

IMPROVED LOUVRE CLIP ASSEMBLY

FIELD OF THE INVENTION

The present invention relates to a louvre clip assembly, in particular an
5 improved louvre clip assembly directed to reducing fluid penetration.

BACKGROUND TO THE INVENTION

The following discussion of the background to the invention is intended to
facilitate an understanding of the present invention. However, it should be
10 appreciated that the discussion is not an acknowledgment or admission that any
of the material referred to was published, known or part of the common general
knowledge in any jurisdiction as at the priority date of the application.

A louvre window typically comprises a plurality of window panes in the
form of blades, where each blade is held by rotatable clips at both ends. The
15 louvre window is activated by an operating mechanism to open and close the
plurality of blades and their clips with a constant locking force. When closed, the
blades are locked with a handle which activate an off-centre toggle bar, the off-
centre toggle bar then exerts a constant locking force such that the overlapping
blades have sufficient blade to blade contact pressure to resist external wind
20 pressure and prevent air/water infiltration.

The blades may be in a horizontal or vertical orientation depending on the
application. The blades can be made from glass, metal, wood, plastic or other
suitable material depending on the desired application. It may not be practical to
drill holes into the blade at times, for example in glass blades – therefore, the
25 rotatable clips are usually provided with a longitudinal recess which receives
and engages the blade. Blades usually overlap when the louvre window is
closed, where a portion of an upper blade overlaps a portion of a lower blade,
when the blades are in a horizontal orientation.

The rotatable clips may be moulded plastic, metal or a composite material
30 comprising plastic and metal, and are usually formed with internal voids or
chambers to reduce weight and for better moulding conditions. Moulded plastic

clips generally perform better than metal clips because of the flexibility of the plastic clips along its perimeter to produce a sealing contact against the channel frame when closed, which generally prevents water/air infiltration. The clips are also usually configured to overlap to seal against water/air, where an end portion of an upper clip overlaps an end portion of a lower clip.

Several clip designs have attempted to prevent water/air penetration between the joints of the clips when the louvre window is closed. However due to pressure differential between the exterior and interior sides of the louvre window, there will still be water ingress and/or air penetration. This is exacerbated during storm conditions.

GB 2062843 A discloses louvre end clips which are provided with resilient flaps at each end of each clip which create a seal against water/air when the clips are in a closed position. Despite the seal, water/air will still penetrate due to the pressure differential describe above, especially during hard weather conditions.

AU 2009212763 discloses a louvre window with clips that has overlapping shrouds at both sides of a longitudinal recess of each clip and a common chamber/channel to allow a common drainage along the plurality of clips when in closed position. The overlapping shroud construction cannot be considered a contact seal as there is a small space in between the shroud and its corresponding surface. This small space is to ensure constant blade-to-blade contact pressure effected by the toggle bar and the handle of the operating mechanism. Any contact between the shroud and its corresponding surface will hinder the blade-to-blade contact pressure. As a result of this gap, the shrouds do not work as an effective air-tight seal. To overcome this shortcoming against water penetration, large openings at both ends of each clip and at both sides of the longitudinal recess are created to form a common drainage chamber through the plurality of clips when closed. Large openings at both ends of the clips are unsightly when the clips are in open position.

US 2012/0025041 A1 discloses a sealing member to stop or minimise water penetration through the bottom edge and side edge of the overlapping

glass panels in relation to the clips. The direct contact of the blade to the vertical seal of the sealing member run counter to the locking force on the blade-to-blade contact pressure. Given the blade length and its flatness tolerances, it is not practical to assume that the locking force can maintain a direct contact seal between the blade and the sealing member and at the same time maintain the blade-to-blade contact pressure.

Therefore there is a need to prevent or minimize water/air penetration at the adjoining ends of the louvre clips when the louvre window is in a closed position. There further exists a need to maintain blade-to-blade contact pressure when the louvre window is in a closed position.

SUMMARY OF THE INVENTION

Throughout this document, unless otherwise indicated to the contrary, the terms "comprising", "consisting of", and the like, are to be construed as non-exhaustive, or in other words, as meaning "including, but not limited to".

The abovementioned need is met at least in part and an improvement in the art is made by a louvre end clip assembly in accordance with this invention.

In accordance to a first aspect of the present invention, there is a louvre end clip assembly comprising a plurality of clips, each clip adapted to receive a blade, each clip comprising an interior-facing side and an exterior-facing side, and a first end and a second end, wherein the first end of one clip and the second end of another clip are adapted to associate to form a pressure equalisation chamber between the first end of the one clip and the second end of the another clip, the pressure equalisation chamber comprising a first fluid-tight seal formed by a first sealing member at the interior-facing sides of the clips, and an opening at the exterior-facing sides of the clips, and wherein the pressure equalisation chamber resists fluid ingress and permits fluid drainage through the opening. The fact that a pressure equalisation chamber is created via the association of the ends of two clips prevents fluid (e.g. air and/or water) from penetrating the overlapping portions of the clip by forming a near-zero fluid differential between for example the air in the pressure equalisation chamber

and the air on the exterior side of the clips. Air in the pressure equalisation chamber weakens any incoming air and/or pushes back on incoming air pressure, thereby preventing fluids driven by such incoming air, from entering and penetrating. The openings on the exterior-facing sides of the clips also
5 allow any fluids to drain out should any small amount of fluids enter into the pressure equalisation chamber.

Preferably, the first sealing member is arranged at the first or second end of each clip, and even more preferably, the first sealing member is arranged at the second end of each clip.

10 Preferably, the first sealing member is a sweep seal.

Preferably, the first fluid-tight seal is located above the opening.

Preferably, each clip is adapted to receive the blade along a longitudinal recess, the longitudinal recess having a second sealing member, and wherein the second sealing member is adapted to form a second fluid-tight seal when
15 the blade is received along the longitudinal recess.

Preferably, the second sealing member is a fin seal.

Preferably, an edge of the blade is spaced by a gap from a side of the longitudinal recess, and wherein a portion at the first end of the clip comprises a barrier adapted to bridge the gap and prevent fluids from entering the gap.

20 Preferably, at least one edge of the barrier is spaced from a surface of another clip or from a surface of a blade of another clip, or from both a surface and a surface of a blade of another clip.

Preferably, the pressure equalisation chamber comprises two or more compartments in fluid connection with each other. It is preferred that the compartments are separated by at least one rib and preferably, the at least one
25 rib extends from a portion of the second end of each clip.

Preferably, a surface of a portion of the first end of each clip is adapted to drain fluids out through the opening.

Preferably, the louvre end clip assembly further comprises a plurality of
30 rotatable bosses, each rotatable boss having a central axis, wherein each

rotatable boss is adapted to mate with each clip and adapted to engage a portion of each blade.

Preferably, each rotatable boss is further adapted to mate with a bearing, the bearing operable to rotate the rotatable boss, the clip and the blade about
5 the central axis.

Preferably, each rotatable boss is of a harder material relative to the material of each clip.

Preferably, each bearing is of a harder material relative to the material of each rotatable boss. It is preferred that each bearing is constructed from metal
10 or hard engineering plastic. Preferably, each bearing comprises attachments integral to the bearing.

Preferably, the assembly further comprises an operating mechanism operable to simultaneously rotate the plurality of rotatable bosses, clips and blades about their respective central axes.

15 In accordance to a second aspect of the present invention, there is a louvre window assembly kit comprising a louvre end clip assembly of the first aspect of the present invention and a plurality of blades.

BRIEF DESCRIPTION OF THE DRAWINGS

20 The invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 provides a perspective view of a louvre window of the present invention in a fully closed position.

Figure 2 provides a perspective view of a louvre window of the present
25 invention in a partially open position.

Figure 3 provides a perspective view of half of a louvre window of the present invention in a fully closed position.

Figure 4 provides a front view of a louvre end clip assembly with a frame of the present invention in a partially open position.

30 Figure 5 provides a close-up exterior perspective view of the ends of two louvre end clips and blades of the present invention in a fully closed position.

Figure 6 provides a close-up interior perspective view of the ends of two louvre end clips and blades of the present invention in a fully closed position.

Figure 7 provides a close-up perspective view of the second end of a louvre end clip and blade of the present invention.

5 Figure 8 provides a close-up perspective view of the first end of a louvre end clip and blade of the present invention.

Figure 9 provides a close-up front cross-sectional view of the ends of two louvre end clips and blades of the present invention in a fully closed position.

10 Figure 10 provides a close-up exploded rear perspective view of a rotatable mechanism of the present invention.

Figure 11 provides a close-up exploded front perspective view of a rotatable mechanism of the present invention.

Figure 12 provides a cross-sectional view of a rotatable mechanism of the present invention, viewed from one end to the other end of a louvre end clip.

15 Figure 13A and 13B provide rear views of a louvre end clip assembly with a frame of the present invention in a fully closed and partially open position.

Other arrangements of the invention are possible and, consequently, the accompanying drawings are not to be understood as superseding the generality of the preceding description of the invention.

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PREFERRED EMBODIMENTS OF THE INVENTION

Particular embodiments of the present invention will now be described with reference to the accompany drawings. The terminology used herein is for the purpose of describing particular embodiments only and is not intended to limit the scope of the present invention. Other definitions for selected terms used
25 herein may be found within the detailed description of the invention and apply throughout the description. Additionally, unless defined otherwise, all technical and scientific terms used herein have the same meanings as commonly understood by one of ordinary skill in the art to which this invention belongs.
30 Where possible, the same reference numerals are used throughout the figures for clarity and consistency.

The present invention will be described with respect to horizontally orientated blades, in that each end clip has a central axis perpendicular to its length (the length of each clip extends from one end of each clip to the other end), the central axis being substantially parallel to a ground surface. Therefore, the terms "upper" and "lower" used throughout the specification will be understood by a skilled person to refer to how far an article is placed relative to another, with respect to a ground surface, for example, an upper article will be further away from the ground surface compared to a lower article.

The term "pressure equalisation" used throughout the specification will be understood to mean a near-zero fluid (including but not limited to air) pressure differential between two or more portions, components, areas or sides, for example between the interior of the pressure equalisation chamber and the area on the exterior-facing side of the clips. A seal is considered "fluid-tight" when the seal substantially prevents fluids from penetrating or moving from one area to another. It will be understood that a fluid-tight seal will be air-tight and/or water-tight, i.e. the seal substantially prevents air, water and/or fluids from penetrating or moving from one portion, component, area or side, to another.

Throughout the specification, the terms "clip", "end clip" and "louvre end clips" are used interchangeably.

Throughout the specification, the terms "fluid" and "fluids" include but are not limited to water and air. Depending on the application, the terms "fluid" and "fluid" may include fluids other than water or air.

A skilled person will understand that hardness is a measure how a solid material resists various permanent shape change when subjected to a compressive force. Therefore when a material is considered harder relative to another material, the harder material will be more resistant to the permanent shape change compared to the other material when both are subjected to the same amount and type of compressive force.

Figures 1 to 3 provide a louvre window 10 in a fully closed (Figures 1 and 3) and a partially (Figure 2 and Figure 4) open position. It is appreciated by a skilled person that the state of partially 'open' may well be considered a partially

'closed' state, however, for purpose of consistency, the state is referred to as 'partially open' throughout the description. Louvre window 10 comprises two louvre end clip assemblies 100 arranged to receive a plurality of blades 150 (150a, 150b, 150c), frames 200 and rotatable mechanism 300. The louvre window 10 also includes an operating mechanism 400 (as better shown in Figures 13A and 13B) which operates the louvre window 10 between a closed position and an open position.

The operating mechanism 400 is located on one louvre end clip assembly 100 as shown in Figures 1 and 2, however it is appreciated that the louvre window 10 can have more than one operating mechanism 400, such that each louvre end clip assembly 100 can have a corresponding operating mechanism 400 and/or that each louvre end clip assembly 100 can have one or more operating mechanism 400. While it is shown in Figures 1 and 2 that the louvre window 10 has three pairs of end clips 110 and three blades 150, it will be appreciated that the louvre window 10 of the present invention will have at least two pairs of end clips 110 and at least two blades 150. For example, louvre window 10 can have five pairs of louvre end clips 110 and five blades 150.

The blades 150 may be formed from glass, plastic, wood, metal or any other suitable material. Louvre end clips 110 are located at both ends of each blade 150 which is oriented in a horizontal position.

With reference to Figure 4, each end clip 110 comprises an external wall 130 having an exterior-facing (i.e. facing elements such as wind and rain) side 120, an inner wall 131 having an interior-facing side 121, and a recess 132 located therebetween for receiving a blade 150. The upper end clip 110a receives in its recess 132, a blade 150a while lower end clip 110b receives in its recess 132, a blade 150b. Each blade 150 is not fully received into the recess 132 of each end clip 110 and does not abut against the base (i.e. a side) of said recess 132 so as to provide certain mechanical tolerances when the louvre window 10 moves between a fully closed position and an open position. Accordingly, there exists a gap 133 (see Figure 7 and 8) between the end of each blade 150 and the base of recess 132. Materials used to construct end clip

110 include but are not limited to plastics and metals. Each end clip 110 has a first end portion 111 and a second end portion 112. The external wall 130 is in a vertically staggered position relative to the inner wall 131 such that at the first end portion 111, the end of the inner wall 131 is at a position higher than that of the external wall 130 when in a fully closed position. In this arrangement, the end clips 110 will have an overlapping configuration when they are in a fully closed position. In this overlapping configuration, a portion of the second end 112 of end clip 110a overlaps with a portion of the first end 111 of end clip 110b. In particular a portion of the external wall 130 of end clip 110a overlaps with a portion of the inner wall 131 of end clip 110b.

Figures 3 and 4 show that as the louvre window 10 moves from a fully closed position to a partially open position, the first end 111 of each end clip 110 moves towards an interior area 11 while the second end 112 of each end clip 110 moves towards an exterior area 12. The interior area 11 may be an interior of a building, while the exterior area 12 may be exposed to the elements such as wind and rain.

Shown clearer in Figures 6 and 9, blades 150 also overlap when the louvre window is in a fully closed position, where a lower edge 151a of blade 150a overlaps with an upper edge 151b of blade 150b to form a contact region 152, thereby forming a barrier against fluids from entering between the blades 150a, 150b.

In a fully closed position as shown in Figure 5, the second end 112 of end clip 110a and the first end 111 of end clip 110b associate, whereby a portion of the second end 112 of end clip 110a overlaps with a portion of the first end 111 of end clip 110b and whereby blade 150a overlaps with blade 150b to form the contact region 152. Throughout the specification, the terms “associate” and “association” refer to the coupling or bringing together of two portions, where such coupling or bringing together includes but is not limited to a temporary contact, connection or engagement between these two portions. The association of the second end 112 of end clip 110a and the first end 111 of end clip 110b forms a pressure equalisation chamber 116 and such association can

occur when the louvre end clip assembly 100 is in a fully closed position. The pressure equalisation chamber 116 comprises an opening 114, and a fluid barrier system which includes sweep seal 113 and fin seals 115. Pressure equalisation chamber 116 allows fluids (e.g. air) to move in and out under applied fluid (e.g. wind) pressure via opening 114. Sweep seal 113 is located on the interior-facing side 121 and seals the ends of the inner walls 131 of upper clip 110a and lower clip 110b while the opening 114 is located on the exterior-facing side 120 formed between the external walls 130 of upper clip 110 a and lower clip 110b. The sweep seal 113 and the fin seal 115 form an effective fluid barrier system, providing fluid-tight continuous planes over gaps and interfaces when the end clips 110 are in a fully closed position.

The sweep seal 113 extends from the second end 112 of the inner wall 131 of each end clip 110 (Figure 7). However, it will be appreciated that sweep seal 113 can instead extend from the first end 111 of the inner wall 131 of each end clip 110. The sweep seal 113 is a continuous fluid-tight seal which seals against the frame 200 via edge 113a, the interfaces between corresponding end clips 110 via face 113b and against the blade 150 via edge 113c. The profile shape of the sweep seal 113 coupled with the rotational closing action of the upper and lower clips 110a, 110b, form a light physical contact seal between end clips 110 without any hindrance to the blade-to-blade contact pressure at contact region 152 (as shown in Figure 9). The sweep seal 113 is flexible and such flexibility in sealing contact mitigates any flatness tolerance of the blades 150, thereby keeping the end clips 110 sealed without obstructing constant locking forces on the overlapping blade-to-blade contact pressure at contact region 152. It will be appreciated that another mechanical seal instead of sweep seal 113 may be used, so long as such mechanical seal can achieve an fluid-tight seal, for example, a brush or butterfly seal. The fin seal 115 extends from the base of the longitudinal recess 132 and seals the gap 133 between the base of the longitudinal recess 132 and end of the blade 150. More than one fin seal 115 may be located along the length of recess 132. Figure 9 shows a fin seal 115 at second end 112 of end clip 110a and a fin seal 115 at first end 111 of

end clip 110b, where the fin seals 115 are so located to form, together with sweep seal 113, the fluid barrier system of pressure equalisation chamber 116.

In Figure 9, air enters through the opening 114 but cannot exit the pressure equalisation chamber 116 because of the fluid barrier system. Likely movement of air entering pressure equalisation chamber 116 is referenced as 'A' in Figures 7 to 9. The air pressure in the pressure equalisation chamber 116 matches the air pressure at the exterior area 12, thereby resulting in near-zero air pressure differential between the pressure equalisation chamber 116 and the exterior area 12. This near-zero air pressure differential between the pressure equalisation chamber 116 and the exterior area 12 resists fluid ingress and prevents fluids from penetrating the overlapping portions of the end clips 110. The pressure equalisation chamber 116 comprising the opening 114 and the fluid barrier system (which comprises sweep seal 113 and fin seals 115), eliminates the positive or negative driving forces induced by wind pressure which can drive rainwater into the interior area 11 of the louvre window 10. Air in the pressure equalisation chamber 116, having no outlet due to the sweep seal 113 and fin seals 115, effectively forms a barrier against any incoming fluid (which includes but is not limited to air and water), the barrier operates to weaken the force of any incoming air and/or pushes back on incoming air pressure, thereby preventing water driven by such incoming air, from entering and penetrating. Even if a small amount of rainwater enters pressure equalisation chamber 116, opening 114 allows such rainwater to easily drain out.

With air as an example, as wind and air pressure is dynamic, the pressure equalisation chamber is divided into smaller compartments 116a, 116b by ribs 118 to counter varying wind and air pressure. Compartments 116a, 116b weaken the pressure of any air or wind entering the pressure equalisation chamber 116, thereby maintaining a near-zero air pressure differential with the external air. It will be appreciated that the pressure equalisation chamber 116 may be divided into two or more chambers 116a, 116b depending on the application.

Gravity is also used to drain out any fluids which have entered the pressure equalisation chamber 116. The sweep seal 113 of the fluid barrier system is generally located at a position higher than that of the opening 114. In this arrangement, gravity in addition to near-zero fluid pressure differential, drains out any fluids that have entered into pressure equalisation chamber 116. The first end 111 of external wall 130 is preferably sloped, i.e. angled from a horizontal axis, as shown in Figures 6 and 9, to also facilitate the draining via gravity, of some fluids which has managed to enter the pressure equalisation chamber 116. Draining by gravity is effective in the pressure equalisation chamber 116. A barrier (upstand member) 117 is further provided in the end clips 110 where said barrier 117 extends from the first end 111 of the external wall 130 of each end clip 110. The barrier 117 seals against a portion of the blade 150 and bridges the gap 133 (which is vulnerable to fluid ingress) formed between the base of the recess 132 and the end of the blade 150. Barrier 117 creates an obstacle for any fluids which has entered the pressure equalisation chamber 116 from entering the gap 133, where gravitational forces and weakened fluid pressure will not provide sufficient force for such fluids to move over barrier 117 into gap 133. Barrier 117 facilitates the draining via gravity, of fluids out through opening 114. In the fully closed position, corresponding surfaces of an opposing end clip 110 and the bottom edge 151a of a blade 150, stay clear of the front and top surfaces of the barrier 117 by a small gap (better shown in Figure 6). This small gap creates a smaller compartment. The bigger compartments formed between the barrier 117 and the fluid barrier system, provide another line of pressure equalisation chamber defence. This applies to the other compartments and chambers created by the ribs 118, the side edges of the barrier 117 and the pressure equalisation chamber 116 with the opening 114.

Turning now to Figures 10 to 12, the louvre window 10 includes a rotatable mechanism 300 for rotating the end clips 110 and blades 150 into open and closed positions. The rotatable mechanism 300 is coupled to the operating mechanism 400 which is partially shown in Figures 10 and 11. The rotatable

mechanism 300 may be located approximately midway along the length of each end clip 110. However depending on the application, the rotatable mechanism 300 may also be located anywhere along the length of each end clip 110, for example, the rotatable mechanism 300 may be located closer to the first end

5 111 of each end clip 110 such that when end clip assembly 100 is in a fully closed position, there is a greater moment about the rotatable mechanism 300 in each end clip 110, resulting from the fluid pressure in the exterior area 12 acting on the second end 112 of each end clip 110, thereby causing the end clip assembly 100 to be more firmly shut – in this configuration, a greater force will

10 be required to open the end clip assembly 100. The rotatable mechanism 300 comprises boss 310, bearing 311 and screw 312. The boss 310 and bearing 311 are sized and configured to comprise corresponding projections and recesses for engaging with one another such that they share a common axis B. Projections 321 on bearing 311 mate with apertures 322 on boss 310 while

15 projection 323 on boss 310 mates with aperture 324 on bearing 311. The bearing 311 is connected to operating bars 410, 410' of the operating mechanism 400 via attachments 412. Attachments may be integral with bearing 311. Movement of the operating bars 410, 410' in the direction of C and C' exerts a rotational force on bearing 311 which in turn drives the rotation of boss

20 310, end clip 110 and blade 150 about axis B. It will be appreciated that the attachments 412 may be projections from bearing 311 that actively engage components which they are intended to connect, for example operating bars 410, 410'. It will also be appreciated that the attachments 412 may be separate from bearing 311, and may be rivets or any other suitable attachments known in

25 the art. Fasteners may be used to secure the attachments 412. The screw 312, preferably a hi-lo screw, connects the boss 310 and bearing 311 to the back of end clip 110 along axis B via spigot 313. To facilitate the prevention of pull-out, the hole diameter of spigot 313 at the end clip 110 for receiving the screw 312 is undersized to create force feed effects between the end clip 110 and the boss

30 310, and between the boss 310 and the bearing 311 due to material expansion, when the screw 312 is driven into the hole. The end clip 110, boss 310 and the

bearing 311 are tightly connected together as one. The boss 310 and end clip 110 are configured to comprise corresponding projections and recesses for engaging with one another, where in Figures 10 and 11, they share common axis B. The boss 310 comprises a groove 314 and flanges 315 which mate with
5 a rear portion of the recess 132 (Figure 12). When a blade 150 is received within the recess 132 of an end clip 110, the groove 314 of boss 310 is forced open slightly where the flanges 315 are urged in a direction of D and D'. When the blade 150 is received in recess 132, boss 310 tightly engages the blade 150 via the rear portion of recess 132. However, depending on application and
10 construction of end clip 110, the boss 310 may directly engage the blade 150 where flanges 315 are in direct contact with a portion of the blade 150. Boss 310 is constructed of a material harder (preferably several times harder) relative to the material which is used to construct end clip 110. Boss 310 may be constructed from metal or hard engineering plastic. Typically end clips 110 are
15 made from softer plastic material which are preferable for better sealing against water and air. However, such end clips 110 being soft will result in the mating portion of these end clips 110 to the operating mechanism 400 to deform easily when subjected to certain forces. Over a prolonged period, soft moulded plastic end clips will yield overtime and result in the loss of the constant locking forces
20 on the blade-to-blade contact pressure. Therefore, it is preferable that the boss 310 is harder than the end clip 110 so that boss 310 can effectively hold and activate the blade 150 with sufficient bite engagement during rotation. The strong modulus strength of the boss 310 holding the blade 150 will increase the strength of the louvre end clip assembly 100 in action and effectively transfer
25 the locking forces from the operating mechanism 400 to the blade-to-blade contact, thereby resulting in better sealing against water between overlapping blades 150.

Bearing 311 is preferably constructed from a metal or hard engineering plastic which are strong and durable. It will be appreciated that the type of metal
30 or hard engineering plastic used to form bearing 311 will depend on the application of the present invention, and the skilled person will be able to select

the appropriate material, for example, the metal may cold-forged aluminium while the hard engineering plastic may be fibre reinforced acetal. In a configuration where attachments 412 are integral with bearing 311 and are also constructed from the same material as bearing 311, attachments 412 will be

5 resistant to damage resulting from deformative forces, e.g. shear force due to unintended rotation of the rotatable mechanism 300, for example, when end clip assembly 100 is in a fully closed position and a force acts on an end clip 110 in an attempt to rotate the end clip 110 to the open position. Bearing 311 is constructed of material preferably harder (preferably several times harder)

10 relative to the material which is used to construct boss 310 where boss 310 will act as an intermediate component which is capable of bridging the strength of bearing 311 to the blade 150. As the end clip 110 is not directly connected to the bearing 311, but rather via boss 310, the amount of wear and tear of end clip 110 is reduced because the difference in hardness between the boss 310

15 and end clip 110 will not be as great as the difference in hardness between bearing 311 and end clip 110. A skilled person will understand that if this difference is too great, the harder material will cause stress on the softer material, thereby increasing the amount of wear and tear. Further, having an intermediate component in the form of boss 310 allows for individual

20 replacement of end clips 110 when the boss 310 and/or end clip 110 become damaged, whereby a user can simply detach the end clip 110 and boss 310 from the bearing 311. If each end clip 110 is directly connected to a bearing 311, a user may have to replace the entire louvre clip assembly 100 if one end clip 110 becomes damaged.

25 Turning to Figures 13A and 13B, the operating mechanism 400 comprises two operating bars 410, 410', toggle bar 411 and an actuator in the form of handle 420. In Figure 13A, the handle 420 is in a locked position and the end clips 110 are in a fully closed position, while in Figure 13B, the handle 420 is in an unlocked position and the end clips 110 are in a partially open position. The

30 operating bars 410, 410' are connected via attachments 412, to the rotatable mechanism 300 of end clips 110 arranged along frame 200. The toggle bar 411

is pivotally connected at one end to operating bar 410 and pivotally connected at the other end to the handle 420. The handle 420 is pivotally connected to the operating bar 410 at a point which is different from that of the handle 420 and the toggle bar 411. In operation, the operating bars 410, 410' are activated by moving the handle 420 upwards (E) or downwards (E'). It will be appreciated that "upwards" and "downwards" are relative to the orientation of the louvre window assembly 100, for example if the louvre window assembly 100 is orientated in a horizontal position (i.e. the blades 150 are oriented in a vertical position), the handle 420 may move horizontally in a left and right direction.

10 In the locked position (Figure 13A), the handle 420 exerts a force on operating bar 410' and a force via toggle bar 411 on operating bar 410 which prevent operating bars 410, 410' from activating. When unlocked (Figure 13B), the toggle bar 411 no longer exerts a restraining force on the operating bars 410, 410' and the operating bars 410, 410' can activate. When the handle 410 is moved downwards (E'), operating bar 410 moves in the direction C and operating bar 410' moves in the direction C'. The movement in direction C, C' causes a rotation of rotatable mechanism 300 where bearing 311, boss 310, end clip 110 and blade 150 are rotated, thereby moving the louvre end clips 110 to an open position. Movement of the handle 420 in an opposite direction, i.e. upwards (E) will cause the operating bars 410, 410' to move in a direction opposite to that of directions C, C', thereby rotating the rotatable mechanism 300 to cause the end clips 110 to move into a closed position.

Operating mechanism 400 may be replaced by any other operating mechanisms known in the art, so long as the operating mechanism used is capable of rotating the rotatable mechanisms 300 about axis B. For example, Singapore patent application number 2013009949 discloses an operating and locking mechanism for a louvre assembly where the mechanism comprises a locking element coupled to link bars and locking bars, the link bars further coupled to operating bars which operate the movement of the louvre blades via blade mounting elements. In summary, movement of the locking bars in opposite directions causes the displacement of the locking element which in

turn causes the movement of the operating bars in opposite direction, thereby rotating the louvre blades and moving the louvre assembly into an open position.

It is to be understood that the above embodiments have been provided
5 only by way of exemplification of this invention, such as those detailed below, and that further modifications and improvements thereto, as would be apparent to persons skilled in the relevant art, are deemed to fall within the broad scope and ambit of the present invention described. In particular, the following additions and/or modifications can be made without departing from the scope of
10 the invention:

- The sweep seal 113 and fin seal 115 may be any other suitable mechanical seals depending on the application – these can include but are not limited to brush and butterfly seals.
- Sweep seal 113 may be located at the first end 111 or second end
15 112 of end clip 110, depending on the application and how the end clips 110 are arranged. It is possible that alternate end clips will not have sweep seals
- Seals may be unitary and form part of the end clips or are separate individual components which are attachable to the end
20 clips.
- Attachments 412 may be any suitable attachments known in the art.

Furthermore, although individual embodiments have been discussed it is to be understood that the invention covers combinations of the embodiments
25 that have been discussed as well.

The invention described herein may include one or more range of values (e.g. distance and temperature). A range of values will be understood to include all values within the range, including the values defining the range, and values adjacent to the range which lead to the same or substantially the same outcome
30 as the values immediately adjacent to that value which defines the boundary to the range.

Claims

1. A louvre end clip assembly comprising a plurality of clips, each clip adapted to receive a blade, each clip comprising:

An interior-facing side and an exterior-facing side; and

5 A first end and a second end;

Wherein the first end of one clip and the second end of another clip are adapted to associate to form a pressure equalisation chamber between the first end of the one clip and the second end of the another clip, the pressure equalisation chamber comprising a first fluid-tight seal formed by a first sealing
10 member at the interior-facing sides of the clips, and an opening at the exterior-facing sides of the clips, and wherein the pressure equalisation chamber resists fluid ingress and permits fluid drainage through the opening.

2. The louvre end clip assembly of claim 1, wherein the first sealing
15 member is arranged at the first or second end of each clip.

3. The louvre end clip assembly of claim 2, wherein the first sealing member is arranged at the second end of each clip.

20 4. The louvre end clip assembly of any one of the preceding claims, wherein the first sealing member is a sweep seal.

5. The louvre end clip assembly of any one of the preceding claims, wherein the first fluid-tight seal is located above the opening.
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6. The louvre end clip assembly of any one of the preceding claims, wherein each clip is adapted to receive the blade along a longitudinal recess, the longitudinal recess having a second sealing member, and wherein the second sealing member is adapted to form a second fluid-tight seal when the
30 blade is received along the longitudinal recess.

7. The louvre end clip assembly of claim 6, wherein the second sealing member is a fin seal.

8. The louvre end clip assembly of claim 6 or 7, wherein an edge of the blade is spaced by a gap from a side of the longitudinal recess, and wherein a portion at the first end of the clip comprises a barrier adapted to bridge the gap and prevent fluids from entering the gap.

9. The louvre clip assembly of claim 8, wherein at least one edge of the barrier is spaced from a surface of another clip or from a surface of a blade of another clip, or from both a surface and a surface of a blade of another clip.

10. The louvre end clip assembly of any one of the preceding claims, wherein the pressure equalisation chamber comprises two or more compartments in fluid connection with each other.

11. The louvre end clip assembly of claim 10, wherein the compartments are separated by at least one rib.

12. The louvre end clip assembly of claim 11, wherein the at least one rib extends from a portion of the second end of each clip.

13. The louvre end clip assembly of any one of the preceding claims, wherein a surface of a portion of the first end of each clip is adapted to drain fluids out through the opening.

14. The louvre end clip assembly according to any one of the preceding claims, the assembly further comprises a plurality of rotatable bosses, each rotatable boss having a central axis, wherein each rotatable boss is adapted to mate with each clip and adapted to engage a portion of each blade.

15. The louvre end clip assembly of claim 14, wherein each rotatable boss is further adapted to mate with a bearing, the bearing operable to rotate the rotatable boss, the clip and the blade about the central axis.

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16. The louvre clip assembly of claim 14 or 15, wherein each rotatable boss is of a harder material relative to the material of each clip.

17. The louvre clip assembly of claim 15 or 16, wherein each bearing
10 is of a harder material relative to the material of each rotatable boss.

18. The louvre clip assembly of claim 17, wherein each bearing is constructed from metal or hard engineering plastic.

19. The louvre clip assembly of claim 18, wherein each bearing
15 comprises attachments integral to the bearing.

20. The louvre clip assembly of any one of claims 14 to 19, the assembly further comprising an operating mechanism operable to
20 simultaneously rotate the plurality of rotatable bosses, clips and blades about their respective central axes.

21. A louvre window assembly kit comprising:
A louvre end clip assembly of any one of claims 1 to 20; and
25 A plurality of blades.