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(73) Haltija - Innehavare - Proprietor
1 •UPONOR INFRA OY, Äyritie 20, 01510 VANTAA, SUOMI - FINLAND, (FI)

(72) Keksijä - Uppfinnare - Inventor
1 •VESTMAN, Christian, VAASA, SUOMI - FINLAND, (FI)

(74) Asiamies - Ombud - Agent
Laine IP Oy, Porkkalankatu 24, 00180 Helsinki

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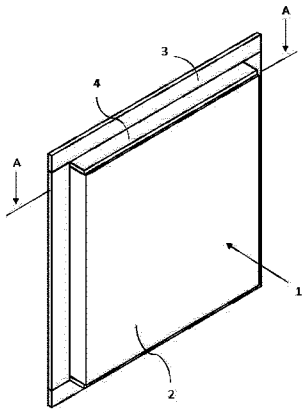
Wall with a passageway and a method for the production thereof

(56) Viitejulkaisut - Anförda publikationer - References cited
US 2014260013 A1, JP 2000078734 A, EP 2273170 A1, WO 2013057373 A1, WO 2013057374 A1

(57) Tiivistelmä - Sammandrag - Abstract

Rakenteen seinämä, joka käsittää valettua sementtipitoista materiaalia, ja menetelmä sen tuottamiseksi. Seinämä käsittää ensimmäisen osan, jonka muodostaa polymeerimateriaalista valmistettu paneeli, jolloin mainitussa paneelissa on siihen muodostettu kanava. Ensimmäinen osuus on yhdistetty seinämän toiseen osuuteen, joka muodostuu sementtipitoisesta materiaalista. Kyseiset kanavat voivat olla muodostettuja betonin jakokanaviksi, kaivoiksi ja käytäviksi. Aukot on helpompi muodostaa termoplastisiin paneeleihin kuin betoniseinämiin yksinkertaisella porauksella, mikä mahdollistaa yhdistämisen rakennuksiin ja niistä pois kulkeviin maanalaisiin putkistoihin, kuten juomavesiputkiin, viemäriputkiin, hulevesiputkiin ja septiputkiin.

A wall of a structure comprising moulded cementious material and a method of producing the same. The wall comprises a first portion formed by a panel of a polymeric material, wherein said panel has a passageway formed therein. The first portion is coupled to a second portion of the wall, consisting of the cementitious material. The present passageways can be formed into concrete distribution chambers, wells and culverts. Openings are much more readily formed into the thermoplastic panels than into concrete walls by simple drilling allowing for ease of coupling to underground piping running from and to buildings, such as fresh water pipes, sewage pipes, drainage pipes and septic pipes.



Wall with a passageway and a method for the production thereof

Technical Field

The present invention relates to wall constructions of cementitious material. Such walls typically form part of three-dimensional constructions, such as concrete boxes, housings or chambers, for example for subterrain installations. In particular the present invention relates to walls formed from cementitious material by moulding and exhibiting at least one passageway extending through the thickness of the walls.

The present invention also concerns a method of producing passageways in walls of cementitious material.

Background Art

Distribution chambers are used for coupling to underground piping running from and to buildings, such as fresh water pipes, sewage pipes, drainage pipes and septic pipes. Conventionally, the distribution chambers are large prefabricated boxes of reinforced concrete with a bottom slab and an opposite concrete cover to protect the ends of the pipes coupled to them, when buried underground. The pipes are fitted into openings formed in the, typically lateral, walls of the boxes.

Normally all connections to and from the distribution chambers are formed by drilling an opening for the connecting pipes through the concrete wall. This operation is slow and costly. The holes have to be drilled at an angle of 90 degrees against the wall. Further, when pipes laid in the ground are to be introduced into concrete walls, utmost care has to be taken to achieve proper sealing, e.g. to prevent standing water from penetrating into the wall and into the distribution chamber. To that purpose, rubber sealings are typically used.

There is a need for passageways (openings) through concrete walls which can be rapidly formed and which can be achieved at angles also different from 90 degrees to provide for additional flexibility of the installation work. This is particularly important when connecting plastic piping to distribution chambers of concrete material. Additional needs

relate to the provision of water tight couplings of the pipes to the opening of the distribution chambers.

Summary of Invention

Based on the above, the present invention aims at eliminating at least a part of the problems relating to the art and at providing a wall structure in which openings for pipes and similar passageways can readily be formed.

The present invention also aims at achieving a method of forming a passageway through a wall of a structure comprising moulded cementitious material.

More specifically, the present wall structure is mainly characterized by what is stated in the characterizing part of claim 1.

The method according to the present invention is characterized by what is stated in the characterizing part of claim 22.

Considerable advantages are obtained by the present invention. Thus, openings are much more readily formed into the thermoplastic panels than into concrete walls by simple drilling allowing for ease of coupling to underground piping running from and to buildings, such as fresh water pipes, sewage pipes, drainage pipes and septic pipes. The angel of the opening and the passageway through the wall can be selected at will.

To achieve water tightness between the pipes and the panels, sockets or spigot ends can be assembled in the openings. When installing such sockets or spigots, in particular of plastic material, they can be welded to the plates by conventional plastic welding to achieve good sealing without the need to resort to separate sealing rings. Connection of pipe spigot or respectively socket ends to the prewelded connection points in the panel is fast and enables a secure gasketed tight solution.

Further features and advantages will be discussed with reference to embodiments of the present invention.

Brief Description of Drawings

Figure 1 shows in a perspective view an embodiment of the present thermoplastic panels;
Figure 2 shows in side-view a cross-section of the embodiment of Figure 1; and
Figure 3 shows in a perspective view an embodiment of the present thermoplastic panels incorporated into a concrete wall and provided with a plurality of opening extending through the panel.

Embodiments

In the present context, "polymer panel" and "panel of polymeric material" stands for a plate-like structure, which has two opposite surfaces which are composed by a polymeric material, for example a thermoplastic material, such as a polyolefin, polyester or polyamide, or from a thermosetting material, for example a reinforced thermosetting material. Generally, it is preferred that the surfaces of the panel are weldable by polymer welding such that they are capable of being provided with plastic sockets that can be sealed against the surfaces by such welding.

"Cementitious material" stands for a material which is composed of a hydraulic binder, such as cement, conventionally mixed with filler and ballast and optionally reinforcing components. As a typical example of such a material, reinforced concrete and various engineered cementitious composites, can be mentioned. However, other hard mineral materials are also encompassed by the term.

"Tubular sleeve" stands for means capable of providing sealable connection of inserted pipes into openings formed in the polymer panel. Typically, such means are represented by tubular pipe ends, such as spigots or sockets. Preferably the tubular sleeves are manufactures from durable materials, such as metals or preferably polymers. In particular, tubular sleeves of thermoplastic materials are used.

As discussed above, the present technology provides a structure with a wall formed by moulded cementitious material.

Basically, in one embodiment, in a first portion of the wall, a passageway element is formed of at least one panel of a polymeric material. A second portion of the wall has two opposing surfaces with a thickness of moulded cementitious material there between. The first portion of the wall is coupled to the second portion of the wall such that the perimeter of the first portion of the wall lies at least partially between the opposing surfaces of the second portion of the wall.

Thus, in practice, in the wall there is at least one panel of polymeric material fitted into the surrounding wall portion formed by moulded cementitious material.

Figures 1 and 2 show an exemplifying embodiment of the present panel. In the drawings, reference numeral 1 is used for designing the panel, which in the embodiment shown comprises a plate having two planar and parallel surfaces. As will appear from the drawing, typically, the second surface is being spaced apart from the first surface and arranged on the opposite side of the first surface with respect to a geometric central plane between the first and the second surfaces. One of the surfaces, will form the external side of the wall and the other surface, the internal side (i.e. the side in the interior of the three dimensional structure.

The edge portions peripherally adjoining the first and the second surfaces are marked with reference numerals 4 and 7. They further comprise a console part extending outwards from the edge portions in a plane essentially parallel with the central plane.
The console part according to the embodiments shown in the drawings comprises an outwards extending flange, in particular the console part comprises a flange which covers 10 to 100 % of the peripheral length of the edge portions. In the present context "peripheral length" is used synonymously with perimeter.

A particular advantage of having the panel fixed to the surround portion of the wall by using flanges which extend into the second portion, rather than securing the panel by fixtures extending from the second portion into the panel, is that an opening can without difficulty by formed in any area of the panel.

The panel of polymeric material is a multi-walled panel construction.
In the drawings, the panel 1 is formed by a double-walled panel formed by two plates 2, 6 spaced apart and joined together by a plurality of transversal walls 5, which also give the double-walled panel high stiffness.

In one embodiment, a suitably stiff and rigid panel is obtained by providing a double-walled panel having parallel, transversal walls which are space apart from each other no more than 0.1 to 2.5 times, in particular 0.5 to 2.0 times, for example 0.75 to 1.5 times, the diameter of an opening which is to be formed throughout the panel.

The transversal walls are typically rigid. They will reinforce the structure. The transversal walls can be linear or curved. "Curved" includes bent shapes as well as structures, which in section along the central plane of the panel are elliptical or circular. Combinations of linear and curved walls of various shapes are also possible.

It is particularly preferred that the panel have a rigidity and stiffness which together will contribute to making the panel buckling resistance when subjected to the pressure caused by, e.g., standing water, when the wall structure is subjected to the conditions encountered for subterrain installations.

Plates capable of being used in the present technology are disclosed, for example, in WO2013/057373 and WO2013/057374 the contents of which are herewith incorporated by reference.

Such plates are typically manufactured from thermoplastic materials, such as polyolefins, and they have a structure which is comprised of elongated hollow profiles, with straight and parallel central axes, the profiles being laterally welded together to form a double-wall structure. Typically, the cross-section of the hollow profiles is rectangular to give plates with at least essentially planar sides. The plates are rigid. They are typically self-supporting at span widths of up to 5,000 mm transversally to the central axes of the profiles, and up to 20,000 mm in the direction of the central axes of the profiles.

Naturally, also other double- and multi-walled plates can be used. For example, plates formed by parallel I-bar shaped plastic profiles, which are laterally welded together to form large plates are possible. The double- or multi-walled plates can further be formed by thinner surface sheets of thermoplastic materials, which are welded or in another fashion fixed together to reinforcing bars running in parallel to the surface planes of the sheets.

The ratio between the thickness of the panel and the distance between two reinforcing bars or walls transversally to the thickness of the panel is in one embodiment 0.1 to 1.0, typically 0.2 to 0.8.

In another embodiment, the ratio between the thickness of the panel and the distance between two reinforcing bars or walls transversally to the thickness of the panel is in one embodiment 1.01 to 10, typically 1.2 to 5.0. These ratios will provide stiff and rigid plates.

In one embodiment, the polymeric plates comprise essentially only thermoplastic material. In another embodiment, the polymeric plates comprise surface layers of thermoplastic materials, which are joined together by some other material, which is more readily drilled through than concrete.

In one embodiment, the thickness of the panel, i.e. the first portion, is 0.1 to 2 times, typically 0.2 to 1 time, the thickness of the adjacent cementitious wall, i.e. the second portion. In one particular embodiment, the thicknesses of the two portions are roughly the same, with the first portion being at maximum of equal thickness to that of the second portion. At minimum the thickness of the first portion is at least 0.5 times that of the second portion.

Typically, there can be 2 or more polymeric plates inserted into the second portion of the wall consisting of cementitious material. The plates can be inserted into different openings. It is also possible to have several overlapping (or sequential) panel in the same opening to secure sufficient stiffness. The total area of a plurality of polymeric plates is about 0.2 to 1.5 times the area of the second area.

In one embodiment, the first portion of the panel of the first portion forms an integral part of the wall with the second part. For example the panel is flush-mounted in the wall so as provide a smooth surface.

Figure 3 illustrates how a panel according to the embodiments of Figures 1 and 2 can be incorporated into a wall to become an integer part thereof. Reference numeral 9 designs a wall portion of a hard material, preferably a cementitious material. Into the wall portion there is formed an opening 10, which is defines an area which is taken up by a panel 1 of the kind discussed above. The flanges 3 are marked with hatched lines to indicate that they are embedded into the material of the second wall portion.

The flanges will contribute to sealing off the seam between the panel and the surrounding wall against water.

Further, as can be seen, the panel 1 comprises several openings 8 formed into and extending through the polymeric material. These can be drilled with ease at a preselected angle.

The openings formed in a panel of the above kind have generally a diameter of about 1 to 1000 mm, in particular 5 to 750 mm, for example 10 to 500 mm.

The openings 8 thus formed into and extending through the panel 1 of the polymeric material can be provided with coupling means, such as tubular sleeves, i.e. spigots or sockets (not shown). The tubular sleeve comprises for example a spigot or socket capable of receiving a pipe end. Further, the outer surface of the tubular sleeve can sealed against the walls of the opening e.g. to reduce or eliminate leaking of fluid between the outer surface of the tubular sleeve and the wall.

When a pipe end is inserted into the opening or into the tubular sleeve, it can be further sealed against the wall or sleeve. To that aim, the pipe can be provided with a sealing collar, for example in the form of a flange, which can be sealed against the wall abutting with the sealing collar to reduce or eliminate leaking.

In a wall of the present kind, the hardened material of the second portion contacts with the first portion in the wall planes on at least three sides. Typically, the first portion is laterally (i.e. in the direction of its central axes) surrounded by the second portion.

Generally, in for example a distribution chamber (as well as other concrete boxes) there can be 1 or 2 and up to 10 panels of polymeric material on one side of a structure. Thus, there can be a plurality of walls, wherein at least one, for example 2 or a plurality, comprise a panel with openings, forming passageways through the walls.

The geometric shape of the panel is not limited to quadratic or rectangular, also arch-shaped and circular shapes are possible.

Based on the above, the present technology also provides a method of forming a passageway through a wall of a structure comprising cementitious material, which is moulded, for example comprises preformed concrete elements or is moulded on-site.

The method comprises the steps of

- arranging into the wall of the cementitious material a panel of a polymeric material, which panel has extends through the wall and which forms two opposite surfaces of the wall in a first portion of the wall, and
- forming into the panel at least one opening which extends through the panel and which forms a passageway through the wall. (forming an opening not necessary if connections are made afterwards and the panel is planned for add-on connections)

In one embodiment, the method is implemented in connection with the moulding of a wall of cementitious material in a mould: Into that mould, a panel of a polymeric material, having two opposite sides, which form outer surfaces at a first portion of the wall, is incorporated at a predetermined position. Unhardened cementitious material is introduced into the mould, such that the cementitious material essentially does not cover the opposite sides of the panel of polymeric material. The cementitious material is then hardened in the mould to form a wall structure having at least one portion formed by the polymeric panel as a “window”.

In another embodiment, the method is carried out by providing a wall having an opening formed therein, defined by its edges, placing a panel of a polymer material which has a perimeter at least roughly corresponding to the edges of the opening such that there is a seam zone formed between the edges of the opening and the perimeter of the panel. The panel is then fixed to the opening by applying a hardening material, such as a cementitious material, to said seam zone. Finally, the material is allowed to harden. This embodiment is particularly useful for field installations.

During hardening the cementitious material contacts with an edge portion between the surfaces of the panel to couple the panel to the wall. As discussed above, it is preferred that the edge portions of the panel have recesses or flanges for enhancing the contact of the hardening material with the panel.

Into the panel, one or several openings are formed, for example by drilling. The drilling is carried out such that the opening extends through the thickness of the panel. For pipe connections, a tubular sleeve is the inserted into to the opening. The outer surface of the tubular conduit is sealed against the walls of the opening e.g. in order to reduce or eliminate leaking of fluid between the outer surface of the tubular conduit and the walls.

The tubular sleeve is capable of accommodating a pipe end, which can further be sealed against the sleeve with a flange attached to the pipe end.

Industrial Applicability

The present structures are suitable as walls in, to mention some examples, inspection chambers; coupling chambers; pumping chambers; and distribution chambers, for example coupling chambers of the kind conventionally used for coupling to underground piping running from and to buildings, such as fresh water pipes, sewage pipes, drainage pipes and septic pipes.

Various other applications as also possible, such as concrete wells and culverts.

In one embodiment, the ends of tubular conduits can be passed through the wall of the concrete structure open into the interior to allow for mounting of coupling means to said ends on the interior side of the structure.

Reference Signs List

1	panel
2	plate
3	flange
4, 7	edge of panel
5	transversal wall
6	plate
8	opening
9	wall

Citation List

Patent Literature

WO2013/057373
WO2013/057374

Claims:

1. A wall (9) of a structure comprising moulded cementious material, wherein said wall (9) comprises a first portion formed by a multi-walled panel (1) of a polymeric material, wherein said panel (1) has a passageway formed therein, said first portion being coupled to a second portion of the wall (9), consisting of cementitious material,
characterized in that the panel (1) of the polymeric material is formed of a hollow double-walled panel formed by two plates (2, 6) spaced apart and joined together by a plurality of transversal walls (5), and
the two plates (2, 6) are manufactured from thermoplastic materials and have a structure, which is comprised of elongated hollow profiles with straight and parallel central axes, the profiles being laterally welded together to form a double-wall structure.

2. The wall (9) according to claim 1, wherein the first portion of the wall has a first thickness and the second portion of the wall has a second thickness, the first thickness being 0.1 to 2 times, typically 0.2 to 1 times the second thickness.

3. The wall (9) according to claim 1 or 2, wherein the first portion has a first area and the second portion of the wall has a second area, the first area being 0.01 to 5 times, preferably 0.1 to 2 times the area of the second area.

4. The wall (9) according to any of claim 1 to 3, wherein the first portion of the wall forms an integral part of the wall together with the second part.

5. The wall (9) according to any of the preceding claims, wherein at least one side, preferably two opposite sides, of the wall (9) is essentially planar.

6. The wall (9) according to any of the preceding claims, wherein the panel (1) comprises an opening (8) formed into and extending through the polymeric material.

7. The wall (9) according to any of the preceding claims, wherein it further comprises a tubular sleeve having an outer surface, inserted into an opening formed into and optionally extending through the panel (1) of the polymeric material.

8. The wall (9) according to claim 7, wherein the tubular sleeve comprises a spigot or socket end capable of receiving a pipe end.

9. The wall (9) according to claim 7 or 8, wherein the tubular sleeve is sealed against the walls of the opening (8) e.g. to reduce or eliminate leaking of fluid between the outer surface of the tubular conduit and the walls, preferably said sleeve is welded to the panel (1).

10. The wall (9) according to any of claims 7 to 9, wherein the tubular conduit is provided with a sealing collar, for example in the form of a flange (3), which can be sealed against the wall (9) abutting with the sealing collar to reduce or eliminate leaking of fluid between the outer surface of the tubular conduits and said wall (9).

11. The wall according to any of the preceding claims, wherein the panel (1) of polymeric material comprises

- a first surface;
- a second surface, which is being spaced apart from the first surface and arranged on the opposite side of the first surface with respect to a geometric central plane between the first and the second surfaces; and
- edge portions peripherally adjoining the first and the second surfaces, said edge portions further comprising a console part extending outwards from the edge portions in a plane essentially parallel with the central plane.

12. The wall (9) according to claim 11, wherein the console part comprises an outwards extending flange (3), in particular the console part comprises a flange (3) which covers 10 to 100 % of the peripheral length of the edge portions.

13. The wall (9) according to any of claims wherein the panel (1) is coupled to the second portion of the wall by hardened cementitious material.

14. The wall (9) according to any of the preceding claims, wherein the material of the first panel is selected from thermoplastic materials, such as polyolefins, polyesters and polyamides, and from thermosetting materials, for example reinforced thermosets.

15. The wall (9) according to any of the preceding claims, wherein the second portion contacts with the first portion in the wall planes on at least three sides.

16. The wall (9) according to any of the preceding claims, wherein the first portion of the wall consists of 2 to 10 overlapping panels of polymeric material.

17. A concrete structure comprising a moulded cementitious material, and having a plurality of walls, **characterized** in that at least one of the walls comprises a wall (9) according to any of claims 1 to 16.

18. The concrete structure according to claim 17, comprising a plurality of walls with a passageway according to any of claims 1 to 16.

19. The concrete structure according to claim 17 or 18, comprising an inspection chamber, a coupling chamber or a pumping chamber.

20. The concrete structure according to any of claims 17 to 19, wherein the ends of tubular conduits passed through the wall of a polymer plane in the concrete structure open into a coupling chamber for allowing mounting of coupling means to said ends.

21. The concrete structure according to any of claims 17 to 20, wherein the first portion of the wall is capable of resisting buckling pressure when the concrete structure is subjected to subterrain installation.

22. A method of forming a passageway through a wall (9) of a structure comprising moulded cementitious material, comprising

- arranging into the wall (9) a panel (1) of a polymeric material, which panel (1) extends through the wall (9) and which forms two opposite surfaces of the wall (9) in a first portion of the wall, and

– forming into the panel (1) an opening (8) which extends through the panel (1) and which forms a passageway through the wall (9),

characterized in that the panel (1) of the polymeric material is formed of a hollow double-walled panel formed by two plates (2, 6) spaced apart and joined together by a plurality of transversal walls (5), and

the two plates (2, 6) are manufactured from thermoplastic materials and have a structure, which is comprised of elongated hollow profiles with straight and parallel central axes, the profiles being laterally welded together to form a double-wall structure.

23. The method according to claim 22, comprising the step of providing a mould defining the shape of the wall (9), incorporating into the mould, at a predetermined position, a panel (1) of a polymeric material, having two opposite sides, which form outer surfaces at a first portion of the wall, introducing unhardened cementitious material into the mould, such that the cementitious material essentially does not cover the opposite sides of the panel (1) of polymeric material, and hardening the cementitious material in the mould.

24. The method according to claim 22, comprising the step of providing a wall (9) having an opening formed therein, defined by its edges (4, 7), placing a panel (1) of a polymer material which has a perimeter at least roughly corresponding to the edges of the opening such that there is a seam zone formed between the edges of the opening and the perimeter of the panel (1), and fixing the panel (1) to the opening by applying a hardening material, such as a cementitious material, to said seam zone, and allowing the material to harden.

25. The method according to claim 22 or 23, wherein the cementitious material contacts with to an edge portion between the surfaces of the panel (1) to couple the panel (1) to the wall (9).

26. The method according to claim 25, wherein the edge portions (4, 7) of the panel (1) has recesses or consoles for enhancing contacting of the hardening material to the panel (1).

27. The method according to any of claims 22 to 26, wherein a tubular sleeve having an outer surface is inserted into to opening (8) formed into and optionally extending through

the panel (1) of the polymeric material, said tubular sleeve preferably forming a spigot or socket of receiving and securing a pipe end.

28. The method according to claim 27, wherein the outer surface of the tubular sleeve is sealed against the walls of the opening e.g. in order to reduce or eliminate leaking of fluid between the outer surface of the tubular conduit and the walls.

29. The method according to claim 27 or 28, wherein the tubular conduit is provided with a sealing collar, for example in the form of a flange (3), which can be sealed against the wall abutting with the sealing collar to reduce or eliminate leaking of fluid between the outer surface of the tubular conduits and said wall.

30. The method according to any of claims 22 to 29, wherein the panel (1) has a thickness which is 0.1 to 2 times, typically 0.2 to 1 times the thickness of the wall (9) at the portions formed by hardened cementitious material.

31. The method according to any of the preceding claims, wherein the material of the first panel is selected from thermoplastic materials, such as polyolefins, polyesters and polyamides, and from thermosetting materials, for example reinforced thermosets.

Patenttivaatimukset:

1. Rakenteen seinämä, joka käsittää valettua sementtipitoista materiaalia, jossa mainittu seinämä (9) käsittää ensimmäisen osuuden, joka on muodostettu polymeerimateriaalin moniseinämäisestä paneelista (1), jossa mainitussa paneelissa (1) on siihen muodostettu läpivienti, mainittu ensimmäinen osuus on yhdistetty seinämän (9) toiseen osuuteen, joka koostuu sementtipitoisesta materiaalista,
tunnettu siitä, että polymeerimateriaalin paneeli (1) on muodostettu ontosta kaksoisseinämaisestä paneelista, jonka muodostaa kaksi levyä (2, 6), jotka ovat erillään toisistaan ja yhdistetty toisiinsa useilla poikittaisilla seinillä (5), ja
kaksi levyä (2, 6) on valmistettu termoplastisista materiaaleista ja niillä on rakenne, joka käsittää pitkänomaisia onttoja profiileja, joissa on suorat ja yhdensuuntaiset keskiakselit, profiilien ollessa hitsattu yhteen muodostaakseen kaksiseinämäisen rakenteen.

2. Patenttivaatimuksen 1 mukainen seinämä (9), jossa seinämän ensimmäisellä osuudella on ensimmäinen paksuus ja seinämän toisella osuudella on toinen paksuus, joka ensimmäinen paksuus on 0,1–2 kertaa, tyypillisesti 0,2–1 kertaa toinen paksuus.

3. Patenttivaatimuksen 1 tai 2 mukainen seinämä (9), jossa ensimmäisellä osuudella on ensimmäinen pinta-ala ja seinämän toisella osuudella on toinen pinta-ala, joka ensimmäinen alue on 0,01–5 kertaa, edullisesti 0,1–2 kertaa suurempi kuin toisen alueen pinta-ala.

4. Jonkin patenttivaatimuksen 1–3 mukainen seinämä (9), jossa seinämän ensimmäinen osuus muodostaa seinämän integroidun osan yhdessä toisen osan kanssa.

5. Jonkin edellä olevan patenttivaatimuksen mukainen seinämä (9), jossa vähintään yksi seinämän (9) puoli, edullisesti kaksi vastakkaista puolta, ovat olennaisesti tasomaisia.

6. Jonkin edellä olevan patenttivaatimuksen mukainen seinämä (9), jossa paneeli (1) käsittää aukon (8), joka on muodostettu polymeerimateriaaliin ja ulottuu sen läpi.

7. Jonkin edellä olevan patenttivaatimuksen mukainen seinämä (9), joka lisäksi käsittää putkimaisen holkin, jolla on ulkopinta, joka on työnnetty polymeerimateriaalin paneeliin (1) muodostettuun ja sen läpi ulottuvaan aukkoon.

8. Patenttivaatimuksen 7 mukainen seinämä (9), jossa putkimainen holkki käsittää putken pään tai holkkipään, joka pystyy vastaanottamaan putken pään.

9. Patenttivaatimuksen 7 tai 8 mukainen seinämä (9), jossa putkimainen holkki on tiivistetty aukon (8) seinämää vasten esimerkiksi sen vähentämiseksi tai estämiseksi, että fluidia pääsisi vuotamaan putkimaisen yhteen ulkopinnan ja seinämien välistä, jolloin edullisesti mainittu holkki on hitsattu paneeliin (1).

10. Jonkin patenttivaatimuksen 7–9 mukainen seinämä (9), jossa putkimainen yhde on varustettu tiivistyskauluksella, esimerkiksi laipan (3) muodossa, joka voidaan tiivistää tiivistekaulusta vasten olevaan seinämään (9) fluidin putkimaisten yhteiden ja ulkopinnan ja mainitun seinämän (9) välistä vuotamisen vähentämiseksi tai estämiseksi.

11. Jonkin edellä olevan patenttivaatimuksen mukainen seinämä (9), jossa polymeerimateriaalin paneeli (1) käsittää

- ensimmäisen pinnan;
- toisen pinnan, joka on erillään ensimmäisestä pinnasta ja järjestetty ensimmäisen pinnan vastakkaiselle puolelle suhteessa ensimmäisen ja toisen pinnan väliseen geometriseen keskitasoon; ja
- reunaosuudet, jotka liittävät ensimmäisen ja toisen pinnan kehämäisesti, jotka mainitut reunaosuudet edelleen käsittävät ulkokeosan, joka suuntautuu reunaosuuksista ulospäin keskitason kanssa olennaisesti samansuuntaisessa tasossa.

12. Patenttivaatimuksen 11 mukainen seinämä (9), jossa ulokeosa käsittää ulospäin suuntautuvan laipan (3), erityisesti ulokeosa käsittää laipan (3), joka peittää 10–100 % reunaosuuksien ulkokehän pituudesta.

13. Jonkin edellä olevan patenttivaatimuksen mukainen seinämä (9), jossa paneeli (1) on yhdistetty seinämän toiseen osuuteen kovetetulla sementtipitoisella materiaalilla.

14. Jonkin edellä olevan patenttivaatimuksen mukainen seinämä (9), jossa ensimmäisen paneelin materiaali valitaan termoplastisista materiaaleista, kuten polyolefiineistä, polyestereistä ja polyamideista, sekä lämpökovettuvista materiaaleista, kuten lujitetuista kertamuoveista.

15. Jonkin edellä olevan patenttivaatimuksen mukainen seinämä (9), jossa toinen osuus on kosketuksissa ensimmäiseen osuuteen seinämätasoissa vähintään kolmella puolella.

16. Jonkin edellä olevan patenttivaatimuksen mukainen seinämä (9), jossa seinämän ensimmäinen osuus muodostuu 2–10 päällekkäisestä polymeerimateriaalin paneelista.

17. Betonirakenne, joka käsittää valetun sementtipitoisen materiaalin ja jolla on joukko seinämiä, **tunnettu** siitä, että vähintään yksi seinämistä käsittää jonkin patenttivaatimuksen 1–16 mukaisen seinämän (9).

18. Patenttivaatimuksen 17 mukainen betonirakenne, joka käsittää joukon seinämiä, joissa on jonkin patenttivaatimuksen 1–16 mukainen läpivienti.

19. Patenttivaatimuksen 17 tai 18 mukainen betonirakenne, joka käsittää tarkistuskammion, kytkentäkammion tai pumppauskammion.

20. Jonkin patenttivaatimuksen 17–19 mukainen betonirakenne, jossa betonirakenteen polymeerilevyn seinämän läpi johdettujen putkimaisten yhteiden päät avautuvat kytkentäkammioon kytkentäelinten mainittuihin päihin asentamisen sallimiseksi.

21. Jonkin patenttivaatimuksen 17–20 mukainen betonirakenne, jossa seinämän ensimmäinen osuus pystyy vastustamaan kupruilemista, kun betonirakenne asennetaan maan alle.

22. Menetelmä läpiviennin muodostamiseksi valettua sementtipitoista materiaalia käsittävän rakenteen seinämän (9) läpi käsittää

- järjestetään seinämään (9) polymeerimateriaalin paneeli (1), joka paneeli (1) ulottuu seinämän läpi (9) ja joka seinämän ensimmäisessä osuudessa muodostaa seinämään (9) kaksi vastakkaista pintaa, ja
- muodostetaan paneeliin (1) aukko (8), joka ulottuu paneelin (1) läpi ja joka muodostaa seinämän (9) läpi kulkevan läpiviennin,

tunnettu siitä, että polymeerimateriaalin paneeli (1) on muodostettu ontosta kaksoisseinämaisestä paneelista, jonka muodostaa kaksi levyä (2, 6), jotka ovat erillään toisistaan ja yhdistetty toisiinsa useilla poikittaisilla seinillä (5), ja
kaksi levyä (2, 6) on valmistettu termoplastisista materiaaleista ja niillä on rakenne, joka käsittää pitkänomaisia onttoja profiileja, joissa on suorat ja yhdensuuntaiset keskiakselit, profiilien ollessa hitsattu yhteen muodostaakseen kaksiseinämäisen rakenteen.

23. Patenttivaatimuksen 22 mukainen menetelmä, joka käsittää vaiheen, jossa järjestetään muotti, joka määrittää seinämän (9) muodon, muottiin lisätään ennalta määritettyyn sijaintiin polymeerimateriaalin paneeli (1), jolla on kaksi vastakkaista puolta, jotka seinämän ensimmäiseen osuuteen muodostavat tämän ulkopinnat, johdetaan kovettumatonta sementtipitoista materiaalia muottiin siten, että sementtipitoinen materiaali ei olennaisesti peitä polymeerimateriaalin paneelin (1) vastakkaisia puolia, ja kovetetaan sementtipitoinen materiaali muotissa.

24. Patenttivaatimuksen 22 mukainen menetelmä, joka käsittää vaiheen, jossa saadaan aikaan seinämä (9), johon on muodostettu reunojensa (4, 7) rajaama aukko, sijoitetaan aukon reunojen väliin polymeerimateriaalin paneeli (1), jonka kehä ainakin pääosin vastaa aukon reunoja siten, että aukon reunojen ja paneelin (1) kehässä on saumavyöhyke, ja kiinnitetään paneeli (1) aukkoon levittämällä mainitulle saumavyöhykkeelle kovettuvaa materiaalia, kuten sementtipitoista materiaalia, ja annetaan materiaalin kovettua.

25. Patenttivaatimuksen 22 tai 23 mukainen menetelmä, jossa sementtipitoinen materiaali on kosketuksissa reunaosuuden kanssa paneelin (1) pintojen välissä paneelin (1) yhdistämiseksi seinämään (9).

26. Patenttivaatimuksen 25 mukainen menetelmä, jossa paneelin (1) reunaosuuksissa (4, 7) on syvennykset tai ulokkeet kovettuvan materiaalin kosketuksen tehostamiseksi paneeliin (1).

27. Jonkin patenttivaatimuksen 22–26 mukainen menetelmä, jossa putkimainen holkki, jolla on ulkopinta, työnnetään polymeerimateriaalin paneeliin muodostettuun aukkoon (8), joka valinnaisesti suuntautuu paneelin (1) läpi, joka mainittu putkimainen holkki edullisesti muodostaa putken pään tai holkin putken pään vastaanottamiseksi ja kiinnittämiseksi.

28. Patenttivaatimuksen 27 mukainen menetelmä, jossa putkimaisen holkin ulkopinta on tiivistetty aukon seinämiin, esimerkiksi putkimaisen yhteen ja seinämien välistä tapahtuvan virtaavan aineen vuotamisen vähentämiseksi tai estämiseksi.

29. Patenttivaatimuksen 27 tai 28 mukainen menetelmä, jossa putkimainen yhde on varustettu tiivistekauluksella, esimerkiksi laipan (3) muodossa, joka voidaan tiivistää tiivistekaulusta vasten olevaan seinämään fluidin putkimaisten yhteiden ja ulkopinnan ja mainitun seinämän välistä vuotamisen vähentämiseksi tai estämiseksi.

30. Jonkin patenttivaatimuksen 22–29 mukainen menetelmä, jossa paneelin (1) paksuus on 0,1–2 kertaa, tyypillisesti 0,2–1 kertaa seinämän (9) kovettuneen sementtimäisen materiaalin muodostamissa osuuksissa.

31. Jonkin edellä olevan patenttivaatimuksen mukainen menetelmä, jossa ensimmäisen levyn materiaali valitaan termoplastisista materiaaleista, kuten polyolefiineistä, polyestereistä ja polyamideista, sekä lämpökovettuvista materiaaleista, esimerkiksi lujitetuista kertamuoveista.

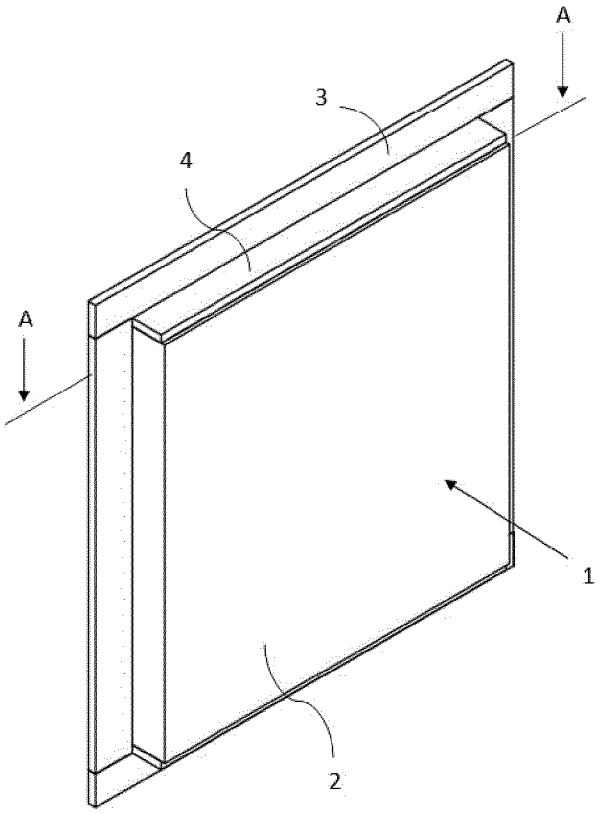


Fig. 1

A – A

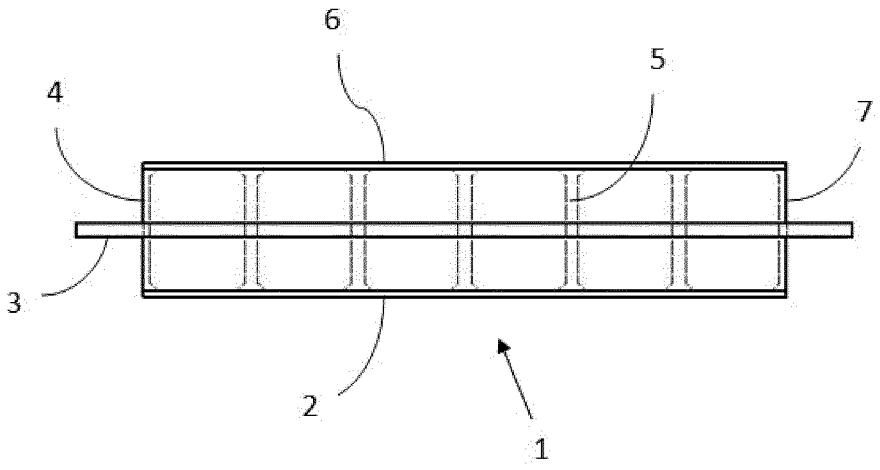


Fig. 2

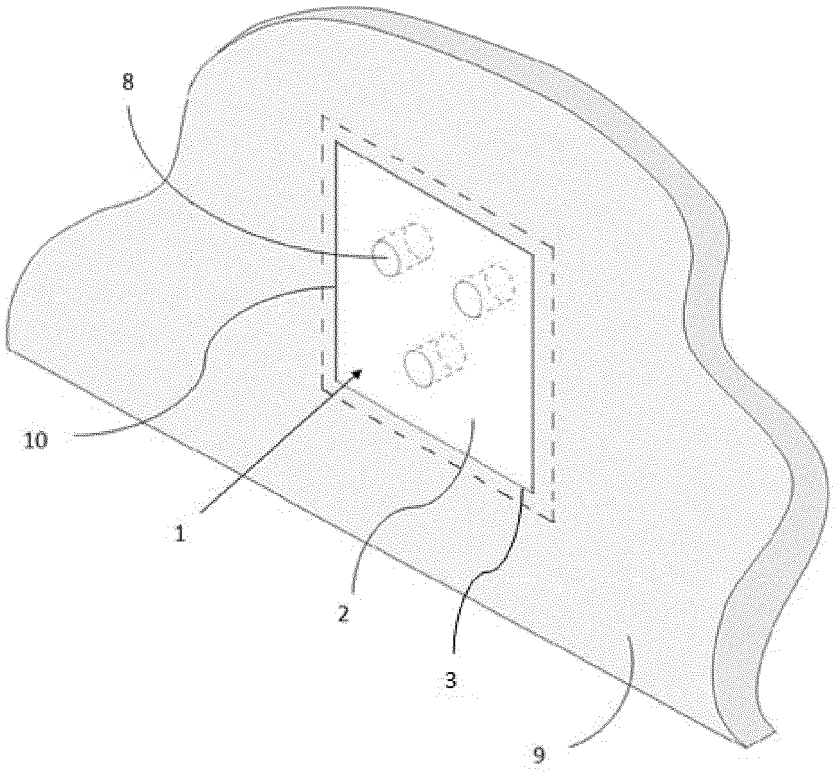


Fig. 3