A sandwich panel wall (1), comprising a foundation fixing means (7) which further comprises an inner horizontal fixing portion (9) and/or outer horizontal fixing portion (11); an inner vertical water barrier portion (22) and an inner vertical fixing portion (8) or a combined vertical water barrier and inner vertical fixing portion (8); a water passage (5); a horizontal water barrier portion (6) and a horizontal thermal insulating portion (10) or a combined horizontal water barrier and a horizontal thermal insulating portion (6,10). Optionally the sandwich panel wall (1) comprises a water tight joint between the frame and sandwich panels (1).
Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(H))

Published:

— with international search report (Art. 21(3))
A SANDWICH PANEL WALL

FIELD OF THE INVENTION

The present invention relates to a sandwich panel wall, in particular to a joint between sandwich panel and a foundation. The invention further relates to a foundation fixing means and a joint between sandwich panels and a frame of building.

BACKGROUND OF THE INVENTION

Sandwich panels are conventionally used in construction applications, such as in warehouses, public buildings, business premises, and agricultural and industrial buildings. In these conventional applications sandwich panels often form the outer wall of building. Sandwich panels are commonly about 0.5-2 m wide and several meters long. Several sandwich panels are installed side by side to cover whole wall. Sandwich panels have one metal sheet as one surface and other metal sheet as other surface and an insulation material such as mineral wool or polyurethane between the metal sheets. Sandwich panels are often installed so that one surface of sandwich panel is outside the building and other surface is inside the building. Further in this document outer refers to an item which is outside of the building or near the surface which is outside the building. Further in this document inner refers to an item which is inside of the building or near the surface which is inside the building. Sandwich panels may be installed in vertical or horizontal direction. Usually sandwich panels are supported by the e.g. steel, wood or concrete frame of building which includes columns, beams and/or other type of girders.

A sandwich panel wall is jointed to foundation usually by thin metal U- or L- profiles. The U- or L-profiles are fixed by screws or by other well-known fixing parts both to foundation and sandwich panel to fix the sandwich panel wall to the foundation.

An unexpected weather condition or an error during the installation of sandwich panels or rain during the installation of sandwich panels may cause rain water going into the sandwich panel wall. Water runs in a wall downwards and/or in horizontal direction and water ends up to the lowest possible point of wall which is usually U- or L- profile in the joint between the wall and a foundation. If the U-profile is made of continuous metal sheet, the water will stay long time between the flanges of U-profile which is harmful for
the structure. If the joint comprise a thermal slotted U-profile or L-profiles, the leaked water may enter inside the building which is also harmful.

Continuous metal items like the web of U-profiles between the outer surface of wall and the inner surface of wall cause a heat bridge. Temperature on an inner surface near the heat bridge may drop down to the level that humidity in air condensates inside the building which is harmful.

In prior art rain water and/or condensation due to a heat bridge cause a risk of damages for a sandwich panel wall.

BRIEF DESCRIPTION OF THE INVENTION

The invention provides the following solutions for improvements concerning the subjects to which it relates:

1. A sandwich panel wall, comprising a foundation fixing means which further comprising a water passage, an inner vertical water barrier portion and an inner vertical fixing portion or a combined inner vertical water barrier and fixing portion, an inner horizontal fixing portion and/or outer horizontal fixing portion, a horizontal water barrier portion and a horizontal thermal insulating portion or a combined horizontal water barrier and thermal insulating portion. Such a sandwich panel wall has an improved water damage preventing and condensation preventing properties.

2. A sandwich panel wall according to item 1, wherein a foundation fixing means comprises a water tight connection between a horizontal and a vertical water barrier portions. Such a sandwich panel wall has an improved ability to prevent water leaks inside the building.

3. A sandwich panel wall according to item 2, wherein the outer edge of horizontal water barrier portion is lower than the inner edge of horizontal water barrier portion. Such a sandwich panel wall has an improved ability to dry fast.

4. A sandwich panel wall according to item 1, 2 or 3, wherein an inner metal surface of sandwich panel in corner has a cutting between outer surface and inner surface of an adjacent sandwich panel wall and/or a vertical fixing portion has accordingly a cutting in the inner vertical fixing portion.

5. A sandwich panel wall according to item 1, 2, 3 or 4, wherein a water tight joint is between the column of steel frame and a sandwich
panel and/or a tape covers the gap between outer metal surfaces of adjacent sandwich panels. Such a sandwich panel wall has an improved ability to prevent water leaks inside the building and/or to sandwich panel wall.

6. A sandwich panel wall according to item 1, 2, 3, 4 or 5 wherein a foundation fixing means further comprising an outer vertical fixing portion. Such a sandwich panel wall has an improved strength and/or tightness in a joint between a sandwich panel wall and a foundation.

7. A sandwich panel wall according to item 6 wherein outer horizontal fixing portion and inner horizontal fixing portion are connected together by a horizontal thermal insulating portion. Such a sandwich panel wall has an improved strength and/or it is easier to install.

8. A sandwich panel wall according to item 1,2,3,4,5,6 or 7 wherein the top surface of horizontal water barrier portion is over or in same level than a horizontal thermal insulating portion and/or horizontal fixing portions. Such a sandwich panel wall has an improved ability to dry fast.

9. A sandwich panel wall according to item 5,6,7 or 8 wherein the tape which allows drying outwards from structure but prevent water drops to enter the structure. Such a sandwich panel wall has an improved ability to dry fast.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following the invention will be described in greater detail by means of preferred embodiments with reference to the attached drawings, in which

Figure 1 shows one embodiment of a joint between sandwich panel wall and foundation structure according to the invention;

Figure 2 shows other embodiment of a joint between sandwich panel wall and foundation structure according to the invention;

Figure 3 shows a preferable embodiment of wall corner according to the invention; and

Figure 4 shows a preferable embodiment of joint of two sandwich panels to the column

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 shows the most preferable embodiment of a joint between
a sandwich panel wall 1 and a foundation structure 2 according to the invention. This embodiment is easy to manufacture and same time it fulfills the improvements of this invention. In this embodiment a sandwich panel wall 1 is jointed to the foundation structure 2 by a foundation fixing means 7. In this embodiment a foundation fixing means 7 comprises an U-profile which further comprises an inner combined water barrier and fixing portion 8, an inner horizontal fixing portion 9, outer horizontal fixing portion 11, an outer vertical fixing portion 12, one or more holes in the lower side of outer vertical fixing portion 12 as a water passage 5 and slots 15 in the web of U-profile as a horizontal insulating portion 10. Preferably the material of U-profile is metal. Most preferable the material of U-profile is 0,5 mm - 4 mm steel. The slots 15 are in more than one queue between outer and inner horizontal fixing portions to prevent the heat bridge effect. The steel material between adjacent slots 15 forms a zig-zag figure. A fixing portion 8,9,11,12 comprises a solid material for screws or fixing parts to attach a sandwich panel wall 1 to a foundation structure 2. In this embodiment a foundation fixing means 7 comprises also a separate horizontal water barrier portion 6. Preferably there is no gap between the lowest point of a water passage 5 and the uppermost surface of horizontal portion to which a water passage 5 abutted on so all water runs out of the structure. The size of water passage 5 is preferably so large that water runs out of the structure despite of the surface tension of water. Preferably the size of water passage is more than 5 x 5 mm2 or ø 5 mm. Distance between neighboring water passages 5 is preferably 0,4 m-2 m. In this embodiment a horizontal water barrier portion 6 is over a horizontal thermal insulating portion 10. If a horizontal water barrier portion 6 would be under a horizontal thermal insulating portion 10, leaked water stayed in slots 15 which increase the drying time. Preferably in this embodiment there is no gap between a horizontal water barrier portion 6 and an inner vertical water barrier portion 8 so the drying is faster. Preferably the joint between an inner vertical water barrier portion 8 and a horizontal water barrier portion 6 is water tight. A water tight joint may be created e.g. by bonding a horizontal water barrier portion 6 and an inner vertical water barrier portion 8 together. Preferably in this embodiment there is a gap between a horizontal water barrier portion 6 and an outer vertical fixing portion 12. Water in the wall will run to above mentioned gap which fastens drying. All known water insulating materials with low thermal conductivity are suitable for a horizontal water barrier portion 6. Optionally the
water insulation material has a corrugation which fastens drying. Preferably the water insulating material bonds by itself to a steel surface. One example of water insulating material is a butyl band.

Preferably in this embodiment a horizontal water barrier portion 6 has an inclination a which improves water to run out of structure through a water passage 5 because the outer edge of horizontal water barrier portion 6 is lower than the inner edge of horizontal water barrier portion 6. Inclination a is created by inclination of the top surface of foundation structure 2 or by material between a foundation structure 2 and a horizontal water barrier portion 6. An inclination a is preferably 1 - 15 degrees.

In one embodiment of the invention the sandwich panel wall further comprises a foundation in which a sandwich panel is arranged with the foundation fixing means. Water insulating material, such as a butyl band, is arranged on the foundation for preventing capillary moisture rising from the foundation to enter inside the sandwich panel. The water insulating material is preferably bonded with the foundation with an adhesive arranged on the side of the water insulating material that is arranged to be in contact with the foundation. The water insulating material is arranged on the foundation such that it imitates the surface of the foundation and is in contact with the frame of the sandwich panel wall. An expanding sealing tape is arranged above the water insulating material or the foundation such that the foundation fixing means 7 is arranged above the expanding sealing tape. The expanding sealing tape is arranged in contact with the frame of the sandwich panel wall and it imitates the surface of the foundation having the water insulating material on it. The foundation fixing means 7 is arranged above the expanding sealing tape and in contact with it. When the horizontal water barrier portion 6 has an inclination relative to the horizontal level the inclination may be accomplished through fixing the side of the horizontal water barrier portion 6 having the water passage 5 such that the expanding sealing tape will be pressed.

A joint between a sandwich panel wall 1 and a foundation structure 2 according to this invention may comprise solutions which are used commonly in joint between a sandwich panel wall 1 and a foundation structure 2 like flashings 14, insulations 13,16 and joint means between sheet of sandwich panel 3,4 and a foundation fixing means 7.

Figure 2 shows one embodiment of a joint between a sandwich
panel wall 1 and a foundation structure 2 according to the invention. In this embodiment a sandwich panel wall 1 is jointed to the foundation 2 by a foundation fixing means 7. In this embodiment a foundation fixing means 7 comprises one inner L-profile which further comprises an inner vertical fixing portion 8 and an inner horizontal fixing portion 9 and at least one outer L-profile which comprises an outer horizontal fixing portion 11 and an outer vertical fixing portion 12, a combined horizontal water barrier and thermal insulating portion 6, a vertical water barrier portion 22, one or more holes in the lower side of outer vertical fixing portion 12 or a gap between outer L-profiles as a water passage 5 and a gap between the fixing portions of an inner and an outer L-profiles 9, 11. Preferably the material of L-profile is metal. Most preferably the material of L-profile is 0.5 mm - 4 mm steel. Preferably there is no gap between the lowest point of a water passage 5 and the uppermost surface of horizontal portion to which a water passage 5 abutted on so all water runs outside the wall.

The size of water passage is preferably so large that water runs out of the structure despite of the surface tension of water. Preferably the size of water passage is more than 5 mm, 5 x 5 mm2 or ø 5 mm. In this embodiment a combined horizontal water barrier and thermal insulating portion 6 is over an inner and outer horizontal fixing portion 9, 11. In some embodiments (not shown in picture) the top surface of a horizontal water barrier portion 6 is in same level than the top surfaces of horizontal fixing portions 9, 11. If a combined horizontal water barrier and thermal insulating portion 6 would be under an inner and outer horizontal fixing portion 9, 11, some of the leaked water stayed in structure which increases the drying time. In this embodiment a combined horizontal water barrier and thermal insulating portion 6 and an inner vertical water barrier portion 22 are continuous material which is bended to L shape so there is no seam between an inner vertical water barrier portion 22 and a combined horizontal water barrier and thermal insulating portion 6 so all water goes out of the structure through a water passage 5. In this embodiment a gap a combined horizontal water barrier and thermal insulating portion 6 and an outer vertical fixing portion 12 is optional. All known water insulating materials with low thermal conductivity are suitable for a combined horizontal water barrier and thermal insulating portion 6 and an inner vertical water barrier portion 8. Preferably the water insulating material bonds to steel surface by itself. Optionally the water insulation material has a corrugation which
fastens drying. One example of water insulating material is a butyl band. Preferably in this embodiment a horizontal water barrier portion 6 has an inclination a which improves leaked water to run out of structure through a water passage 5 because the outer edge of horizontal water barrier portion 6 is lower than the inner edge of horizontal water barrier portion 6. Inclination a is created by inclination in a top surface of foundation structure 2 or by material between a foundation structure 2 and a horizontal water barrier portion 6. An inclination a is preferably 1 - 15 degrees.

In this embodiment a joint between a sandwich panel wall 1 and a foundation structure 2 may comprise solutions which are used commonly in joint between a sandwich panel wall 1 and a foundation structure 2 like flashings, insulations and joint between sheet of sandwich panel 3,4 and a foundation fixing means 7.

In some embodiments joint between a sandwich panel wall 1 and foundation structure 2 comprises only inner L-profile (not shown in picture) but this kind of joint has less stiffness than joint with two L-profiles or one C-profile.

Figure 3 shows one preferable embodiment of wall corner according to the invention. In this embodiment an inner metal surface 4 of the sandwich panel wall 1 comprises a cutting 17 between inner and outer metal surfaces 3, 4 of sandwich panel 19 to improve condensation preventing properties. The cutting 17 means in other words that outer metal surface of sandwich panel wall 1 is removed near the edge of sandwich panel wall 1. A vertical fixing portion 7 may have accordingly comprises a cutting in the inner vertical fixing portion. Sandwich panels 1, 19 are supported by a steel frame 18.

Figure 4 shows a preferable embodiment of joint of two sandwich panels to the column according to the invention. In this embodiment joint between sandwich panels 1, 19 and column of frame 18 comprises a water tight material to prevent water leak to building. The water tight material is any kind of sealant such as e.g. silicon or polyurethane foam. In one preferable embodiment according to the invention the gap between outer metal surfaces 3 of sandwich panels 1, 19 are covered by a tape 21. Preferably the tape is material which allows drying outwards from structure but prevent water drops to enter the structure. Above mentioned material comprise e.g. so small channels that water vapor penetrates the material but water drops are not able to penetrate the material.
In one embodiment of the invention a sealing tape 20, such as butyl, is arranged on a surface of a column of the frame 18 such that it extends preferably the whole height of the sandwich panel wall 1 which is arranged next to the column and attached to it. The sealing tape 20 extends from the column to the foundation fixing means 7 such that the sealing tape 20 extends through the foundation fixing means 7 in a cross direction from the inner vertical fixing portion 8 through the inner horizontal fixing portion 9 and covers the slots 15 in the horizontal thermal insulating portion 10 or when there is already a horizontal water barrier portion 6 the sealing tape 20 covers the horizontal water barrier portion 6 which has slots 15 under it. The sealing tape 20 is arranged to extend to a vicinity of the water passage 5. This way water entering between the column and the sandwich panel is conveyed away from the sandwich panel wall 1.

It is apparent to a person skilled in the art that as technology advanced, the basic idea of the invention can be implemented in various ways. The invention and its embodiments are therefore not restricted to the above examples, but they may vary within the scope of the claims.
CLAIMS

1. A sandwich panel wall (1), comprising a foundation fixing means (7) for jointing a sandwich panel to a foundation, which foundation fixing means (7) further comprising an inner horizontal fixing portion (9) and/or an outer horizontal fixing portion (11); an inner vertical water barrier portion (22) and an inner vertical fixing portion (8) or a combined inner vertical water barrier and fixing portion (8), characterized in that the foundation fixing means (7) comprises also a water passage (5), a horizontal water barrier portion (6) and a horizontal thermal insulating portion (10) or a water passage (5) and a combined horizontal water barrier and thermal insulating portion (6,10).

2. A sandwich panel wall (1) according to claim 1, characterized in that a foundation fixing means (7) comprises a water tight joint between a horizontal water barrier portion (6) and an inner vertical water barrier portion (22) or a joint between a horizontal water barrier portion (6) and a combined inner vertical water barrier and fixing portion (8) or a joint between a combined horizontal water barrier and thermal insulating portion (6) and a combined inner vertical water barrier and fixing portion (8) or a joint between a combined horizontal water barrier and thermal insulating portion (6) and an inner vertical water barrier portion (22).

3. A sandwich panel wall (1) according to claim 1 or 2, characterized in that the outer edge of horizontal water barrier portion (6) is lower than the inner edge of horizontal water barrier portion (6).

4. A sandwich panel wall (1) according to any of claim 1 - 3, characterized in that an inner metal surface (4) of sandwich panel (1) in corner has a cutting (17) between outer surface (3) and inner surface (4) of an adjacent sandwich panel wall (19) and/or a vertical fixing portion (7) has accordingly a cutting in the inner vertical fixing portion (8).

5. A sandwich panel wall (1) according to any of claim 1 - 4, characterized in that a sandwich panel wall (1) comprises a water tight joint (20) between the frame (18) and sandwich panels (1,19) and/or a tape (21) covers the gap between outer metal surfaces 3 of adjacent sandwich panels.

6. A sandwich panel wall (1) according to any of claim 1 - 5, characterized in that a foundation fixing means (7) further comprising an outer vertical fixing portion (12).
7. A sandwich panel wall (1) according to any of claim 1 - 6, characterized in that an outer horizontal fixing portion (11) and an inner horizontal fixing portion (9) are connected together by a horizontal thermal insulating portion (10).

8. A sandwich panel wall (1) according to any of claim 1 - 7, characterized in that a horizontal water barrier portion (6) is over or in same level than a horizontal thermal insulating portion (10) and/or an horizontal fixing portion (9, 1).

9. A sandwich panel wall (1) according to any previous claim, characterized in that the sandwich panel wall (1) further comprises a foundation (2), and that a water barrier material and/or an expanding sealing tape is arranged between the foundation fixing means (7) and the foundation (2) for preventing capillary moisture entering into the sandwich panel wall (1).

10. A sandwich panel wall (1) according to any previous claim, characterized in that the sandwich panel wall (1) comprises a connection with a column of a frame (18) and a sealing tape (20) is arranged on the surface of the column between the column and the sandwich panel wall (1) such that the sealing tape (20) extends from the column to the inner vertical fixing portion (8) of the foundation fixing means (7) and through the inner horizontal fixing portion (9) to the vicinity of the water passage (5) of the foundation fixing means (7).
INTERNATIONAL SEARCH REPORT

PCT/EP2014/061112

A. CLASSIFICATION OF SUBJECT MATTER

INV. EQ4B1/14
ADD.

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)
E04B

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 practicable, search terms used)

EPO-Internal , WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>column 3, line 17 - line 51; figures 2,2a</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>US 2002/139059 Al (ZIMMERMAN DAVID L [US]) 3 October 2002 (2002-10-03)</td>
<td>1-10</td>
</tr>
<tr>
<td></td>
<td>paragraphs [0030] - [0042]; figures 3-6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>column 7, line 1 - line 8; figure 6</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>US 6 269 608 B1 (PORTER W LIAM H [US]) 7 August 2001 (2001-08-07)</td>
<td>5,9,10</td>
</tr>
<tr>
<td></td>
<td>column 3, line 27 - line 45</td>
<td></td>
</tr>
<tr>
<td></td>
<td>column 6, line 4 - line 41; figures 1,4</td>
<td></td>
</tr>
</tbody>
</table>

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 application or patent 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

"Z" document member of the same patent family

Date of the actual completion of the international search: 20 August 2014

Date of mailing of the international search report: 27/08/2014

Name and mailing address of the ISA:
European Patent Office, P.B. 5018 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016

Authorized officer: Porwoll, Hubert

Form PCT/ISA/210 (second sheet) (April 2005)
<table>
<thead>
<tr>
<th>Patent document cited in search report</th>
<th>Publication date</th>
<th>Patent family member(s)</th>
<th>Publication date</th>
</tr>
</thead>
<tbody>
<tr>
<td>US 6298619</td>
<td>09-10-2001</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>US 2002139059</td>
<td>03-10-2002</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>US 4936069</td>
<td>26-06-1990</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>US 6269608</td>
<td>07-08-2001</td>
<td>NONE</td>
<td></td>
</tr>
</tbody>
</table>