OPENABLE PANEL STRUCTURE SUITABLE FOR USE EITHER AS ROOFING OR AS A CURTAINWALL FOR BUILDINGS

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ABSTRACT
Openable panel structure comprises a rectangular frame to which panels are hinged along their diagonal axes, in order to cause overlapping of the sides of two adjacent panels with respect to each other, and overlapping of the bottom edge of each panel with respect to the bottom edge of the frame.

8 Claims, 6 Drawing Figures
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SUMMARY OF THE INVENTION

In many types of civil, agricultural and industrial buildings, attempts have been made for some time to construct walls or roofing with openable panels for the purpose of greatly facilitating aeration and air conditioning of the rooms under certain desired conditions. This occurs for example in areas used as verandas or solariums, in animal quarters, in greenhouses and in industrial sheds used as laboratories or stores.

At present openable panel structures are known, consisting substantially of a frame which supports a series of adjacent panels individually hinged along their longitudinal middle axis, and which can be arranged either in the same plane as the frame, in the closed position, or in perpendicular thereto in the open position.

With this type of structure, the panels can be made to overlap only along the edges parallel to the hinging axis, which are always parallel to each other, but evidently it is not possible to make the two remaining edges of the panels overlap the frame, otherwise the panels would not be able to rotate in order to open.

Structures formed in this manner have two fundamental disadvantages: firstly a perfect seal cannot be obtained against rain water, which always penetrates through the edges comprising the hinges, and in the second place, with structures of this type, it is not possible to obtain roof pitches because the edges of the panels, when open, would lie above the roof ridge, which would thus have to be raised in order to allow the panels to be opened.

The present invention proposes a solution which eliminates all the aforementioned disadvantages and in addition offers the further advantage of providing panels which, when closed, have the edge at the highest level abutting against the inside edge of the base frame, and the edge at the lowest level abutting against the outside edge of the base frame, in such a manner as to guarantee a seal even against sheets of water running along the top of the panel structure when it is closed.

This is rendered possible according to the invention by the fact that each individual panel is not pivoted along any longitudinal axis, but is instead pivoted along a diagonal axis in such a manner that two diametrically opposite corners of the panel are substantially fixed during opening operations, while the two opposing edges of the panel are rotated towards the inside and towards the outside of the base frame respectively.

In this manner not only is it possible to form an overlap between the edge of the panel and the edge of the frame, this overlap being on opposite sides of the frame for the two opposing edges, but in addition the sides of the panel rotate in pairs while always remaining on the same side of the frame.

This enables the structure to be used as roofing in double pitch roofs, in that the roof ridge may be made fixed without further constructional complications.

The operational and constructional merits and characteristics of the invention will be more evident from the detailed description given hereinafter referring to the figures of the accompanying drawings, which illustrate one preferred embodiment of the invention, given purely by way of example in the drawings.

FIG. 1 is a perspective view of the invention applied to roofing;
FIG. 2 is a plan view of it with the panels completely open;
FIG. 3 is a diagrammatic perspective view of portion of the invention shown on an enlarged scale;
FIG. 4 is a partial vertical section through a shed in which the structure is also used for the side walls;
FIG. 5 is a partial schematic sectional of the central part of the roofing with the panel locking devices in the closed position; and
FIG. 6 is a perspective view of one of the panels forming the structure.

The aforementioned figures show the support frame 100 for the roofing comprising substantially two longitudinal side stringers 2 and a longitudinal central stringer 1 at the ridge.

The two roofing pitches are supported between the stringer 1 and the stringers 2, and each comprise a plurality of panels 3, each composed of a welded metal tubular frame 4 which supports a sheet 5 of corrugated material which may either be of sheet metal or plastic laminate.

Each of the panels 3 comprises two hinging bosses 6 and 7 on one of its diagonals, and aligned along said diagonal.

The boss 6 of each panel is supported by a suitable pivot pin 66 carried by one of the stringers 2, while the corresponding opposing boss 7 is supported by a like pivot pin 77 carried by the central stringer 1.

It is evident that the pivot pins 66 and 77 supporting the bosses 6 and 7 respectively are aligned with each other.

The fixed concave ridge 8 is positioned above the central stringer 1 along the entire length of the roofing, and is formed of the same corrugated material as the sheets 5.

Because of the aforementioned arrangement, each panel 3 of the roofing may be disposed either horizontally or vertically, to close or open the roofing. Furthermore in its vertical open arrangement, the panel 3 has no parts extending above the level of the ridge 8, which can therefore remain fixed, and the two end edges 33 of the panel are parallel to the stringers 2 in the closed position, and are always above the stringer 2 and always below the central stringer 1 respectively.

Furthermore, because of the aforementioned arrangement, each panel 3 is rotated about axis an which does not correspond with the lines of maximum slope of each roofing pitch, but is inclined to said lines.

It is evident that in the closed position, the edge 33 at the highest level abuts against the underside of the ridge, while the lower edge 33 abuts against the upper edge of the stringer 2, so ensuring a seal against sheets of water.

Where the invention is applied in the formation of side curtain walls in sheds, its characteristics remain unchanged, as is better evident in FIG. 4, and enable the upper edge 33 of each panel to be always kept inside the shed and the lower opposing edge always outside the shed, so avoiding any infiltration of water on to the floor.

Where said panels are to form a curtain wall, the pivot pins 66 and 77 supporting each panel are located respectively below the upper side stringer and at the lower projecting edge defining the side wall.
Each individual panel also comprises an arm 9 close to the hinge at the stringer 2, its purpose being to control the rotation of the panel.

All the arms 9 are connected together by connecting rods 10, the last of which is connected to a cylinder-piston unit 11 which rotates all the component panels of one pitch.

Below the central stringer 1 there are two rods 12, each of which is associated with the series of panels forming part of a single pitch, and which support a plurality of equidistant arms 13, their distance apart being equal to the distance apart of the pivot pins 77.

The rods 12 can slide axially, supported in a series of rings not shown in the figure, and the movement of translation of each rod 12 is controlled by a cylinder-piston unit 14.

The stroke of said cylinder-piston unit is equal to the distance between two consecutive pivot pins 77.

Under these conditions, in one of the limiting position of the cylinder-piston unit, the arms 13 are in a position below the pivot pin 77 and thus enable the panels 3 to be rotated.

When the panels 3 are to be locked, the cylinder-piston unit is simply moved into the opposite limiting position so that each arm 13 becomes engaged under a projection formed on the edge 33 of each panel, thus preventing said edge from being lowered.

The invention is not limited to the single embodiment hereinafore described, and modifications and improvements may be made to it without departing from the scope of the invention, the fundamental characteristics of which are summarised in the following claims.

What is claimed is:

1. Panel structure comprising:
   a frame having two parallel sides defining a plane, and
   a plurality of panels supported by said frame, each panel being mounted to swing about an individual axis diagonal to that panel between a closed position in which said panels lie parallel to each other in the plane of said frame and an open position in which two adjacent sides of each panel lie on one side of said plane and its other two sides lie on the other side of said plane.

2. Panel structure as claimed in claim 1 in which said panels have edges transverse to said parallel sides of said frame which overlap the adjacent edges of any adjacent panels when said panels are in closed position.

3. Double pitch roofing section for buildings comprising at least three parallel longitudinal stringers, with the central stringer at a higher level than the other two stringers, and a set of panels supported between each two adjacent stringers, each panel being mounted to swing about an individual axis diagonal to that panel between a closed position in which said panels lie parallel to each other in the plane containing said two adjacent stringers and an open position in which two adjacent sides of each panel lie on one side of said plane and its other two adjacent sides lie on the other side of said frame.

4. Double pitch roofing section as claimed in claim 3 in which said central stringer carries a cover member and said panels have edges adjacent said central stringer which project beneath said cover member when the panels are in their closed position, and edges adjacent said other stringers which overlie said other stringers when in the panels are in their closed position.

5. Double pitch roofing for buildings as claimed in claim 3 in which each panel has edges transverse to said stringers which overlap the adjacent edges of any adjacent panels when said panels are in closed position.

6. Double pitch roofing as claimed in claim 5 comprising means for swinging all of the panels in each set as a unit about their individual axes.

7. Double pitch roofing as claimed in claim 6 in which the means for swinging all of the panels in each set as a unit comprises a lever arm carried by each panel, each lever being connected to a longitudinally movable rod, and a piston connected to reciprocate said rod.

8. Double pitch roofing as claimed in claim 3 comprising means for locking said panels in their closed position, said locking means comprising an arm attached to each panel, a rod attached to each arm, means for reciprocating said rod between two positions, and means for preventing swinging movement by said arms and consequently by said panels when said rod is in one of said two positions.

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