion, and steel grilles 38, where the front lamella 39 are at a 45 degree angle in order to reduce the pressure force of the shock wave.

[0018] Lights 40 are flush-mounted in the reinforced concrete enclosure 1 of the storage facility, are explosion-proof and dust-proof and have impact-proof glasses 41 with steel mesh installed in front of the lights.

[0019] The storage facility is supplied with at least two independent temperature sensors 42 and moisture sensors 43. The storage facility is also supplied with an automatic addressed security alarm system 44 and fire alarm system 45.

[0020] The heating system 34 of the storage facility is installed inside the floor of the storage facility and is automatically controlled. The temperature of the heater does not exceed the maximum indoor temperature +15 °C. Under the heater is the composite thermal, waterproof and radiation insulation material 14 installed. The floor of the storage facility is covered with an even, easy-to-clean material 46 that conducts static discharges.

[0021] Composite thermal, waterproof and radiation insulation material 14 is glued air-tightly with moisture resistant glue to the outside of the reinforced concrete enclosure 1 of the storage facility.

[0022] The inner sides of the enclosure of the storage facility are covered with material 47, which buffers ricochets.

[0023] The reinforced concrete framework 48 of enclosures 1 of the storage facility, aluminium foil layers 19, 22, 24, all steel elements and products 6, 8, 12, 13, 33, 35, 36, 37, 38, 39, 40 and flooring 46 that conducts static discharges are connected to earthing 28. Earthing 28 of the storage facility is local and away from the influence of the earthing of the normal building and the lighting conductor 49 of the storage facility.

[0024] The storage facility is supplied with lighting con-

ductor 49, the earthing loop of which is taken away from the storage facility, more far from the influence of the electrostatic and electromagnetic induction of lightning bolts.

[0025] The result is a storage facility for explosive substances, where explosive substances are secured with an environment with suitable storage temperature, moisture level and air, and protected against the influence of electrostatic and magnetic inductions and radio waves.

Claims

1. Storage facility for explosive substances, comprising enclosure walls, a barrier wall to block the spread of the shock wave, a ceiling, safety mesh, bearing mesh above the area of explosive substances, insulation material and covering material located on top of the bearing mesh, **characterized in that:**

   - the storage facility for explosive substances is created separately from the normal building, with reinforced concrete enclosures (1);
   - the storage facility for explosive materials is separated from the normal building by means of flexible structures (2), which are installed below the ground level (3) into grained mineral soil (4);
   - barrier walls (7) are built between the storage area (5) of the explosive substances and exit doors (6, 8);
   - the ceiling above the storage area (5) for explosive substances is built as a ballistic surface (9) and is elevated higher from the roof (10) of the storage facility by the height of the storage facility;
   - the storage facility contains a shock wave guide (11);
   - the safety mesh (12) of the storage facility is fixed to the walls of the shock wave guides (11);
   - the ballistic surface (9) of the storage area (5) of the explosive substances incorporates a bearing mesh (13), insulation material (14) located on top of the bearing mesh (13), and a covering material (15);
   - the storage facility incorporates local earthing (28), local supply and extraction ventilation (33), a heating system (34), lights (40), at least two independent temperature sensors (42) and moisture sensors (43), security alarm and fire alarm systems (44, 45), the floor of the storage facility is covered with a material (46) that conducts static discharges and the storage facility is protected with a lighting conductor (49).

2. Storage facility for explosive substances according to claim 1, **characterized in that** the external sides of enclosures (1) are covered air-tightly with an insulation material (4) with the help of a moisture-resistant glue, and the internal sides are covered with a material (47) that buffers ricochets.

3. Storage facility for explosive substances according to claim 1, **characterized in that** the ballistic surface (9) is produced from eight triangular surfaces (16), which rest diagonally on the corners and on steel wires (17) stretched to the side tips of the shock wave guide (11), while the triangular parts (16) are attached to the outside of the sides of the shock wave guide (11); the ballistic surface contains a bearing mesh (13) from steel wires, which consists of triangular parts (18).

4. Storage facility for explosive substances according to claim 1, **characterized in that** the ends of the sides of the shock wave guide (11) are produced in the form of a ridge with an inclination towards the corners.

5. Storage facility for explosive substances according to claim 1, **characterized in that** the insulation material (14) located on top of the bearing mesh (13) of the ballistic surface is a composite thermal, waterproof and radiation insulation material, which is produced in seven layers: the first layer (19) is produced from aluminium foil and processed against oxidation; the second layer (20) is produced from fire-retarding polyethylene that contains hollows (21) with dry air; the third layer (22) is produced from aluminium foil; the fourth layer (23) is produced from a layer of fire-retarding and water-repellent foam polyethylene; the fifth layer (24) is produced from aluminium foil; the sixth layer (25) is produced from a layer of fire-retarding polyethylene that contains hollows (21) with dry air; the seventh layer (26) is produced from aluminium foil and processed against oxidation.

6. Storage facility for explosive substances according to claim 1, **characterized in that** the covering material (15) is weather-proof and ultraviolet resistant and contains polyester fabric (29), which is plasticized with a layer of fireproofing polyvinyl (30), while the layer of polyvinyl (30) is covered from beneath and on the top with a layer of acrylic; the covering material (15) is produced from eight triangular parts (32), which are positioned with overlapping edges.

7. Storage facility for explosive substances according to claim 1, **characterized in that** the eight triangular parts of the ballistic surface (16) of the composite thermal, waterproof and radiation insulation material (14) are positioned with overlapping edges and the edges are taped with a tape (27) that contains aluminium foil.

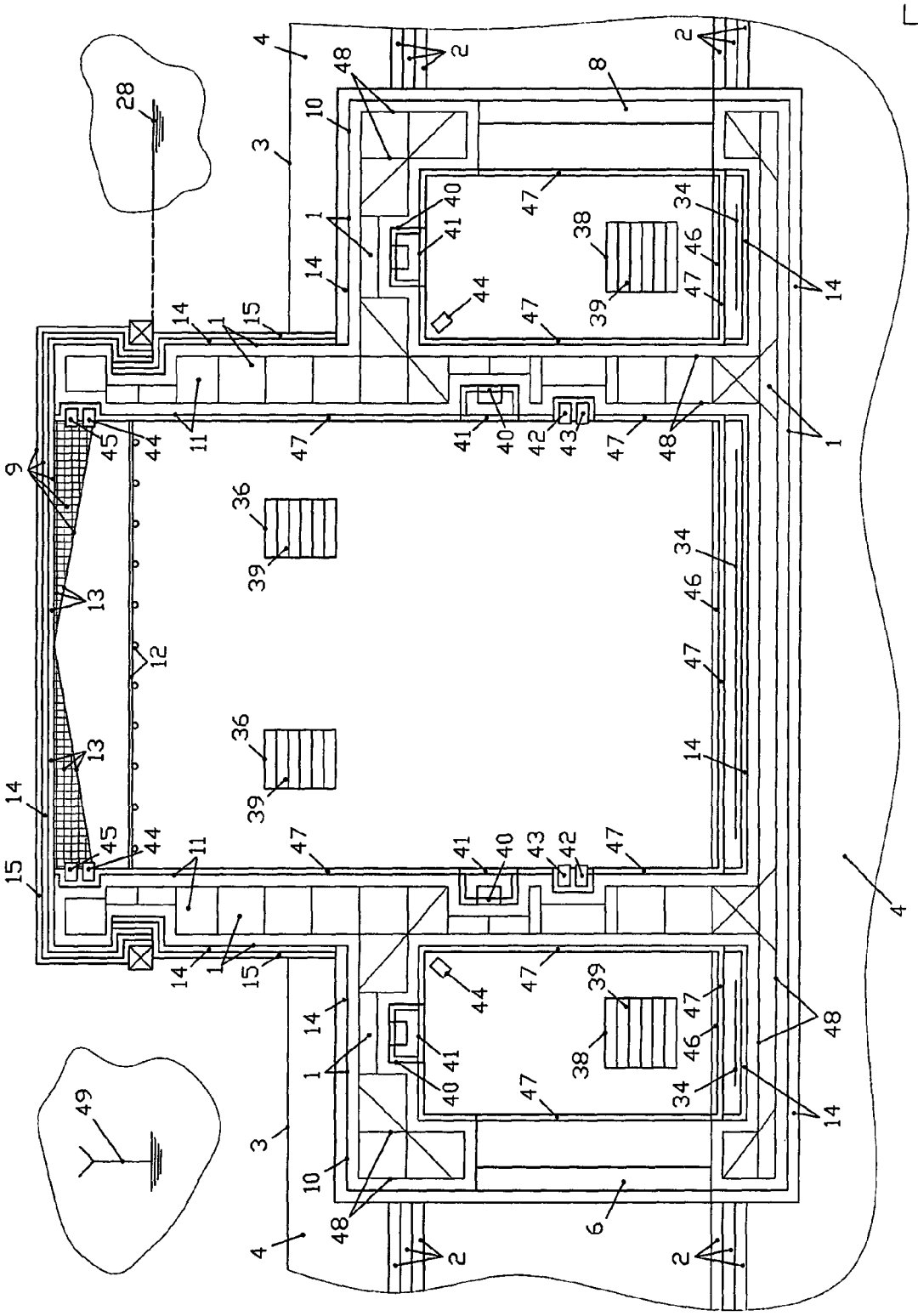

Fig 1

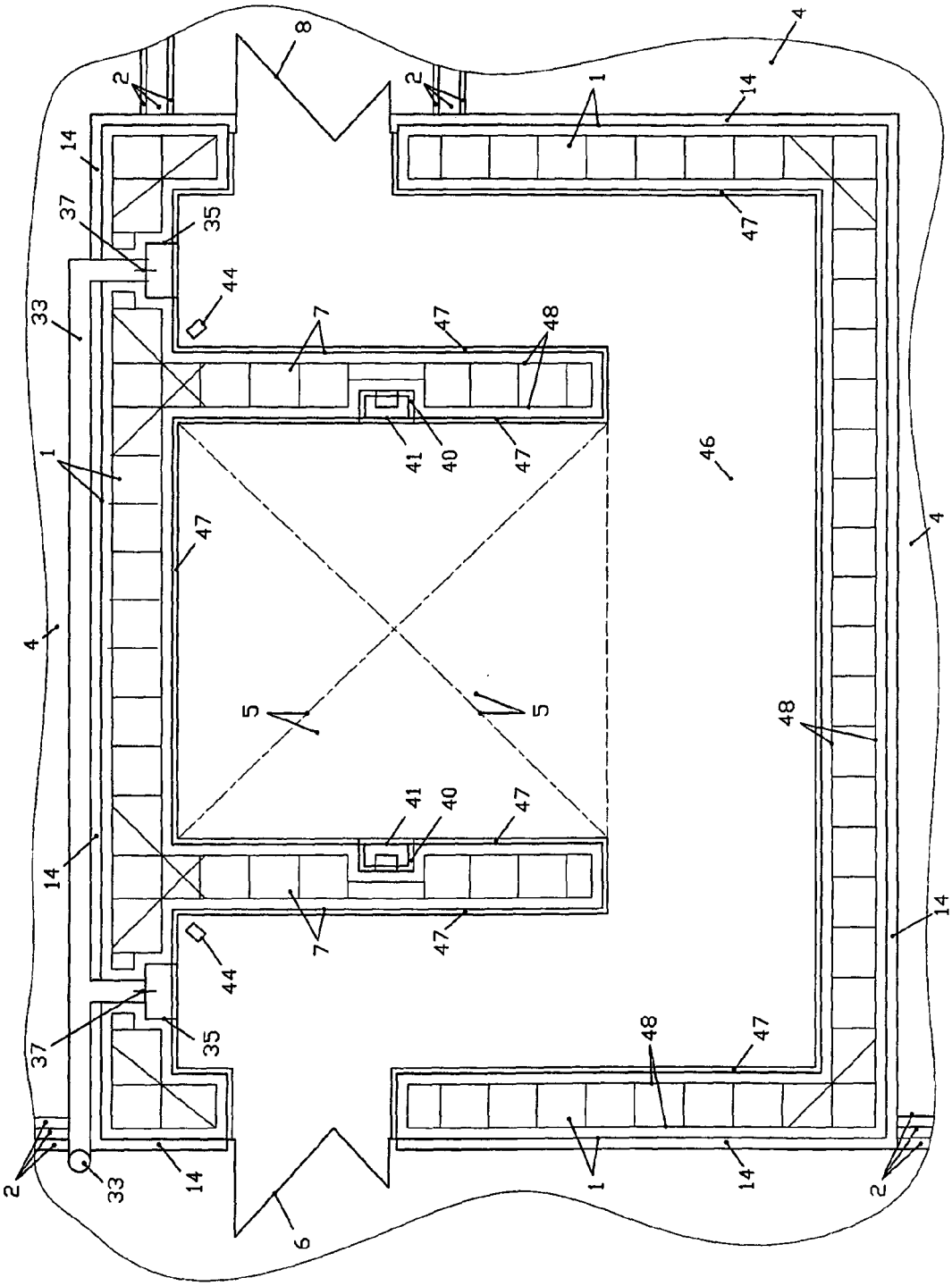
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Fig 2

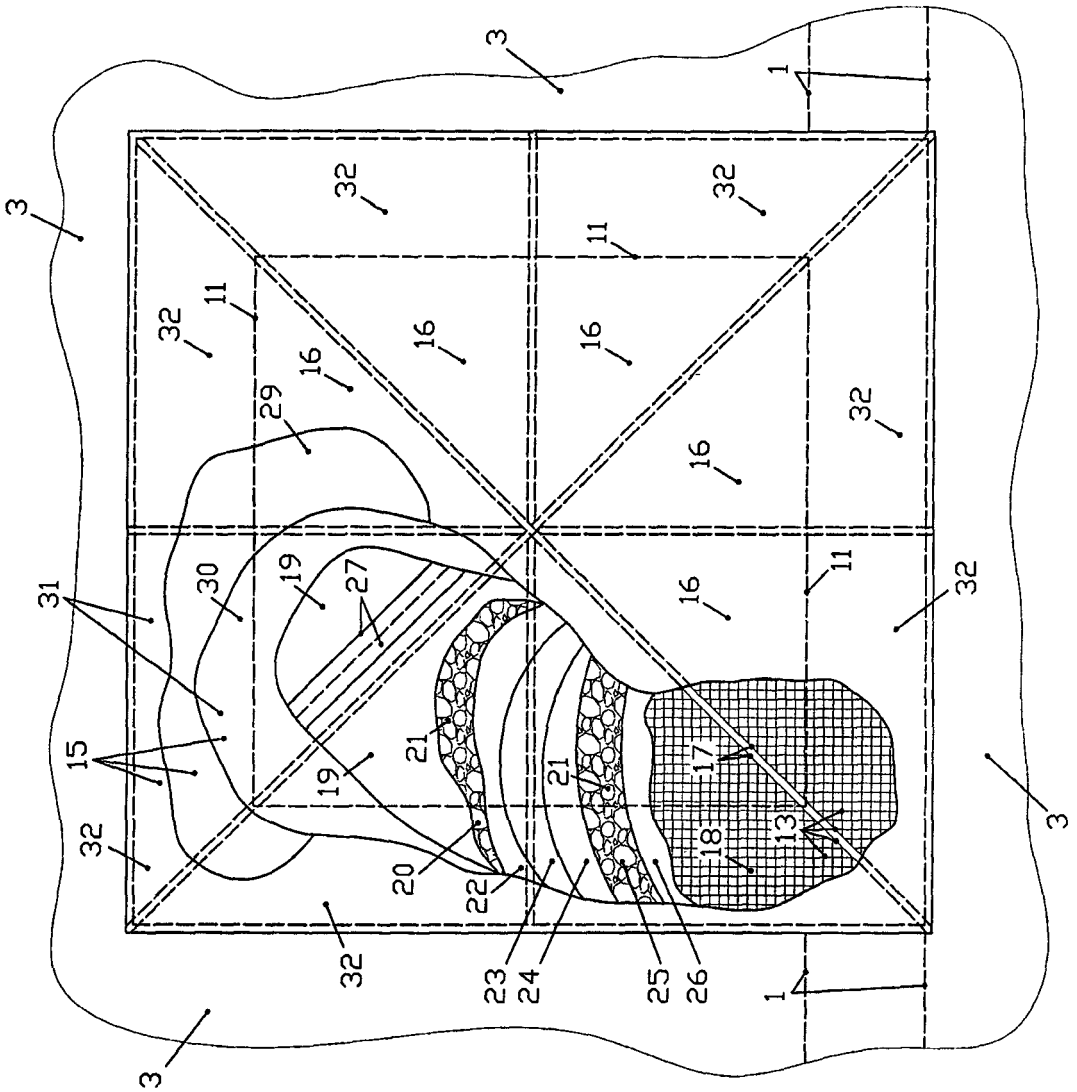

Fig 3

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EUROPEAN SEARCH REPORT

Application Number
EP 10 00 6057

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 September 2010	Decker, Robert

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X : particularly relevant if taken alone
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