Aug. 26, 1969 A. BALENCY-BEARN 3,462,898

CONSTRUCTIONAL BUILDING PANEL

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FIG. 1

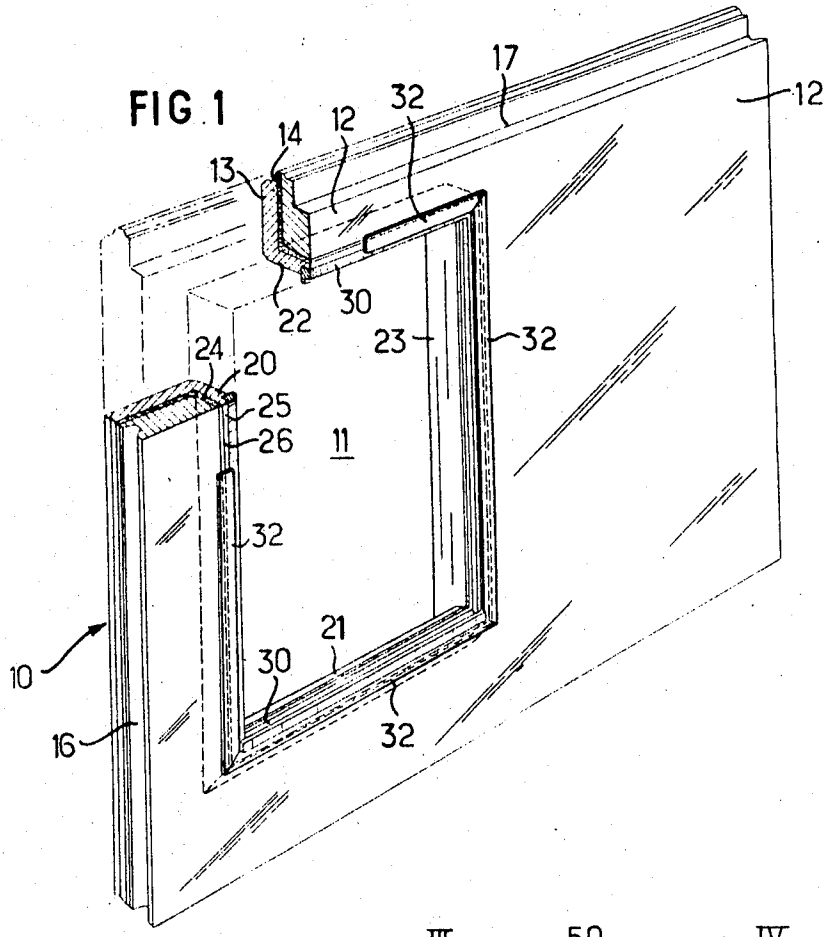
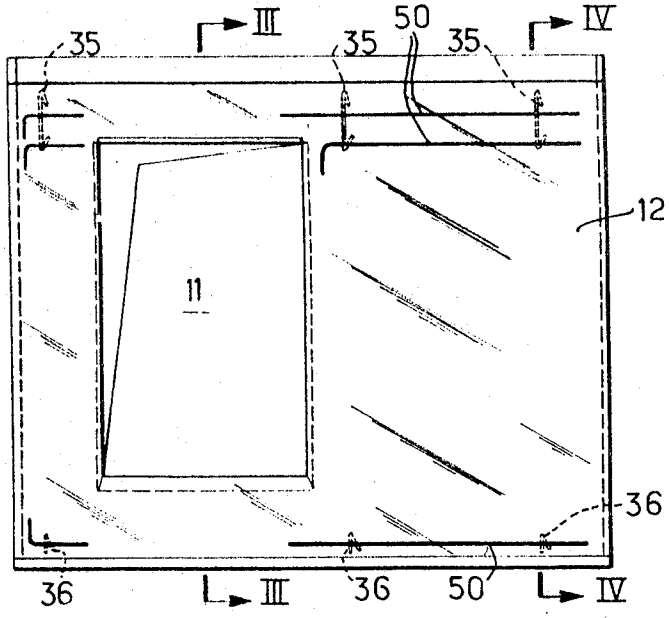


FIG. 2



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FIG.3

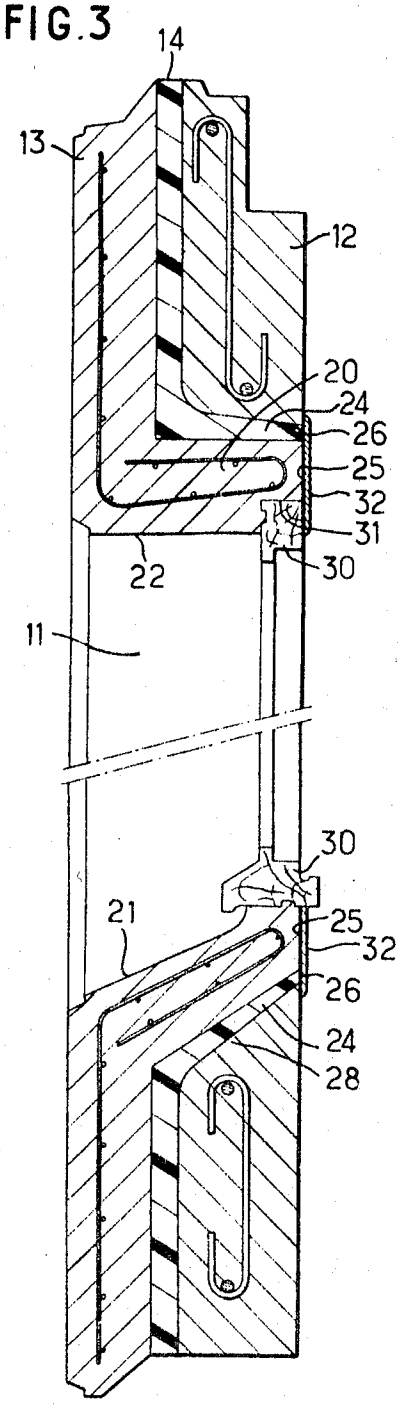
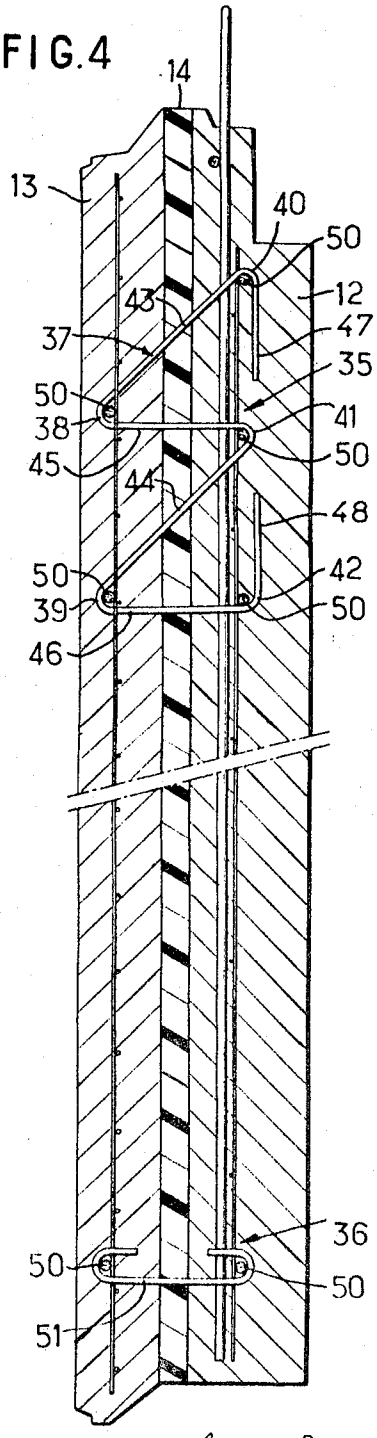


FIG.4



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United States Patent Office 3,462,898 Patented Aug. 26, 1969

3,462,898

CONSTRUCTIONAL BUILDING PANEL

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Filed Oct. 4, 1967, Ser. No. 672,885
Claims priority, application France, Dec. 7, 1966, 86,428
Int. Cl. E06b *1/24;* E04b *1/80, 2/06*
U.S. Cl. 52—208 9 Claims

ABSTRACT OF THE DISCLOSURE

A constructional building panel consists of inner and outer prefabricated concrete layers having a thermally insulating layer sandwiched therebetween and the concrete layers are connected for relative vertical and transverse displacement by connecting elements made of wire and suitably disposed in the upper and lower portions of the panel, the wires in the upper portion being arranged to permit said displacement and those in the lower portion being provided primarily to maintain the concrete layers against the thermally insulating layers.

BACKGROUND OF THE INVENTION

Field of the invention

The invention is particularly concerned with a constructional building panel of the kind having an inner concrete layer, which may or may not be load carrying, an outer concrete layer which is not load carrying, and which may have an outer decorative covering, and, between the two concrete layers a thermally insulating layer of a light material such, for example, as expanded polystyrene or other similar material. In the known forms of such panels the two concrete layers are essentially connected together either by small beams of reinforced concrete disposed along the edges of the panels, by reinforced concrete plugs distributed over the surfaces of the panels, or by the floors or ties of a building incorporating the panels in order to ensure the stability of the outer layer.

It will be appreciated that the inner and outer concrete layers will be subjected respectively to different influences, connected with temperature, hygrometry, vertical loads and additional stresses, lateral wind forces, differential contractions or extensions.

All of these actions tend to produce movements of one of the layers with respect to the other, and if, as is very often the case, the connections between the panels are rigid, such movements cannot occur freely. This gives rise to considerable stresses in the panels which can cause deterioration of the latter, and, in particular, the appearance of cracks therein.

Description of the prior art

It is known to effect the connections between panels by means of steel rods, stainless or otherwise, which allow a certain relative movement of the layers, but this expedient is unsatisfactory when there is an opening in the panel, because, in order to protect the edge of the insulating material from the weather, the inner and outer concrete layers are joined by a concrete rib disposed at the periphery of the opening and forming a frame to the opening and particularly a window-sill when the opening is a window.

This frame is naturally subjected to the stresses referred to above, and it thus cracks and no longer prevents infiltration of water between the concrete layers.

It is an object of the present invention to provide a panel free from the aforesaid drawbacks in which the connections between the concrete layers allow considerable liberty of movement of the outer layer with respect to the inner layer, and in which the protection of the thermal insulating material is complete even when openings, and particularly windows, are provided in the panel.

SUMMARY

According to the invention, there is provided a constructional building panel comprising an inner concrete layer, an outer concrete layer, and between the concrete layers a thermally insulating layer of insulating material, connecting elements joining together the concrete layers and passing through the insulating layer, some of said elements being disposed in the upper portion of the panel and permitting relative vertical and transverse displacement of said layers, and some of said elements being disposed in the lower portion of the panel and being arranged primarily to maintain the layers against the thermally insulating layer.

When an opening is formed in the panel the opening is formed by a frame-forming portion integral with and forming a frame comprising a sill, uprights and a lintel. The frame-forming portion extends through the inner concrete layer and into the plane of the free face of the inner concrete layer, and the thermal insulation is so shaped as to follow the frame-forming portion as far as its free edge whereby the insulating layer surrounds the frame and a free edge thereof is located in the plane of the free face of the inner layer.

The freedom of movement of the outer layer is thus preserved and at the same time the thermal insulation is protected against the weather since at the periphery of the opening the free edge of the insulation only appears at the interior of a biulding incorporating the panel, and on the free face of the inner layer.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view, partially cut-away, of one embodiment of a panel according to the invention in which there is an opening intended to receive a window of which only the frame is shown;

FIG. 2 is an elevation of the panel shown in FIG. 1;

FIG. 3 is a section, to an enlarged scale, along the line III—III, FIG. 2; and

FIG. 4 is a section, to an enlarged scale, along the line IV—IV of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, the cladding panel **10** is intended to receive a window and for this purpose has an opening **11**.

The panel **10**, seen from behind in FIG. 1, comprises, in the usual manner, an inner layer **12** of reinforced concrete which may or may not be load carrying, a thinner outer layer **13** also of reinforced concrete, arranged to receive a decorative facing (not shown), and between the two layers a thermal insulating layer **14** of light material such as expanded polystyrene. The two concrete layers are joined by connecting elements which will be described in detail hereafter.

On its periphery, the panel has grooves or rebates such as **16**, **17** intended, for example, in known manner, for forming joints or to join with flooring.

In one embodiment of the invention, the outer layer **13** has a frame-forming portion **20** which is integral therewith and which is directed towards the inner layer and forms a frame for the opening **11**. As shown in FIGS. 1 and 3 the portion **20** forms an oblique window-sill **21**, a lintel **22** and uprights **23**. The frame-forming portion **20** extends from the rear of the panel into the plane of the free face of the inner layer **12**. The lintel and uprights are at right angles to said plane of the free

face of the layer, the lintel is at right angles to the uprights, and the sill is upwardly inclined with respect to said plane of the layer **12** (FIG. 3).

The thermal insulation **14** is shaped, for example by moulding, so as to form also a lip portion **24** which is applied against the frame-forming portion **20**, the insulation following the latter as far as its free edge **25**. The exposed edge **26** of the insulation thus completely surrounds the free edge of the frame-forming portion **20** in the plane of the rear face of the inner layer.

The frame formed by the portions **20** and **24** projects into an opening **28**, FIG. 3, of the inner layer **12** and, as already indicated, the free edge **25** of the portion **20** and the free edge **26** of the thermal insulation is located in the plane of the free face of the layer **12**.

The frame **30** proper, FIGS. 1 and 3, of the window is housed in a recess **31**, FIG. 3, formed in and around the frame-forming portion **20** near to the free edge thereof.

Beading **32** forming a joint cover is fixed to the frame **30** and masks the edge **26** of the thermal insulation around the whole periphery of the opening. Thus, the thermal insulation is protected against the weather since its edge is flush with the inner wall of the panel without the concrete layers being connected together other than by the connecting elements previously mentioned and which are shown in detail in FIG. 4.

The connecting elements comprise elements **35** disposed in the upper portion of the panel and elements **36** located in the lower portion thereof.

Each upper element **35** consists of a wire **37**, for example of stainless steel, bent into a zig-zag configuration and disposed in a vertical plane at right-angles to the panel, alternate points of the zig-zag being set respectively in each of the concrete layers **12** and **13**. Thus, in the example shown, two points **38** and **39** are anchored in the layer **13** whilst the other points **40**, **41** and **42** are anchored in the layer **12** and the wire **37** passes through the thermal insulation **14**.

The zig-zag path of the wire **37** comprises a succession of rectilinear portions **43**, **44**, **45**, **46** of which alternate portions **43**, **44** are inclined with respect to the vertical by an angle of about 45°, the direction of inclination being from top to bottom and from the inner layer towards the outer layer, whilst the other portions **45** and **46**, which connect the portions **43**, **44**, are horizontal.

At its two extremities, the wire **37** ends beyond the two end points **40** and **41** of the zig-zag in two vertical portions **47**, **48** directed one towards the other.

The zig-zag points **38**, **39**, **40**, **41**, **42** are bent around horizontal iron rods designated by a general reference **50** and set in the concrete. The layer **13** is thus suspended from the layer **12** by its upper portion.

Each connecting element **36** in the lower portion of the panel is constituted by a wire **51**, which may also be of stainless steel, extending from one layer to the other, through the thermal insulation and at right-angles to the faces of the panel, each of the two ends of the wire **51** being bent around rods **50**.

The connecting elements **35** and **36** are distributed over the length of the panel, as illustrated in FIG. 2, and in the example described, in which the opening **11** is towards one end of the panel and is thus flanked by two unequal panel portions, the connecting elements are disposed only in these panel portions, two of each type in the widest portion and one of each type in the other portion, each upper element being directly above its associated lower element.

In the case of a panel without an opening, the connecting elements can, for example, be distributed regularly along the length of the panel. The number can, of course, be varied.

As a result of these arrangements the outer layer **13** is suspended at its upper portion by the elements **35** which are shaped so as to allow, by deformation of the elements, relative vertical and transverse displacement of the layers whilst the connecting elements **36** have the primary role of maintaining the layers **12**, **13** against the thermally insulating layer so that there is no gap between the layers. The lower elements **36** by reason of their shape also allow relative displacement of the layers.

If necessary, connecting elements similar to the elements **36** can be placed at the mid-height of the panel, particularly near to the edges of the latter or along the openings, as shown in FIG. 3, which the panel may have.

There are no other connections between the layers themselves, even when the panel has an opening therein, and the arrangement described above enables complete sealing of the opening to be effected and enables the usual concrete beams connecting the layers to be eliminated. The panel is, therefore, not subjected to stresses which can lead to cracking or other faults in the panel, since the frame-work of the window and the window itself are a part of the outer layer and can move freely with the latter relative to the inner layer.

The panel can advantageously be made by moulding. The outer layer **13** is poured first with its decorative covering, its reinforcement and the connecting elements **35** and **36**. When the concrete has set, the thermal insulation **14**, previously moulded, is placed in position. It is placed on the layer and easily penetrated by the connecting elements without special preparation, and the interior layer **12** is thereafter poured.

The embodiment of the panel described and shown is given merely by way of example and can naturally be varied in many ways.

I claim:

1. A constructional building panel comprising an inner concrete layer, an outer concrete layer, and between the concrete layers a thermally insulating layer of insulating material, connecting elements joining together the concrete layers and passing through the insulating layer, some of said elements being disposed in the upper portion of the panel and permitting relative vertical and transverse displacement of said layers, and some of said elements being disposed in the lower portion of the panel and being arranged primarily to maintain the layers against the thermally insulating layer, the panel having an opening therethrough which is formed by a frame-forming portion integral with the outer concrete layer and forming a frame comprising a sill, uprights and a lintel, the frame-forming portion extending through the inner concrete layer and into the plane of the free face of the inner concrete layer, and the insulating layer being so shaped as to follow the frame-forming portion as far as its free edge, whereby the insulating layer completely surrounds the frame and a free edge thereof is located in the plane of the free face of the inner concrete layer.

2. A panel according to claim **1**, wherein a window frame proper is mounted in a recess formed in the frame-forming portion near the free edge of said portion.

3. A panel according to claim **2**, wherein a joint cover is fixed to the window frame against the free face of the inner concrete layer to mask the free edge of the insulating layer.

4. A panel according to claim **1**, wherein the connecting elements for the concrete layers are disposed only in the vertical areas to either side of the opening.

5. A constructional building panel comprising an inner concrete layer, an outer concrete layer, and between the concrete layers a thermally insulating layer of insulating material, connecting elements joining together the concrete layers and passing through the insulating layer, some of said elements being disposed in the upper portion of the panel and permitting relative vertical and transverse displacement of said layers, and some of said elements being disposed in the lower portion of the panel and being arranged primarily to maintain the layers against the

thermally insulating layer, the panel having an opening therethrough, each connecting element at the upper portion of the panel comprising a wire bent to zig-zag form and disposed in a vertical plane at right angles to the faces of the panel, alternate points of the zig-zag being anchored respectively in the inner and outer concrete layers and being bent around bars set in the concrete layers, each connecting element at the lower portion of the panel comprising a substantially horizontal wire the extremities of which are bent around rods set respectively in the inner and outer concrete panels, the opening being formed by a frame-forming portion integral with the outer concrete layer and forming a frame comprising a sill, uprights and a lintel, the frame-forming portion extending through the inner concrete layer and into the plane of the free face of the inner concrete layer, and the insulating layer being so shaped as to follow the frame-forming portion as far as its free edge, whereby the insulating layer completely surrounds the frame and a free edge thereof is located in the plane of the free face of the inner concrete layer.

6. A panel according to claim 5, wherein a rectilinear portion on each of the zig-zagged wires is inclined at about 45° to the vertical from top to bottom and from the inner concrete layer towards the outer concrete layer, the remaining portion or portions being substantially horizontal.

7. A panel according to claim 5, wherein a window frame proper is mounted in a recess formed in the frame-forming portion near the free edge of said portion.

8. A panel according to claim 7, wherein a joint cover is fixed to the window frame against the free face of the inner concrete layer to mask the free edge of the insulating layer.

9. A panel according to claim 8, wherein the connecting elements for the concrete layers are disposed only in the vertical areas to either side of the opening.

References Cited

UNITED STATES PATENTS

2,078,753	4/1937	Christenson et al.	52—405 X
3,237,357	3/1966	Hutchings	52—169 X

FOREIGN PATENTS

481,597	3/1952	Canada.
561,231	5/1944	Great Britain.

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U.S. Cl. X.R.

52—223, 573, 612