Title: EXTERNAL WALL UNIT

Abstract: The invention relates to an external wall unit (1) comprising at least one glass pane element (2) having an outer surface (4) constituting an external wall, and an inner surface (6), and a framework structure (8) made from a metal sheet and fastened to the inner surface (6) of the glass pane element (2) by gluing for attaching the external wall unit (1) to a body of a building or a structure. In accordance with the invention, the framework structure (8) is arranged to be directly fastened to a body structure of the building or the structure.
EXTERNAL WALL UNIT

BACKGROUND OF THE INVENTION

[0001] The invention relates to an external wall unit according to the preamble of claim 1 and particularly to an external wall unit comprising at least one glass pane element having an outer surface constituting the external wall and an inner surface, and a framework structure fastened by gluing to the inner surface of the glass pane element and attachable to the framework structure of a building or a structure.

[0002] In accordance with prior art, external wall units or external wall elements comprising a glass pane are used to provide buildings with external glass wall surfaces by installing such external wall units adjacently and superimposed. Such external wall units generally comprise a support structure or a framework and a glass pane element fastened thereto. The external wall unit conventionally further comprises fastening parts fastened to the support structure and by means of which each external wall element can be separately fastened to the framework of the building by means of bolts or the like fastening means, for example, in a manner allowing the support structure and the fastening means to support the external wall unit.

[0003] The problem in the above arrangement is that in known solutions, support structures or frameworks and fastening means are often multipart and complex solutions that have to be separately manufactured for these external glass wall elements. Furthermore, because of their complicated shapes, they are often manufactured from aluminium or some other expensive material and by special manufacturing processes, such as by extruding aluminium. However, the external walls of buildings or the like are often composed partly of external glass wall elements and partly of closed external wall elements, whereby the structures of the external glass wall elements and the closed external wall elements are different because of the special framework structures of the external glass wall elements intended only for them.

BRIEF DESCRIPTION OF THE INVENTION

[0004] The object of the invention is to provide an external wall unit in a manner solving the above problems. The object of the invention is achieved with an external wall unit according to the characterizing part of claim 1, which is characterized in that the framework structure is made from thin sheet metal by shaping.
Preferred embodiments of the invention are described in the dependent claims.

The invention is based on achieving an external wall unit comprising a glass pane and a framework structure fastened to the inner surface of the glass pane, the framework structure being generated in its entirety solely of a metal sheet or thin sheet metal and being attachable directly to the framework of the building without separate fastening parts to be installed in the external wall unit. This being so, the external wall unit is composed substantially only of the glass pane and the framework structure fastened to the inner surface thereof, which together constitute a composite structure wherein the glass pane serves preferably at least partly as a part reinforcing the external wall unit. At the same time, the framework structure of the external wall unit can be generated such that each external wall unit can be supported and coupled to an external wall unit to be installed under it and having a corresponding support structure and/or to an external wall unit to be installed above it and having a corresponding support structure. The coupling to the external wall unit installed above or under is carried out on the inside of the innermost glass surface. In other words, the couplings to the framework of the building and to any other external wall elements take place on the inside of the glass pane.

An advantage of the external wall unit of the invention is that a framework structure made from thin sheet metal is simple and inexpensive to manufacture, since it can be generated by shaping, cutting, bending and folding thin sheet metal. In addition, it is easy to shape in such a manner that it is capable of being supported or coupled to an external wall element under or above it by a groove joint or a tongue-and-groove joint, whereby the shapes achieving this joint are made in the framework structure. Furthermore, since external wall elements without glass, i.e. closed external wall elements, and external wall panels reinforced with insulation are presently manufactured typically at least partly from thin sheet metal used as the surface plate, the framework structure of an external glass wall element made from thin sheet metal can be coupled well together with these closed external wall elements. The framework structure of a glass pane element made from thin sheet metal also enables the manufacture of the framework structure in the same production line with closed external wall elements and/or the surface plates thereof, and, consequently, in given embodiments, the shape of the framework structure may be similar to the edge areas of the thin sheet metal of a closed external
wall element. The glass element and the closed external wall element are joined to each other and to the framework with joints of the same shape and with the same fastening parts. Accordingly, the framework structure can be manufactured for instance by cutting an opening in such thin sheet metal of a closed external wall element and by gluing it to the glass pane. Such an external wall unit according to the invention provides a simple and compact structure, the number of separate parts thereof being minimized and the manufacture simplified.

BRIEF DESCRIPTION OF THE FIGURES

[0008] In the following, the invention will be described in more detail in connection with preferred embodiments with reference to the accompanying drawings, in which

Figure 1 shows an embodiment of an external wall unit in accordance with the present invention;

Figure shows a framework structure for the external wall unit of Figure 1;

Figure 3 shows two superimposed external wall units of Figure 1 coupled together; and

Figure 4 shows the coupling of two external wall units of Figure 2 in more detail.

DETAILED DESCRIPTION OF THE INVENTION

[0009] Referring to Figure 1, it shows an external wall unit 1 according to the present invention, or an external wall glass unit. The external wall unit 1 comprises a glass pane element 2, and a framework structure 8 fastened thereto. The shape, dimensions and thickness of the glass pane element 2 may conform to each particular embodiment, and the invention is thus not restricted to these properties. The framework structure 8 is preferably manufactured by cutting, folding or other shaping from a metal sheet. For instance thin sheet metal, made from steel, can be used for manufacturing the framework structure 8. Alternatively, the framework structure 8 may be manufactured from some other suitable metal sheet or some other material.

[0010] The framework structure 8 is preferably fastened to the glass pane element 2 by gluing by using any glue suitable for this purpose. The gluing may be performed on the entire surface of the framework structure 8 against the entire glass pane element 2 or only on part of said surface. In ac-
In accordance with Figure 1, the framework structure 8 is fastened only to one surface of the glass pane element 2, to the inner surface, in such a manner that the outer surface constituting the external wall of the glass pane element 2 contains no framework structures 8 or other supporting or fastening structures, but the external wall is composed of only the outer surface of the glass pane element 2.

[0011] Figure 2 shows the framework structure 8 of the external wall unit 1 according to Figure 1 in more detail. The framework structure 8 comprises a frame part 9 that essentially conforms to the edges of the glass pane element 2 and that is glued to the inner surface of the glass pane element 2. The frame part 9 constitutes a circumferential structure surrounding the glass pane element 2 on the inner surface thereof at the edges of the glass pane element or in the vicinity thereof, and/or conforms to the edges of the glass pane element 2 at said edges or in the vicinity thereof. However, the frame part 9 does not preferably extend beyond the edges of the glass pane element 2.

[0012] The framework structure 8 further comprises first coupling means 10 for coupling and/or supporting the external wall unit 1 to a second external wall unit to be installed under it, and second coupling means 12 for coupling and/or supporting the external wall unit 1 to a third external wall unit to be installed above it. In the structure of Figure 2, the second coupling means are utilized also in installing and fastening the external wall unit 1 to the framework of a building of a structure. Such fastening of the external wall unit 1 to the framework of a building or a structure can be carried by for instance with bolt joints or other corresponding fastening manners and means. Alternatively, the external wall unit can be fastened to the framework of a building or a structure also by means of the first coupling means or at them, by means of the first and second coupling means or directly by means of the frame part 9. In other words, the external wall unit 1 can be fastened to the framework of a building from the first 10 and/or second fastening means 12, the frame part 9 or from both the frame part 9 and the first and/or second coupling means 10, 12.

[0013] Figure 2 shows a solution wherein the first and second coupling means 10, 12 are arranged integrally in the framework structure 8 by shaping the metal sheet constituted by the framework structure 8. Alternatively, the coupling means 10, 12 may be separate parts that can be fastened to the framework structure 8. The coupling means 10, 12 are implemented in such a manner that when similar external wall units 1, framework structures 8 com-
prising a similar framework structure 8 or similar coupling means 10, 12 are installed on top of each other, the coupling means 10, 12 thereof are coupled together. In this case, the first coupling means 10 of the external wall unit 1 are adapted to engage with the second coupling means 12 of a second external wall unit installable under the external wall unit 1 and/or the second coupling means 12 are adapted to engage with the first coupling means 12 of a third external wall unit installable above the external wall unit 1. However, it should be further noted that in some cases the external wall unit may comprise only the first or the second coupling means 10, 12.

[0014] It is to be further noted that instead of the framework structure 8 shown in Figure 2, a framework structure composed of two separate framework parts can be used, whereby it does not constitute a circumferential frame part 9. An alternative is to implement a framework structure composed of an upper framework fastened to the upper edge of the glass pane element 2 or in the vicinity thereof and a lower framework fastened to the lower edge or in the vicinity thereof. In other words, the structure could correspond to the structure of Figure 2 with the exception that it would not comprise any vertical partitions in the frame part 9 extending between the fastening means 10 and 12. In this case, the framework structure 8 could comprise a separate upper framework fastened to the inner surface 6 of the glass pane element 2 at the upper edge of the glass pane element 2 or in the vicinity thereof and a separate lower framework fastened to the inner surface 6 of the glass pane element 2 at the lower edge of the glass pane element 2 or in the vicinity thereof. In this way, the lower framework may comprise the first coupling means 10 and/or the upper framework may comprise the second coupling means 12. The lower framework may also comprise lower supports. In addition, the lower framework and/or the upper framework may be directly fastened with fastening means, such as bolts, to the body of the building.

[0015] As can be seen from Figure 2, the framework structure 8 may be further provided with lower supports 16 that support the glass pane element 2 fastened to the framework structure 8 at the lower edge thereof. In other words, the lower edge of the glass pane element 2 is placed on top of the lower supports 16, whereby they support the glass pane element 2 receiving at least part of the loading generated by the glass pane element 2 and thus lowering the loading of the glue joints between the framework structure 8 and the glass pane element 2. The lower supports 16 also assist the fastening of
the glass pane element 2 to the right point in the framework structure 8. Depending on the application and the size and weight of the glass pane, there may be one or more lower supports 16, for instance one, two, three or even more. The lower support 16 may also extend along the entire length of the lower edge of the glass pane element 2 or only along part of the length thereof. Although the lower support 16 extends below the lower edge of the glass pane element 2, it does not extend above the outer surface of the glass pane element 2, but its height corresponds to at most the thickness of the glass pane element 2. The lower supports 16 are preferably implemented by cutting and folding or by otherwise moulding the framework structure 8 made from a metal sheet in such a manner that the lower supports 16 constitute an integral part of the framework structure 8. Alternatively, it is naturally possible to fasten separate lower supports to the framework structure 8. The shape of a separate lower support may be a T profile, for example, which is fastened to the lower surface of the coupling means 10 and which may extend on top of the outer surfaces of the superimposed glasses or the separate lower support may be adapted to be fastened with screws remaining hidden inside the coupling means 10, a support surface being bend thereof for supporting the glasses.

[0016] Figure 3 shows two similar external wall elements 1, 1', coupled together by means of coupling means 10, 12, 10', 12'. In accordance with Figure 3, the upper framework structure 8 of the external wall element 1 comprises first coupling means 10 inside the glass pane element 2 at the lower edge thereof, which engage with the couplings means 12' of the lower framework structure 8' of the external wall element 1', which are located inside the glass pane element 2' at the upper edge thereof. The first coupling means 10 and 10' are similar in both external wall elements 1, 1', and also the second coupling means 12 and 12' are similar. This allows such external wall elements 1, 1' to be installed on top of each other and coupled to each other easily and quickly.

[0017] Figure 4 shows the coupling and structure between two external wall elements 1 of the invention in more detail. In accordance with Figure 4, the framework structure 8 is fastened to the glass pane element 2 with glue to the inner surface 4 of the glass pane element 2, whereby no framework structures are provided on the outer surface 4 constituting the external wall of the glass pane element 2, but the external wall is composed solely of the outer surface 4 of the glass pane 2. The framework structure 8 may be glued directly
to the glass pane element 2 or, as shown in Figure 4, a spacer piece 18 and/or a seal 20 can be installed between the framework structure 8 and the glass pane element 2, which are glued to the framework structure 8 and the glass pane element 2. The spacer piece 8 may extend along the entire length of the framework structure 8 or only along part of the length, and it may be made from any suitable material. Any suitable seal or sealing material may be used as the seal 20.

[0018] As is shown in Figure 4, the entire framework structure is placed on the side of the inner surface 6 of the glass pane element 2. The framework structure 8 further comprises at least one fold, which is shaped to extent away from the inner surface 6 of the glass pane element 2, thus constituting a profile structure, from which the framework structure 8, and thus the entire external wall element 1, may be fastened to the body structure of a building or a structure. Such a fastening profile or fastening flange that protrudes from the glass pane element 2, may extend along the entire length of one or more edges of the glass pane element 2 or only along part of the length, and if they extend only along part of the length of the edge, there may be one or more of them on each edge. Thus, the structure of the external wall element 1 is simple and it can be easily manufactured, since it suffices that a framework structure is fastened to the glass pane element 2, which structure can be further fastened directly to the body of a building with bolts or the like fastening means, for example. This way the glass pane element 2 and the framework structure constitute a composite structure wherein the glass pane element 2 is at least part of the load-bearing structure. In Figure 4, such fastening profiles are implemented by generating a fold from the framework structure 8 in the direction of the surface of the glass pane element 2.

[0019] In the embodiments shown in Figures 1 to 4, the coupling means 10, 12 correspond to fastening profiles, from which the external wall element 1 can be fastened to the body structure of a building. In accordance with the above, these coupling means 10, 12 are further adapted to engage with the coupling means 10', 12' of the second external wall element 1'. Thus, the coupling means 10, 12 may simultaneously serve as the fastening profiles of the external wall element 1 to the body of the building or the structure and as coupling means for coupling adjacent and/or superimposed external wall elements together.

[0020] Figure 4 shows a preferred embodiment of the external wall
element 1, 1', wherein the framework structure 8, 8' is fastened to the glass pane element 2 in the manner described above. At the lower edge of the glass pane element 2 or in the vicinity thereof, the framework structure 8 of the external wall element 1 comprises first coupling means 10 coupled to the framework structure 8' of a second external wall element 1' located underneath, to second coupling means 12' provided in the upper edge of the glass pane element 2' or in the vicinity thereof. In accordance with Figure 4, the coupling means 10, 12' constitute a groove joint, wherein the second coupling means 12' comprise a male part or a tongue, which, in the coupling, extends to a groove or recess, a female part, in the first coupling means 10. Alternatively, the male part can be provided in the first coupling means 12' and the female part in the second coupling means 10.

[0021] In the configuration of Figure 4, it is possible to fasten only the second coupling means 12' to the body of the building with bolts, for example. Upon this external wall element 1' is then installed an external wall element 1, whose first coupling means 10 engage into the second coupling means 12', whereby the external wall element 1 leans on the external wall element 1' and settles in the correct position and direction relative to the external wall element 1'. This superimposed external wall element 1, in turn, is fastened to the body of the building from the coupling means 12 at the upper edge thereof. Then, a new external wall element is again installed on top of the external wall element 1 in the same manner. Thus, each external wall element is fastened to the body of the building only from the second coupling means 12, 12' at the upper edge, and the external wall element 1 is fastened to the body of the building at the lower edge thereof via the lower external wall element 1'. In this manner, a structure is accomplished, which speeds up and facilitates the installation of elements and saves the manufacturing costs thereof. It is to be further noted that fastening profiles and coupling means may be implemented in a plurality of alternative manners and at a plurality of different points without departing from the idea of the present invention.

[0022] It is obvious to a person skilled in the art that as technology advances, the basic idea of the invention can be implemented in a variety of ways. Consequently, the invention and its embodiments are not restricted to the above examples, but can vary within the scope of the claims.
CLAIMS

1. An external wall unit (1) comprising at least one glass pane element (2) having an outer surface (4) constituting an external wall, and an inner surface (6), and a framework structure (8) fastened to the inner surface (6) of the glass pane element (2) by gluing and by means of which the external wall unit (1) is attachable to a body structure of a building or a structure, characterized in that the framework structure is made from thin sheet metal by shaping.

2. An external wall unit (1) as claimed in claim 1, characterized in that the framework structure (8) comprises first coupling means (10) on the side of the inner surface (6) of the glass pane element (2) for coupling and/or supporting the external wall unit (1) to a second external wall unit (1') to be installed under it, and/or second coupling means (12) on the side of the inner surface (6) of the glass pane element (2) for coupling and/or supporting the external wall unit (1) to a third external wall unit to be installed above it for generating an optimally uniform glass surface.

3. An external wall unit (1) as claimed in claim 1 or 2, characterized in that the framework structure (8) is implemented as a circumferential structure surrounding the glass pane element (2) on the inner surface (6) thereof at edges (14) of the glass pane element or in the vicinity thereof.

4. An external wall unit (1) as claimed in claim 3, characterized in that the framework structure (8) comprises first coupling means (10) on the side of the inner surface (6) of the glass pane element (2) at the lower edge of the glass pane element (6) or in the vicinity thereof and/or second coupling means (12) on the side of the inner surface (6) at the upper edge of the glass pane element (6) or in the vicinity thereof.

5. An external wall unit (1) as claimed in claim 1 or 2, characterized in that the framework structure (8) comprises a separate upper frame fastened to the inner surface (6) of the glass pane element (2) at the upper edge of the glass pane element (2) or in the vicinity thereof and a separate lower frame fastened to the inner surface (6) of the glass pane element (2) at the lower edge of the glass pane element (2) or in the vicinity thereof.

6. An external wall unit (1) as claimed in claim 5, characterized in that the lower frame comprises first coupling means (10) and/or the upper frame comprises second coupling means (12).
7. An external wall unit (1) as claimed in any one of claims 1 to 6, characterized in that the first coupling means (10) are arranged to engage with the second coupling means (12) of the second external wall unit installable underneath the external wall unit (1) and/or the second coupling means (12) are arranged to engage with the first coupling means (10) of the third external wall unit installable above the external wall unit (1).

8. An external wall unit (1) as claimed in any one of claims 1 to 7, characterized in that the first and/or the second coupling means (10, 12) are arranged to engage with the second coupling means (12) of the second external wall unit installable underneath the external wall unit (1) and/or the second coupling means (12) are arranged to engage with the first coupling means (10) of the third external wall unit installable above the external wall unit (1).

9. An external wall unit (1) as claimed in any one of claims 1 to 8, characterized in that the first coupling means (10, 12) are arranged to form a groove joint with the second coupling means (12) of the second external wall unit installable underneath the external wall unit (1) and/or the second coupling means (12) are arranged to form a groove joint with the first coupling means (10) of the third external wall unit installable above the external wall unit (1).

10. An external wall unit (1) as claimed in any one of claims 1 to 9, characterized in that the framework structure (8) further comprises one or more lower supports (16) arranged to extend beneath the lower edge of the glass pane element (2) in such a manner that it supports the glass pane element (2) from the lower edge.

11. An external wall unit (1) as claimed in claim 10, characterized in that the one or more lower supports (16) are implemented by shaping the framework structure (8).

12. An external wall unit (1) as claimed in any one of claims 1 to 11, characterized in that the framework structure (8) is glued directly to the glass pane element (2).

13. An external wall unit (1) as claimed in any one of claims 1 to 12, characterized in that the external wall unit (1) comprises at least one spacer member and/or a seal member (18) installed between the framework structure (8) and the glass pane element (2).

14. An external wall unit (1) as claimed in any one of claims 1 to 13, characterized in that the external wall unit (1) comprises at least one second glass pane element installed on the outer surface of the glass pane element (2).

15. An external wall unit (1) as claimed in claim 14, characterized in that the lower supports (16) extend below the lower edges of all glass pane elements.
FIG. 2
**INTERNATIONAL SEARCH REPORT**

**International application No.**

PCT/FI2008/050191

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**A. CLASSIFICATION OF SUBJECT MATTER**

See extra sheet

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)

IPC8: E04F, E06B, E04C, E04B

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

FI, SE, NO, DK

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-internal, WPI

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**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
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* Further documents are listed in the continuation of Box C.  
* See patent family annex.

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**Date of the actual completion of the international search**

01 July 2008 (01.07.2008)

**Date of mailing of the international search report**


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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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