

INTERCLOSING PANEL SCREEN

The present invention relates to protective screens and, in particular, to a blade element for a protective screen that may be used as an openable roof or other openable protective structure where high sealing efficiency is
15 required from time to time.

It is to be understood that, in the context of the present specification, the term "protective screen" is to be considered as having a wide interpretation so as to include such screens as may be used to create a protective barrier against a wide range of climatic conditions and
10 unauthorised entry. Furthermore, such protective screens may have application as either horizontally arranged or vertically arranged climatic control louvres for residential, commercial or industrial buildings.

Typically, protective screens of the kind described above comprise a preferred roof structure of many industrial buildings, particularly those that
15 require a controlled level of outside air ventilation and the flexibility to shut off the internal working environment from climatic conditions when the need arises. Adequate sealing of the internal working environment, however, has proved difficult, and cumbersome opening and closing mechanisms have ensured that the overall cost in installation and
20 maintenance of such screens is high.

One known screen system comprises a plurality of interacting blade elements, each of which is connected to and responsive to the operation of a link rod. An operator may push or pull the link rod to simultaneously move each blade element and thereby open or close the screen. However,
25 the blade elements of such a screen are only lightly overlapped and there is no sealing of one blade element to the next.

More recently, a protective screen has been developed that, although having a primary use for protecting windows, may be used as an openable roof in an attempt to protect the interior of a building. Such a screen is described in Australian Patent No 655,367.

5 However, the blade elements disclosed in the aforementioned patent are not efficiently designed for operation as either a horizontally or vertically arranged roof screen, allowing some leakage of rain water through gaps that exist between adjacent blade elements. In addition, the blade elements of Australian Patent No 655,367 are not adapted to
10 withstand a large volume of rain water and so, if used as a horizontally arranged roof screen, a heavy or prolonged downpour of rain may cause a substantial amount of water to leak through the seals between the blade elements.

15 The object of the present invention is to overcome or substantially ameliorate the disadvantages of the prior art.

According to the invention there is provided a blade element adapted to interact with like blade elements so as to form an openable and closeable protective screen, said blade element comprising:-

20 a central tubular portion from which extend in generally opposite directions relative to a longitudinal axis of said central tubular portion a first wing element and a second wing element,

 each of the said first and second wing elements having a free end, the free end of the first wing element defining a seal carrying portion extending longitudinally therealong, and the free end of the second wing
25 element defining a seal engaging portion extending longitudinally therealong,

sealing means attached to and extending the length of the seal carrying portion,

the arrangement being such that the seal engaging portion is adapted to sealingly engage the said sealing means on an adjacent blade element when the protective screen is closed.

In one form of the invention, the free end of the first wing element is defined by a first U-shaped channel extending longitudinally therealong and having an opening facing a first direction, and the free end of the second wing element is defined by a second U-shaped channel extending longitudinally therealong and having an opening facing a second direction which is generally opposite to the first direction.

Preferably, the sealing means is attached to and extends the length of the first U-shaped channel.

It is preferred that the first and second directions are such that the sealing means engages sealingly within the second U-shaped channel of an adjacent blade element when the protective screen is closed.

In another form of the invention, a sealing means is also attached to and extends the length of the seal engaging portion, which is preferably the second U-shaped channel.

In this embodiment, it is preferred that the free end of the first wing element also defines a seal engaging portion extending longitudinally therealong and adjacent to the first U-shaped channel and that the free end of the second wing element also defines a second seal engaging portion extending longitudinally therealong and adjacent to the second U-shaped channel, whereby the said seal engaging portion of the first wing element of a first blade element is adapted to sealingly engage the sealing means attached to the second U-shaped channel of the second wing element of an

adjacent second blade element, and the said seal engaging portion of the second wing element of the said second blade element is adapted to sealingly engage the sealing means of the first U-shaped channel.

Preferably, the sealing means comprises a neoprene seal.

1) The present invention also provides an openable and closeable protective screen comprised of a plurality of blade elements as hereinbefore defined.

Preferably, each blade element is individually driven by a gear assembly, and the seal engaging portions are adapted to sealingly engage or receive the said sealing means by movement controlled by the gear assembly.

Preferably, the gear assembly is driven by a torque rod.

The torque rod may be driven by a manual crank or electric motor.

In order that the invention may be readily understood and put into practical effect, reference will be made to the accompanying drawings, in which:-

Fig. 1 is a cross-sectional view along the longitudinal axis of a blade element according to a first embodiment of the invention,

Fig. 2 is a cross-sectional view along the longitudinal axis of a blade element according to a second embodiment of the invention,

Fig. 3 is a cross-sectional view along the longitudinal axis of a blade element according to a third embodiment of the invention,

Fig. 4 is a cross-sectional view along the longitudinal axes of the free end of a first wing element and the free end of a second wing element of two adjacent blade elements of Fig. 3 when they are in a first closed position,

Fig. 5 is a cross-sectional view along the longitudinal axes of the

free end of a first wing element and the free end of a second wing element of two adjacent blade elements of Fig. 3 when they are in a second closed position after having been rotated 180° from the first closed position shown in Fig. 4,

Fig. 6 is an isometric view of a portion of a protective screen adapted for use as an openable roof which incorporates a plurality of blade elements according to Fig. 1, and Fig. 7 is a sectional side view through a portion of the openable roof of Fig. 6, with the blade elements in the open position.

The blade element 10 of Fig. 1, which may be extruded of aluminium, has a central tubular portion 11 and two oppositely extending first and second wing elements 12 and 13. The central tubular portion 11 has, in this instance, a cross-sectional shape in the form of an offset "eye". An internal member 14 extends generally longitudinally through the central tubular portion 11 so as to integrally interconnect and reinforce opposed sides 15 and 16 of the central tubular portion 11 against crushing or bending.

The wing elements 12 and 13 are complementarily profiled and form continuations of opposed sides of the central tubular portion 11.

Extending longitudinally along the free end of the first wing element 12 is a seal carrying portion which, in this embodiment, comprises an integrally formed U-shaped channel 17 having an opening facing a first direction as shown by arrow A. Attached along the length of the channel 17 is a neoprene or other polymeric sealing means 18, which fixedly engages within the opening and covers at least the upper parts of the channel 17 as shown.

Extending longitudinally along the free end of the second wing portion 13 is a seal engaging portion, which, in this embodiment, comprises an integrally formed U-shaped channel 19 having an opening facing a second direction as shown by arrow B, the said second direction being generally opposite to the first direction.

The relative dimensions of the inner walls of channel 19 and the outer surface of the sealing means 18, when attached to channel 17, are sufficient for a tight fit of the sealing means 18 within channel 19 when the protective screen is closed. The resultant seal is water proof and resistant to a wide range of climatic conditions when the closed protective screen is arranged horizontally or vertically.

The blade element 10, when used as a component of a horizontally arranged openable roof 22, such as that shown in part in Fig. 6, is orientated as shown in Fig. 1 with the wing element 12 forming a relatively deep catchment 20, and the wing element 13 combining with a portion of side 15 of the central tubular portion 11 to form a smaller catchment 21. A large volume of rain water may collect in catchment 20 in the event of torrential rain storms and then run off under gravity before the water level in the catchment 20 reaches the height at which one blade element is sealingly engaged to the next.

Although less rain water can be collected in catchment 21, the wing element 13 is so formed that excess rain water will spill over the central tubular portion 11 and collect in the larger catchment 20. In this way, about 75% of the width of the blade element 10 is able to carry water.

The water carrying capacity of the blade element 10 is therefore greatly enhanced over prior art systems.

The openable roof 22, shown in part in Fig. 6, has a plurality of blade elements 10 orientated in the closed position for protecting the interior of a building (not shown) over which the roof 22 is supported. Each of the blade elements 10 is rotatably supported at both ends thereof within casings 23 and 24 that extend along the length of the roof 22. At least one of the casings 23, 24 house therewithin gears and a torque rod (not shown) for controlling the opening and closing of the roof.

Fig. 7 shows the openable roof 22 with the blade elements 10 in their open position. The blade elements 10 are able to rotate in synchrony with respect to the casings (only casing 24 shown) and are spaced apart such that there is a tight fit of the sealing means 18 of one blade element within channel 19 of an adjacent blade element when the blade elements are rotated to their closed positions. The dotted outline shown in Fig. 7 shows the path followed by each of the sealing means 18 and channels 19.

The blade element 25 of Fig. 2 has some similar features to the blade element 10 of Fig. 1. Similar features are identified in Fig. 2 with the original numerals used in Fig. 1. Notably, however, the shape of the wing elements 12a and 13a and the orientation of the central tubular portion 11a are different.

The wing element 12a has a deeper and more voluminous catchment 20a than wing element 12, while wing element 13a has very little catchment. The sealing arrangement between adjacent blade elements 25 is similar to that for blade elements 10 of Fig. 1.

The blade element 30 of Fig. 3 also has some similar features to the blade element 10 of Fig. 1. Similar features are identified in Fig. 3 with the original numerals used in Fig. 1. Notably, the shape of the wing elements

12b and 13b and the sealing channel arrangements at the free ends of both the first and second wing elements are different.

The wing element 12b has a shallower catchment 20b than wing element 12, while wing element 13b has very little catchment. The blade element 30 is most suited for use in a vertically arranged screen, say for a window or for a vertically arranged roof louvre.

As with the blade elements 10 and 25 of Figs. 1 and 2, a neoprene sealing means 18b is attached to and extends the length of the seal carrying U-shaped channel portion 17b at the free end of the first wing element 12b. However, unlike the blade elements 10 and 25, the seal engaging U-shaped channel portion 19b has a neoprene sealing means 32 attached thereto and extending the length thereof and, so, serves as a seal carrying portion.

Furthermore, the free end of the first wing element 12b has an integrally formed spike member 34 extending longitudinally therealong and adjacent to the seal carrying U-shaped channel portion 17b so as to define a seal engaging portion 36. The free end of the second wing element 13b also has an integrally formed spike member 38 extending longitudinally therealong and adjacent to the U-shaped channel portion 19b, thereby defining a second seal engaging portion 40.

When a protective screen having the blade elements 30 is closed, as shown in Fig. 4, the seal engaging portion 36 of the first wing element 12b sealingly engages or receives the neoprene sealing means 32 which is attached to the U-shaped channel portion 19b of the second wing element 13b of an adjacent blade element 30, and the seal engaging portion 40 of the second wing element 13b sealingly engages or receives the neoprene

sealing means 18b which is attached to the U-shaped channel portion 17b of the first wing element 12b of an adjacent blade element 30.

As shown in Fig. 3, the blade element 30 also has seal engaging portions 42 and 44 at respectively opposed sides of each of the wing elements to the seal engaging portions 36 and 40, formed by the integrally curved construction at the free ends of the wing elements 12b and 13b.

As shown in Fig. 5, the seal engaging portions 42 and 44 enable the blade elements 30 to be closed and still form a tight seal therebetween when the blade elements 30 have all been rotated a full 180° from their other closing position as shown in Fig. 4.

The pivotal mounting of the blade element 10, 25 or 30 and the control of its movement can be achieved in a number of different ways.

In one of many approaches, the blade elements may have their movement controlled by a series of gears that are driven by a torque rod. A motor or manual crank may drive the torque rod. A preferred blade element movement control system is disclosed in Australian Patent Specification No 65,812/96 which is incorporated herein by reference.

The gears enable tension to be created and maintained between adjoining wing elements of adjacent blade elements. When all the blade elements are cranked tightly together, any load is distributed over a number of blade elements and the structural integrity of the resultant screen is increased. The strength of the screen is enhanced by the configuration of the wing elements as, when they lock together, they apply a spring tension against their adjoining wing element, and this is particularly advantageous for horizontally arranged roof screens.

Various modifications may be made in details of design and construction without departing from the scope or ambit of the invention.



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A blade element adapted to interact with like blade elements so as to form an openable and closeable protective screen, said blade element comprising:-

a central tubular portion from which extend in generally opposite directions relative to a longitudinal axis of said central tubular portion a first wing element and a second wing element,

each of the said first and second wing elements having a free end, the free end of the first wing element defining a seal carrying portion extending longitudinally therealong, and the free end of the second wing element defining a seal engaging portion extending longitudinally therealong,

sealing means attached to and extending the length of the seal carrying portion,

the arrangement being such that the seal engaging portion is adapted to sealingly engage the said sealing means on an adjacent blade element when the protective screen is closed.

2. The blade element of claim 1 wherein the free end of the first wing element is defined by a first U-shaped channel extending longitudinally therealong and having an opening facing a first direction, and the free end of the second wing element is defined by a second U-shaped channel extending longitudinally therealong and having an opening facing a second direction which is generally opposite to the first direction.





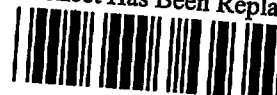
3. The blade element of claim 2 wherein the sealing means is attached to and extends the length of the first U-shaped channel.
4. The blade element of claim 2 or claim 3 wherein the first and second directions are such that the sealing means engages sealingly within the second U-shaped channel of an adjacent blade element when the protective screen is closed.
5. The blade element of any one of claims 1 to 4 wherein a sealing means is also attached to and extends the length of the seal engaging portion.
6. The blade element of claim 5 wherein the seal engaging portion is the second U-shaped channel.
7. The blade element of claim 6 wherein the free end of the first wing element also defines a seal engaging portion extending longitudinally therealong and adjacent to the first U-shaped channel and the free end of the second wing element also defines a second seal engaging portion extending longitudinally therealong and adjacent to the second U-shaped channel, whereby the said seal engaging portion of the first wing element of a first blade element is adapted to sealingly engage the sealing means attached to the second U-shaped channel of the second wing element of an adjacent second blade element, and the said seal engaging portion of the second wing element of the said second blade element is adapted to sealingly engage the sealing means of the first U-shaped channel.





8. The blade element of any one of claims 1 to 7 wherein the sealing means comprises a neoprene seal.
9. The blade element of any one of claims 1 to 8 wherein the first and second wing elements are complementarily profiled and form continuations of opposed sides of the central tubular portion.
10. The blade element of any one of claims 1 to 9 wherein a first one of the wing elements forms a relatively deep catchment for the collection and run off of rain water.
11. The blade element of claim 10 wherein the second one of the wing elements forms a smaller catchment than that of the first one of the wing elements.
12. The blade element of claim 11 wherein the second one of the wing elements is so formed that any excess rain water collected within its catchment will spill over the central tubular portion and collect in the catchment of the first one of the wing elements.
13. An openable and closeable protective screen comprising a plurality of the blade elements of any one of claims 1 to 12.
14. The protective screen of claim 13 wherein each blade element is individually driven by a gear assembly, and the seal engaging portions are adapted to sealingly engage or receive the said sealing means by movement controlled by the gear assembly.

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15. The protective screen of claim 14 wherein the gear assembly is driven by a torque rod.

16. The protective screen of claim 15 wherein the torque rod is driven by a manual crank or electric motor.

17. A blade element substantially as hereinbefore described with reference to the accompanying drawings.

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