

# PATENT SPECIFICATION

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- (21) Application No. 51803/77 (22) Filed 13 Dec. 1977  
 (31) Convention Application No. 51/176973U (32) Filed 27 Dec. 1976 in  
 (33) Japan (JP)  
 (44) Complete Specification published 11 March 1981  
 (51) INT. CL.<sup>3</sup> E06B 1/58  
 (52) Index at acceptance  
 EIJ GB  
 B5A 1R150 1R214A 1R456 20T3 D29



## (54) PRECAST CONCRETE WALL PANEL HAVING FRAME FOR WINDOW-ATTACHING OPENING

(71) We, YOSHIDA KOGYO K. K., a Japanese body corporate, of No. 1, Kanda Izumi-cho, Chiyoda-Ku, Tokyo, Japan, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a precast concrete wall panel having a frame for a window-attaching opening, to be used as a wall panel in prefabrication construction or the like.

In a precast concrete wall panel, a frame formed by extrusion molding of a metal such as aluminium or a frame formed by welding an iron plate or die steel must be fixed to a window-attaching opening. The present invention provides means for fixing such frame to the concrete portion of the precast concrete wall panel assuredly.

Referring to Fig. 1 of the accompanying drawings which is a perspective view showing a precast concrete wall panel, this wall panel indicated at 1 comprises a mold frame 2 composed of a metal, a concrete portion 14 and a frame 4 for a window-attaching opening.

When a precast concrete wall panel 1 is prepared according to a customary method, as shown in Fig. 7, a receiving stand 12 and a mold frame 2 are placed on a base 15 and a frame 4 for a window-attaching opening, including an anchoring fitting 16 extending outwardly of the frame 4, is provided. Then, concrete 14 is filled in a space defined by the mold frame 2, the frame 4 for a window-attaching opening and the base 15.

Anchoring flanges 7 and 8 having lips 5 and 6 confronting each other in the widthwise direction of the frame 4 are mounted on the back side attachment portion of the frame 4, and the flanges 7 and 8 are embedded in the window-attaching opening of the precast concrete wall plate. An anchoring fitting 16 is disposed to bridge the confronting lips 5 and 6 and is embedded in the concrete 14, whereby the frame 4 for the window-attaching opening

is firmly embedded in the concrete 14.

The above-mentioned anchoring fitting 16 used in convenient structures is molded to have a plate-like shape so as to enhance the reinforcing effect. Even if this anchoring fitting 16 is attached at a point separate from the frame 4 for the window-attaching opening, when concrete is poured in, a gap is inevitably formed in a portion S between the anchoring fitting 16 and the frame 4 for the window-attaching opening. In general, concrete does not sufficiently fill such gap, and a uniform filling of concrete is hardly attained. If the anchoring fitting 16 is not completely embedded in the concrete 14, the frame 4 for the window-attaching frame is readily peeled from the concrete 14, and there is brought about a disadvantage that rigid fixing of the frame 4 cannot be expected.

Still further, if there are present bubbles in concrete between the anchoring fitting 16 and the frame 4 for the window-attaching opening and in the vicinity of the flange 7 of the frame 4, escape of these bubbles is inhibited by the presence of the anchoring fitting 16 and flange 7, and such troubles as cracks of concrete are readily caused to occur.

According to the invention, there is provided a precast concrete wall panel having a frame for a window-attaching opening, the frame having a main body portion and a flange extending from the main body portion and away from the opening, the flange being at least partially embedded in the concrete wall panel and having a lip extending from the outer edge of the flange substantially perpendicular thereto, there being provided openings in the flange and/or lip to permit the escape of air when concrete is being poured during casting of the wall panel and embedding of the flange in the concrete.

There is thus provided means for fixing tightly the frame for a window-attaching opening in concrete. In particular, part of the frame is fixed in concrete tightly and assuredly without leaving bubbles in the concrete.

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The frame for the window-attaching opening can be fixed in concrete without using an anchoring fitting and the precast concrete wall panel can be assembled very easily, which is advantageous economically.

Since the lipped anchor flanges of the frame for a window-attaching opening are embedded in concrete, use of an anchoring fitting as used in conventional precast concrete wall plates can be excluded to provide a less expensive anchoring structure, facilitate the operation of attachment of the frame for a window-attaching opening and reduce the cost of manufacture of precast concrete wall panels.

Further, since small openings for escape of bubbles are formed on the lipped anchor flanges of the frame for a window-attaching opening at parts where bubbles are readily accumulated, it is possible to prevent peeling of the frame for a window-attaching opening from the concrete by the presence of bubbles left around the lipped anchor flanges. Still further, since concrete can flow through the small openings, the adhesion of the frame for a window-attaching opening to the concrete can be remarkably improved.

The present invention will now be described in detail by reference to embodiments illustrated in the accompanying drawings.

Preferred embodiments of the present invention have specific means for fixing a frame for a window-attaching opening to concrete. Embodiments of the structure of this fixing means are illustrated in Figs. 3 to 6.

Fig. 3 is a perspective view showing a part of a frame for a window-attaching opening. This frame 4 for a window-attaching opening is formed, for example, by extrusion of a metal such as aluminium. The side indicated by arrow F is a side of the opening from which various ribs are projected, and the side indicated by arrow B is a back face side which is to have direct contact with filled concrete. A flange 7 having a lip 5 and a flange 8 having a lip 6 are mounted on the back face B. Notches 10 are formed on each of these lips 5 and 6. Accordingly, each lip has a comb-like shape. Through these notches 10, concrete can enter and bubbles are allowed to escape.

Fig. 4 is a perspective view illustrating another embodiment of the frame 4 for a window-attaching opening. In this embodiment, a plurality of through holes 11 are formed on the flanges 7 and 8. According to need, both the abovementioned notches 10 and these through holes 11 may be simultaneously formed on the flanges 7 and 8 so far as the strength of these flanges 7 and 8 is not adversely influenced.

Fig. 5 illustrates still another embodi-

ment in which an inclined face portion 9 is formed on the lower face of the flange 7 and notches 10 are formed on the lip 5. In the frame 4 for a window-attaching opening according to this embodiment, 70 since the thickness of the base portion of the flange 7 can be increased, bubbles A can be effectively guided to the outside and reduction of the strength of the flange 7 by the loss of the section by formation of the notches 10 or piercing holes 11 can be compensated by the thickness-increased base portion of the flange 7.

Fig. 6 illustrates a further embodiment in which through holes 11 are formed on the flange 7. This embodiment is similar to the embodiment shown in Fig. 4.

The steps of preparing a precast concrete wall panel by using the above-mentioned frame for a window-attaching opening will now be described by reference to Fig. 2.

The frame 4 for a window-attaching opening having the above-mentioned structure is placed on a receiving stand 12 fixed to or placed on a base 15. The position of the frame 4 is set by an outer plate 13, and concrete 14 is filled in a mold frame 2 to embed the anchor flanges 7 and 8 therein. Thus, the frame 4 is fixed in the concrete 14, and a precast concrete wall plate is prepared.

Although bubbles are generated in the concrete 14 when it is poured in, since the top face of the concrete 14 is not covered in the middle portions except parts where the flanges 7 and 8 are disposed, bubbles are allowed to escape readily through such open portion. However, in the vicinity of the flange 7, there is a risk that bubbles are left in the concrete because escape of bubbles is blocked by the flange 7.

Since small openings such as notches 10 or through holes 11 are formed as shown in Figs. 3 to 6, bubbles A accumulated in the vicinity of the flange 7 and lip 5 are allowed to escape through said notches 10 or through holes 11. Accordingly, the flange 7 and lip 5 are fixedly embedded in the concrete 14 free of bubbles.

Further, when an inclined face portion 9 is formed on the back side of the flange 7 so that the thickness of the flange 7 is increased in the base portion and is gradually reduced toward the top end as shown in Fig. 5 or 6, bubbles A can be guided smoothly to the outside along this inclined face. Still further, by thus changing the thickness of the flange 7, the loss of the strength owing to formation of the notches 10 or through holes 11 can be effectively compensated.

Since an anchoring fitting 16 customarily used in the conventional anchoring structure for a frame for a window-attaching

opening as shown in Fig. 7 is not used in the anchoring structure of the present invention, the concrete 14 can be sufficiently filled even between the flanges 7 and 8 and the adhesion of the frame 4 for a window-attaching opening can be remarkably improved. Accordingly, the frame 4 can be fixed tightly and assuredly.

In the anchoring structure for a frame for a window-attaching opening according to the present invention, since it is unnecessary to attach particularly a special anchoring fitting, the operation of attaching such fitting can be omitted and therefore the manufacture of precast concrete wall plates can be accomplished economically advantageously while improving the labor-saving effect.

Furthermore, when notches 10 are formed as the small openings by cutting off parts of the lips 5 and 6, the effect of the difference of the thermal expansion coefficient between concrete and the aluminium of the sash acting as the frame 4 for a window-attaching opening can be moderated or eliminated, and therefore, formation of a gap between the sash 4 and concrete 14 under influence of heat can be effectively prevented.

As will be apparent from the foregoing illustration, according to the present invention, since flanges 7 and 8 having lips 5 and 6 are formed on the frame 4 for a window-attaching opening and since they are arranged so that they act as anchoring structure for the frame 4, an anchoring fitting customarily used as the anchoring structure for a conventional frame for a window-attaching opening as shown in Fig. 7 need not be provided at all, and therefore, the steps of preparing precast concrete wall panels can be remarkably simplified. Further, since bubbles gathering in the vicinity of the flanges 7 and 8 can readily escape through the notches 10 or through

holes 11, the frame 4 for a window-attaching opening can be fixed to the concrete 14 tightly and assuredly.

#### WHAT WE CLAIM IS:

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1. A precast concrete wall panel having a frame for a window-attaching opening, the frame having a main body portion and a flange extending from the main body portion and away from the opening, the flange being at least partially embedded in the concrete wall panel and having a lip extending from the outer edge of the flange substantially perpendicular thereto, there being provided openings in the flange and/or lip to permit the escape of air when concrete is being poured during casting of the wall panel and embedding of the flange in the concrete.

2. A wall panel as claimed in Claim 1, wherein the openings for the escape of air comprise notches formed in the lip of the flange at intervals around the periphery of the frame.

3. A wall panel as claimed in Claims 1 or 2 wherein the openings for the escape of air comprise or further comprise a plurality of through holes piercing the flange.

4. A wall panel as claimed in any one of the preceding claims, wherein the flange has a face which is inclined upwardly towards the lip and constitutes a lower face of the flange when the wall panel is being cast.

5. A precast concrete wall panel having a frame for a window-attaching opening, substantially as hereinbefore described with reference to Figures 1 to 6 of the accompanying drawings.

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opening as shown in Fig. 7 is not used in the anchoring structure of the present invention, the concrete 14 can be sufficiently filled even between the flanges 7 and 8 and the adhesion of the frame 4 for a window-attaching opening can be remarkably improved. Accordingly, the frame 4 can be fixed tightly and assuredly.

In the anchoring structure for a frame 10 for a window-attaching opening according to the present invention, since it is unnecessary to attach particularly a special anchoring fitting, the operation of attaching such fitting can be omitted and therefore the manufacture of precast concrete wall plates can be accomplished economically advantageously while improving the labor-saving effect.

Furthermore, when notches 10 are formed as the small openings by cutting off parts of the lips 5 and 6, the effect of the difference of the thermal expansion coefficient between concrete and the aluminium of the sash acting as the frame 4 for a window-attaching opening can be moderated or eliminated, and therefore, formation of a gap between the sash 4 and concrete 14 under influence of heat can be effectively prevented.

As will be apparent from the foregoing illustration, according to the present invention, since flanges 7 and 8 having lips 5 and 6 are formed on the frame 4 for a window-attaching opening and since they are arranged so that they act as anchoring structure for the frame 4, an anchoring fitting customarily used as the anchoring structure for a conventional frame for a window-attaching opening as shown in Fig. 7 need not be provided at all, and therefore, the steps of preparing precast concrete wall panels can be remarkably simplified. Further, since bubbles gathering in the vicinity of the flanges 7 and 8 can readily escape through the notches 10 or through

holes 11, the frame 4 for a window-attaching opening can be fixed to the concrete 14 tightly and assuredly.

#### WHAT WE CLAIM IS:

1. A precast concrete wall panel having a frame for a window-attaching opening, the frame having a main body portion and a flange extending from the main body portion and away from the opening, the flange being at least partially embedded in the concrete wall panel and having a lip extending from the outer edge of the flange substantially perpendicular thereto, there being provided openings in the flange and/or lip to permit the escape of air when concrete is being poured during casting of the wall panel and embedding of the flange in the concrete.

2. A wall panel as claimed in Claim 1, wherein the openings for the escape of air comprise notches formed in the lip of the flange at intervals around the periphery of the frame.

3. A wall panel as claimed in Claims 1 or 2 wherein the openings for the escape of air comprise or further comprise a plurality of through holes piercing the flange.

4. A wall panel as claimed in any one of the preceding claims, wherein the flange has a face which is inclined upwardly towards the lip and constitutes a lower face of the flange when the wall panel is being cast.

5. A precast concrete wall panel having a frame for a window-attaching opening, substantially as hereinbefore described with reference to Figures 1 to 6 of the accompanying drawings.

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