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Suarez

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[54] **HORIZONTALLY-PIVOTABLE DOUBLE-GLAZED WINDOW**

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[51] **Int. Cl.** **E06b 3/40**

[58] **Field of Search** 49/390–393; 160/107; 52/302, 304, 398, 399

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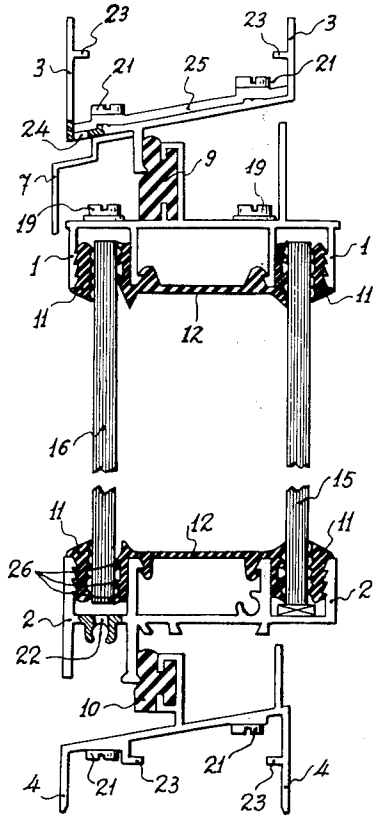
Primary Examiner—Kenneth Downey

[57] **ABSTRACT**

The present invention relates to a horizontally-pivotable double-glazed window. The sash of the window comprises a horizontal cross-piece whose cross-section presents a section different from that of the lower cross-piece, and upright pieces which have the same cross-section. The differences in the horizontal cross pieces are only on the outer parts of the sash. The inner parts of the four pieces of the sash have four parallel flanges which determine two longitudinal channels which form grooves. The edges of the panes of glass are secured by pressure in the grooves by means of gaskets which are partially introduced into the grooves. There is a distance between the grooves which constitutes the air chamber between the two panes of glass. Ventilation is provided at the bottom pane interior face of the exterior glass.

7 Claims, 3 Drawing Figures



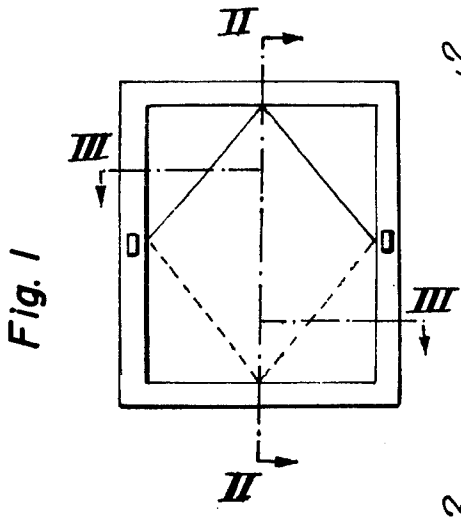

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Fig. 1

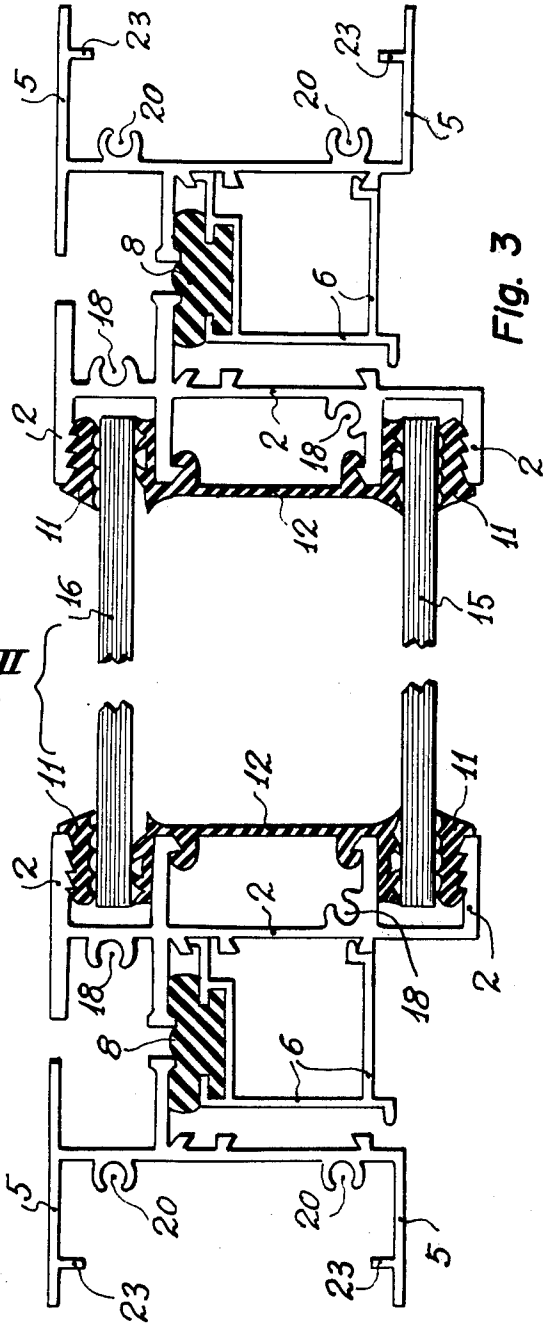
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Fig. 3

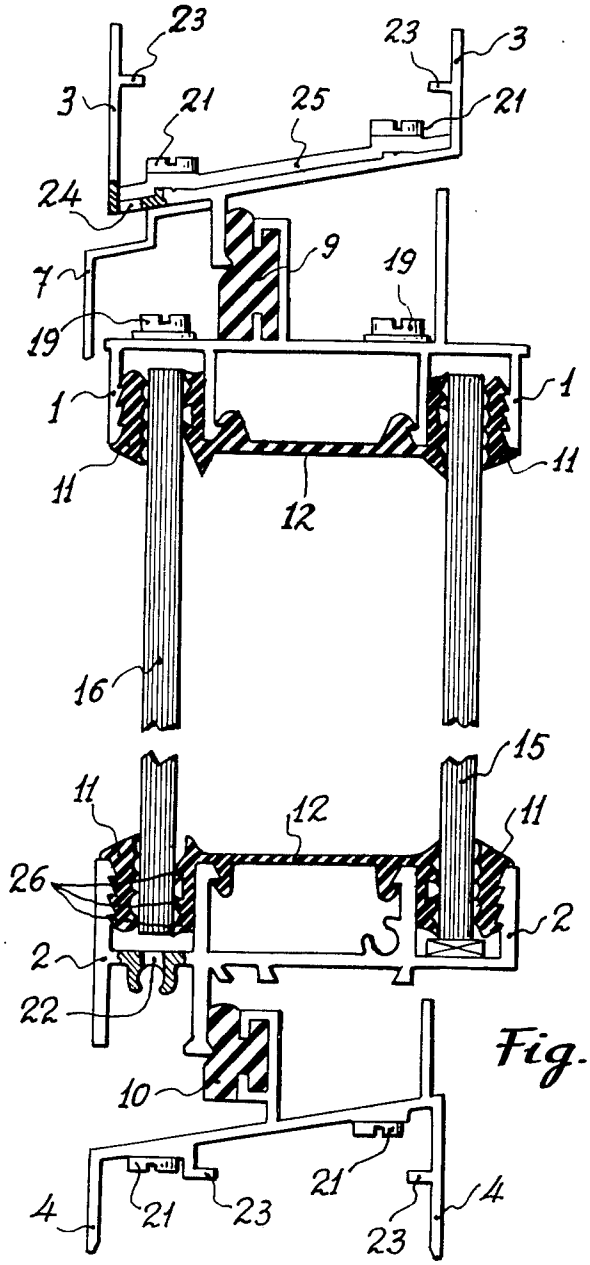
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Fig. 2

HORIZONTALLY-PIVOTABLE DOUBLE-GLAZED WINDOW

BACKGROUND OF THE INVENTION

At the present time the use of double glazing in windows is very generalized, having the purpose of increasing their degree of insulation, both thermal and acoustic.

From among the various types of windows, horizontally-pivotable windows have a wide field of application.

Horizontally-pivotable windows are operated by rotation of the sash around a horizontal shaft situated approximately half way up the window, which can be rotated through **180°** in order to clean the outside of the window without difficulty from inside the building.

The double-glazed windows at present in existence on the market are the result of adding to the sash frame of a single-glazed window a second frame holding another pane of glass. In this way, the sashes of these windows are constituted by two frames joined together by different processes and, generally, hinged together for the purpose of permitting access to the interior of the air chamber which separates the two frames from one another like the pages of a book.

This solution, although it permits the required access to the interior of the chamber, nevertheless, presents economic and technical disadvantages.

The use of two frames to constitute the window sash with the consequent need for utilizing means of fixing, coupling and hinging the two together, entails a complexity of construction that implies high costs of manufacture, both for materials and for the troublesome mechanical processes to which they must be subjected and which require a considerable amount of labour.

Additionally, the use of two frames is inadvisable, since there is a perimetrical joint between the two which gives rise to various problems.

In fact, when the two sashes are operatively sealed in parallel to each other, the joint between the two frames will be either inside or outside, or even partly inside and partly outside of the building with respect to the ceiling joint between the movable window sash and the fixed window frame.

If the joint between the frames is situated inside the building, with respect to its entire length, or with respect to only part of it, it will be practically impossible to obtain a seal in the joint that is adequate to prevent the infiltration of water vapour from the atmosphere inside the building into the air chamber. This will cause the formation of condensation in the air chamber in winter when the outside temperatures are low. This phenomenon is frequently seen in this type of window.

And if the perimetrical joint between the two sash frames is situated totally or partially on the outside, this gives rise to penetration of dust into the interior of the chamber, causing it to become dirty, as well as to the possible infiltration of rainwater into the said chamber.

One of the reasons for the inherent difficulty in the joint between the two frames is based on the fact that, for reasons of economy, one of the two frames is constructed with sections of small cross-section, so that this frame, which is the one that is affixed to the other, lacks rigidity and, consequently, it is technically difficult to satisfactorily establish the junction between the two frames. To give it the necessary rigidity would make the window totally uneconomical.

SUMMARY OF THE INVENTION

The double-glazed window which is the subject of the present invention is provided with a single-sash frame which eliminates the aforementioned disadvantages.

The sash frame, of rectangular form, although it may have rounded corners, is constituted on its four sides by pieces having faces that form the walls of the interior air chamber. These faces have two longitudinal channels placed at a distance from one another, which constitute the grooves in which the edges of the window panes are housed in order to keep them firm.

The upper horizontal cross piece of the sash is fixed by its ends to the ends of each of the vertical pieces by means of screws whereby it can be withdrawn from the sash.

The window sash is thus constituted by way of a parallelepiped box equipped with a cover which can be withdrawn.

In this way, on withdrawing the "cover," that is to say the cross-piece of the sash, access to the interior of the chamber is provided for a possible cleaning of the interior, although only exceptionally will the need for doing so arise, since the construction window sash prevents the interior of the air chamber from becoming dirty.

The joining of the window panes to the sash is effected by utilizing gaskets which are introduced into the interior of the grooves, the edges of the window panes being firmly secured between them, thus bringing about the seal of the said joints as a consequence of the pressure to which they are subjected.

The simplicity of this system of fixing the window panes, which eliminates the use of battens or other auxiliary pieces, and the rapidity with which it can be carried out, is another positive factor which further contributes to the reduction of manufacturing costs.

The four pieces of the sash are equipped on their faces opposite to the interior of the air chamber with longitudinal flanges parallel to one another, which are adequate for effecting the necessary overlapping with the window frame when the latter is in its closed position.

This set of flanges is identical in the case of the two lateral members and in the lower cross-piece and presents a different configuration in the upper horizontal cross-piece of the sash.

The configuration of the lower cross-piece of the sash provides a channel opposite to the channel that constitutes the groove of the outer window pane. The bottom of this groove is equipped with a number of small openings that are protected from the penetration of rainwater by the channel opposite the groove, which acts as a gutter.

Small discontinuities can be provided in the gasket which seals the inside surface of the outer window pane by eliminating small portions of the gripping flanges. By alternating the discontinuities with respect to the small openings in the lower cross-piece and on the gripping flanges, labyrinth communication is established, which impedes the passage of dust and the contact of the outside atmosphere with that of the interior of the air chamber.

In this way, it is possible to achieve the equalization of the partial pressure of the water vapour of the interior of the chamber with that of the outside atmosphere.

In these circumstances, when the outside temperature falls in winter, there is no fear of the formation of condensation in the interior of the chamber, since when the temperature of the chamber is higher than that of the outside atmosphere, dew point will not be reached in the chamber.

This communication of the chamber with the outside eliminates condensation in the interior of the chamber but has only a negligible effect on the thermal insulation of the window, since, although it permits the diffusion of the water vapour through it, it does not cause air convection currents.

The sash is joined to the window frame or fixed part of the window by a number of hinges or pivots that permit the rotation of the window sash with respect to a horizontal shaft. The axis of turning is moved slightly downwards with respect to the middle point of the height of the window in order to permit the window sash to revolve through **180°**, thus enabling the outside of the window sash to be cleaned easily from inside the building.

The window frame, that is to say, the assembly of fixed sections which are in contact with a sill or with the facade, is composed of a rectangular frame in which the cross-pieces of the frame are fixed by their ends to the vertical pieces or up-rights of the frame by means of screws.

The four members adopt, in their sectional view a U-shaped configuration with the arms of the U situated in vertical planes, facing towards the outside of the frame. One or more flanges also being provided in vertical planes but pointing toward the inside of the frame.

The web in each section of the two vertical pieces of the window frame is perpendicular to the arms of the U, as it is normally positioned.

However, the web in each section of the two cross-pieces is oblique with respect to the arms of the U.

That is to say, assuming that the window frame is already fixed in a facade, the web of the cross-pieces is not horizontal but both the upper and the lower webs are inclined toward the outside for the purpose of tending to expel the rainwater that might possibly penetrate into them towards the outside. The outflow of this water is affected through a number of small orifices suitably placed for the purpose.

This arrangement is of primary importance when the windows are installed in curtain walls.

Experience shows that in this type of facade it is impossible, in practice, to achieve an absolute seal.

The numerous joints existing in curtain walls, joints which should be provided with adequate clearances to permit the expansion and contraction caused by heat of the various enclosing elements which, being juxtaposed, constitute the facade, finish up by causing the penetration of rainwater into the interior of their structure.

This water should be channelled towards the outside in order to prevent its penetration into the interior of the building.

Hence, the importance of seeing that the various elements of the curtain walls are provided with a system of drainage towards the outside.

This drainage is achieved in the most simple manner with the inclined configuration adopted here for the cross-piece of the window frames.

However, the risk of penetration of water does not only arise in the case of curtain walls, but also in facades of traditional type, especially when the windows are placed flush with the facade. Therefore, the system of drainage envisaged can also be advantageously applied in these cases.

With respect to the importance of the degree of seal against water and air provided by a window between its moveable sash and the fixed frame, we shall not comment on this because of its being too well known. In the window which is the subject of the present invention, the seal between sash and frame is effected by means of overlapping flanges and projections placed for the purpose provided with a gasket placed between them.

The arrangement adopted presents a single plane of closure. This arrangement is, not very generally encountered. There are numerous windows in which two planes of closure are established as has been done traditionally, and this double overlap defeats its own ends since, in view of the practical impossibility of obtaining a perfect coplanarity of sash and window frame, the simultaneous contact of both overlaps or planes of closure is not, in fact, achieved. One or other of them enters into contact alternately, giving rise to discontinuities in the seal, thus causing a diminution of the seal of the window.

The horizontal pivot delimits two zones in the window for the purpose of closing it.

In the upper zone, on closing the window, the sash contacts the window frame from the inside, the opposite occurring in the lower zone.

The overlap of the flanges of the sash and the window frame of the upper cross-pieces of both is such that, when the window is closed, the flange pertaining to the window frame is outside and that pertaining to the sash is situated on the inside, while in the case of the lower cross-pieces of both, the opposite occurs.

In the vertical pieces, a projection member is fixed alternately to the sash or to the window frame when suitably placed, the projection member permits the correct functioning of the window.

These projection members are straight members which are joined to the two vertical pieces of the sash, running from the horizontal pivot to the head of the sash.

In the same way, they are joined to the vertical pieces of the window frame but running in this case, from the horizontal pivot to the lower cross-piece of the window frame.

The four projecting members used have one and the same cross-section. They are provided with a longitudinal housing in the form substantially of a "C" in cross-section which serves to support the weather strip. These projections are fixed with a clip both to the window and to the sash frame without the need for any other type of fixing. The weather strip housed in the projections fulfils the double mission of acting both as a seal joint between the fixed and moveable parts of the window, and serving as a seal joint between the projection member itself and the piece to which it is affixed.

It is appropriate to indicate that in the windows that are the subject of this invention, projection members are only used on the vertical pieces, where they are really indispensable, whilst in other existing windows on the market they are utilized also on the horizontal pieces.

Consequently, the arrangement adopted implies an economy in materials and also in labour, because of the

simplicity of fixing by means of a clip; this is one more factor which reduces the cost of the window.

Both the seal flange of the upper cross-piece of the sash and the lower cross-piece of the window frame are provided with housings similar to those of the projection member for securing the gasket.

Therefore, the said gasket, when the window is closed, does not present a gap, being made firm with the window sash above the horizontal pivot and with the window frame below the said shaft.

Since, as indicated previously, the window sash constitutes a unitary assembly in the form of a parallelepiped box, it possesses greater rigidity than the conventional double-framed window sashes so that the seal is more efficient because it affords the sash a high degree of resistance to warping.

Another feature of this window is the special configuration adopted by the vertical pieces of the sash and the window frame, which provide additional protection to the window gasket in the vertical lengths so that, in the majority of cases, rainwater does not even reach the said joint.

In fact, the plane of closure executed on the outer plane of the gasket is set back in respect to the outer plane of the window.

Each of the two vertical pieces of the window frame is provided with two longitudinal flanges parallel to one another pointing toward the inside of the frame. One of them is situated flush with the outside plane of the window frame and the other is set back towards the inside, forming a longitudinal channel or groove.

The flange situated on the inside acts as a seal.

Against this flange abuts the gasket on the projection member fixed to the sash in its upper half and the gasket on the projection member fixed to the vertical pieces of the window frame in its lower half.

The vertical pieces of the sash frame are in turn provided with two similar flanges that form a longitudinal channel, similar to that formed by the vertical pieces of the window frame in such a way that when the window is closed, the channels of the vertical pieces of the sash are facing the channels of the vertical pieces of the window frame.

Between the outer flanges of the vertical pieces of the window frame and the sash, flanges which are coplanar when the window is closed, there is provided a small aperture which runs from top to bottom of the window. A similar aperture is provided between the inner flanges of the window frame and the sash, and which is closed by the weather strips. Between these outer and inner flanges a chamber is defined.

With the arrangement described, the drops of rainwater which can fall on the weather strips is reduced to a minimum since the greater part of water which penetrates through the outer aperture drains downwards through the chamber without reaching the weather seal. In this way, although the weather strip section is capable by itself of providing the necessary seal, it will not even be reached by the water in the majority of cases.

The clearance between the upper cross-pieces of the window frame and the sash is also additionally protected against the penetration of rainwater by means of a small flashing or gutter fixed to the upper cross-piece of the window frame and along its length, and which overlaps on the outside with the upper cross-piece of the sash.

This flashing has a gap in its upper part to permit drainage of the upper cross-piece of the window frame to which we have referred previously, expelling the water drained to the outside, preventing it from falling on the upper cross-piece of the window sash.

By means of this flashing, the weather strip of the upper horizontal length of the window is in turn protected from water.

The lower cross-piece of the sash has a cross-section with identical configuration to that of the vertical piece of the sash, so that the channel with which it is provided does the work of a gutter, preventing the water from draining towards the inside of the window, so that the weather strip of the lower horizontal stretch of the window is also protected.

Finally, the slops with which the lower cross-piece of the window frame is provided deflects towards the outside the water that falls on its surface.

The sum total of all the arrangements adopted guarantees a high degree of seal in the window.

The locking of the window in its closed position can be obtained by any of the conventional existing procedures. By way of example, and not being limitative, we shall indicate, because of its simplicity, the system consisting of a handle which has a gudgeon firmly joined at a right angle to it in such a way that the revolving of the handle causes the gudgeon to revolve. By situating this system on the lower cross-piece of the sash, and placing a dolly plate against the vertical inner flange of the lower cross-piece of the window frame, the action on the handle causes a gudgeon to press against the dolly, providing an adequate locking of the window sash that provides sufficient pressure to compress the weather strip of the window thus assuring a seal.

Having regard to their dimensions, the window will be provided with one or more locking devices.

In order that the subject of the invention may be better understood, and only be way of example, sheets of drawings are attached in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a diagram of the frontal view of a window according to the invention.

FIG. 2 shows the vertical section through II—II of FIG. 1.

FIG. 3 shows the horizontal section through III—III of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the above-mentioned illustrations, it can be seen that in the vertical section of FIG. 2, the upper number II designates the section corresponding to the upper horizontal length and that the lower number II designates that corresponding to the lower length, while in the horizontal cross-section of FIG. 3, the left number III designates the sectional view of a vertical length from above the horizontal pivot of the window, and the right number III designates that of the opposite vertical length from below the previously mentioned pivot.

With respect to the sash of the window there appears in the vertical section of FIG. 2, the upper horizontal cross-piece I and the lower horizontal cross-piece 2, the latter being identical in configuration to the vertical members or up-rights 2 of the sash shown in the horizontal cross-section of FIG. 3.

The joint of the cross-piece I with the vertical pieces **2** is effected by means of the screws **19** which, on passing through the cross-piece I at its two ends (two screws at each end) screw in the screw channels **18** placed in the upper ends of the vertical pieces **2** so that the cross-piece I is securely attached to the sash frame. The cross-piece I may be withdrawn by unscrewing the screws **19.**

Both in the vertical and the horizontal cross-sections of the window it can be seen that the window panes **15** and **16** are embedded in the sash, being housed in their corresponding grooves and fixed by means of the gaskets **11, 12** and **13.**

The ventilation orifices **22** together with the elimination of the small projections of the edge **26** of the gasket **12** provide communication between the outside atmosphere and that of the air chamber of the window, for the purpose of preventing the formation of condensation in the chamber.

As far as the window frame is concerned, there can be seen at the upper number II of the vertical cross-section, the upper cross-piece **3** to which the flashing **7** is fixed, at the lower number II the lower cross-piece **4** is shown.

The horizontal cross-section of the window shows the vertical pieces or uprights **5** of the window frame which is joined to the cross-pieces **3** and **4** by means of screws **21** (two at each end of each cross-piece) that is to say eight in all. These screws, on passing through the cross-pieces screw into the screw channels **20** with which the vertical pieces **5** of the window frame are provided.

The horizontal cross-section shows the projecting members **6** fixed with a clip onto the sash in left section III, that is to say in the upper half of the window, and on the window frame in right section III, that is to say in the lower half of the window.

These projections **6** support the weather strips **8** which is housed in them.

In the upper zone of the window (section II) the weather strip **9** is housed in a flange with which the upper cross-piece I of the sash is provided for this purpose and in the lower zone (lower section II) the elastic seal joint **10** is housed in a flange pertaining to the lower cross-piece **4** of the window frame.

The orifices **24** in the upper cross-piece **3** of the window frame provide the drainage of the latter cross-piece.

The retaining flanges **23** with which the two members of the window frame are fitted have the purpose of producing a fixing to the anchorage clips (not shown) with which the window frames are fixed to the traditional type of facade.

In the interior of the upper cross-piece of the window frame **3** a foundation piece **25** is housed, which presents parallel surfaces on which are supported the heads of the screws **21** to maintain their coaxiality with the corresponding screw channels **2** in the vertical uprights of the window frame **5.**

What is claimed is:

1. A sash for a double-glazed window, said sash comprising:

an upper horizontal cross-piece;

a lower horizontal cross-piece;

a pair of vertical pieces joined at their ends to the ends of said horizontal cross pieces to form the sides of the sash, each of said pieces having four integral parallel spaced apart flanges on their inner surface forming a front groove and a rear groove to receive the edges of two panes, said two grooves being spaced from each other to form a central U-channel in said sash between an adjacent flange of each of said grooves;

a resilient inverted U-shaped cover gasket spanning said central U channel in said sash, each side of said U-shaped gasket extending within a respective one of said front and rear grooves against said adjacent flange;

retaining means on said U-shaped cover gasket cooperating with mating retaining means on said adjacent flanges to hold said U-shaped cover gasket in place;

a pair of separate resilient wedge shaped gaskets, each of said wedge shaped gaskets extending within a respective one of said grooves against the flange facing said adjacent flange; and

retaining means on each of said wedge shaped gaskets cooperating with retaining means on each respective flange, whereby two panes can be held in said grooves by said cover and wedge shaped gaskets in a single sash.

2. The sash as claimed in claim **1,** wherein said pair of vertical pieces and said lower horizontal cross-piece each have a pair of spaced apart parallel exterior flanges integral on their outer surface opposite the flanges forming said front groove.

3. The sash as claimed in claim **2,** including in combination a frame for the window comprising:

an upper frame cross-piece;

a lower frame cross-piece;

a pair of vertical frame pieces joined at their ends to the ends of said frame cross-pieces, said vertical frame pieces each having two parallel frame flanges on their inner surface in alignment with said pair of exterior flanges on said vertical pieces of said sash when said sash is in the closed position with respect to said frame.

4. The sash as claimed in claim **3,** wherein said upper and lower frame cross-pieces are inclined downwardly from their rear side to their front side.

5. The sash as claimed in claim **3,** including:

a horizontal pivot between said frame and said sash;

ventilation means in said forward groove of said lower horizontal cross-piece to ventilate the chamber formed between said front and rear grooves by the panes;

four projecting members having a forward facing weather strip on one side for sealing said sash to said frame when said sash is in the closed position, two of said projecting members being fastened to said vertical pieces of said sash above said horizontal pivot to abut said weather strip against the rear flange of said two parallel frame flanges, and the other two of said projecting members being fastened to said vertical frame pieces below said pivot to abut said weather strip against the rear flange of said pair of exterior flanges on said vertical pieces of said sash.

6. The sash as claimed in claim **5,** wherein said upper frame cross-piece has a downward projecting flange in the same plane as said rear flange of said two parallel frame flanges; and

said lower frame cross-piece and said upper horizontal cross-piece of said sash each have a C-shaped member projecting upward and supporting forward

facing horizontal weather strips in abutment against the rear flange of said pair of exterior flanges on said lower horizontal cross-piece of said sash and against said downward projecting flange on said upper frame cross-piece, whereby the horizontal and vertical pieces of said sash are sealed when said sash is in said closed position.

7. A horizontally pivotable double-glazed window sash and frame comprising:

an upper horizontal cross-piece;

a lower horizontal cross-piece;

a pair of vertical pieces joined at their ends to the ends of said horizontal cross-pieces to form the sides of the sash, each of said pieces having four integral parallel spaced apart flanges on their inner surface forming a front groove and a rear groove to receive the edges of two panes, said two grooves being spaced from each other to form a central U channel in said sash between an adjacent flange of each of said grooves;

a resilient inverted U-shaped cover gasket spanning said central U channel in said sash, each side of said U-shaped gasket extending within a respective one of said front and rear grooves against said adjacent flange;

retaining means on said U-shaped cover gasket cooperating with mating retaining rings on said adjacent flanges to hold said U-shaped cover gasket in place;

a pair of separate resilient wedge shaped gaskets, each of said wedge shaped gaskets extending within a respective one of said grooves against the flange facing said adjacent flange;

retaining means on each of said wedge shaped gaskets cooperating with retaining means on each respective flange, whereby two panes can be held in said grooves by said cover and wedge shaped gaskets in a single sash;

a pair of spaced apart parallel exterior flanges integral with the outer surfaces of said pair of vertical pieces and said lower horizontal cross-piece and located opposite the flanges forming said front groove;

a frame encompassing the sash comprising an upper frame cross-piece, a lower frame cross-piece, and a pair of vertical frame pieces joined at their ends to the ends of said frame cross-pieces, said vertical frame pieces each having two parallel frame flanges on their inner surface in alignment with said pair of exterior flanges on said vertical pieces of said sash when said sash is in the closed position with respect to said frame;

a horizontal pivot between said frame and said sash;

ventilation means in said forward groove of said lower horizontal cross-piece to ventilate the chamber formed between said front and rear grooves by the panes; and

four projecting members having a forward facing weather strip on one side for sealing said sash to said frame when said sash is in the closed position, two of said projecting members being fastened to said vertical pieces of said sash above said horizontal pivot to abut said weather strip against the rear flange of said two parallel frame flanges, and the other two of said projecting members being fastened to said vertical frame pieces below said pivot to abut said weather strip against the rear flange of said pair of exterior flanges on said vertical pieces of said sash;

a downward projecting flange on said upper frame cross-piece in the same plane as said rear flange of said two parallel frame flanges; and

C-shaped member projecting upward from said lower frame cross-piece and said upper horizontal cross-piece of said sash and supporting forward facing horizontal weather strips in abutment against the rear flange of said pair of exterior flanges on said lower horizontal cross-piece of said sash and against said downward projecting flange on said upper frame cross-piece, whereby the horizontal and vertical pieces of said sash are sealed when said sash is in said closed position.

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