

A FIRE BARRIER FOR WINDOW, DOOR, OR OTHER OPENINGS

Field of the invention

This invention relates to a fire barrier to cover an opening in the event of a fire.

Background to the invention

Fire can spread extremely quickly if it is not properly contained. It is therefore desirable that openings such as doors or windows in buildings or vehicles are able to prevent flames passing through them. Many international building regulations require doors in areas such as stairwells to meet particular standards of fire resistance. A fire door must be capable of resisting the effects of a standard fire test for a stipulated period of time, usually 30 or 60 minutes. One of the most common tests used to measure the fire resistance of a door is known as British Standard (BS) 476 Part 22, which refers to a method of measuring the fire resistance of non-load bearing elements of construction.

It is common to include a window in a fire door to allow a person to see whether there is fire behind the door without opening it. Because normal or laminated glass can break at high temperature, fire-rated glass is often used to satisfy building regulations. Fire-rated glass is more expensive than normal or laminated glass but not necessarily more resistant to damage caused by impact. Consequently, the use of fire-rated glass in a fire door can significantly increase the costs of manufacturing and maintaining the door.

As an alternative to using fire-rated glass in the window of a fire door, it is known in the art to use normal or laminated glass and install a mechanism that will release a fire barrier over the window in the event of a fire. However, it is desirable for such a fire door to meet the one hour fire rating requirement under BS 476 Part 22.

WO 03/106800 describes a mechanism in which a heat and/or smoke detector releases a sheet-metal element from a horizontal position above a window allowing the sheet-metal element to swing down by its own weight to a vertical position covering the window. In a preferred embodiment, the sheet-metal element consists of two sections which are pivotally connected by means of a hook on one of the sections. In this preferred embodiment, the two sections are folded on top of each other when the sheet-metal element is in the horizontal position and are unfolded when the sheet-metal element is in the vertical position.

However, the mechanism described in this patent requires a large amount of horizontal space in which to operate and may cause injury to a person near the window when the sheet-metal element is released.

Singapore Patent No. 111020 and Singapore Patent No. 111993 both describe a mechanism in which a number of rectangular barrier elements are released from above a window in the event of a fire. Each barrier element is designed to slide a predetermined distance down runners on either side of the window. This is done by tabs on the barrier elements resting on steps in the runners. Once all of the barrier elements have been released, the window is covered by the barrier elements.

In Singapore Patent No. 111020 there is some overlap between the released barrier elements, whereas in Singapore Patent No. 111993 there is no overlap between the released barrier elements.

While the mechanisms described in both of these patents are suitable for use where there is limited horizontal space, flames may be able to pass between the barrier elements once they have been released.

It is an object of the invention to provide a fire barrier for use with openings that will overcome the abovementioned difficulties and/or disadvantages.

Summary of the invention

According to a first aspect of the invention, there is provided a fire barrier for use over an opening formed in a door, window or wall structure, comprising at least two barrier elements and a means for releasing the barrier elements in the event of a fire, and wherein each said barrier element slides with respect to one another and includes at least one catch means adapted to engage a complementary catch means on the opening or an adjacent barrier element.

In a preferred embodiment, the catch means may project from the barrier element at an acute angle.

Expediently, the barrier element may be rectangular, having a front face, a rear face and perimeter edges defining a top, bottom, left, and right edge.

The catch means may project from the top edge of the barrier element at an acute angle to the back of the barrier element. A catch means may project from the bottom edge of the barrier element at an acute angle to the front of the barrier element. Preferably the catch means may extend along the entire top and bottom edges of the barrier element.

In one embodiment, one of the barrier elements may include an L-shaped in cross section projection from the bottom edge of the barrier element. Preferably the L-shaped projection may extend along the entire bottom edge of the barrier element.

One of the barrier elements may include at least one hole, preferably in a tab projecting from the top edge of the barrier element.

The opening includes a retaining bracket adjacent to the top side and the bottom side of the opening.

The opening includes a guide bracket adjacent to each of the left and right sides of the opening. Preferably each bracket may be Z-shaped in cross section. Preferably one flange of each bracket may be fastened and/or welded into the structure into which the opening is formed.

In one embodiment, there is at least one spring element mounted on a flange of the guide bracket to urge the catch means of two barrier elements to engage.

Expediently, the means for releasing the barrier elements in the event of a fire may be triggered by heat and/or smoke or by the activation of a fire alarm. The means may comprise a retractable pin. Preferably the retractable pin is urged into disengagement by a spring which is released when a trigger melts due to high temperature. Preferably one end of the retractable pin may be contained in a housing attached to the structure into which the opening is formed.

In one embodiment, the barrier elements are mounted above the opening. Preferably the barrier elements are supported by the L-shaped projection of one of the barrier elements. Preferably one end of the retractable pin or rod may be releasably attached to the barrier element with the L-shaped projection.

The fire barrier may include two, three or more barrier elements. Preferably the barrier includes three barrier elements.

Detailed description of the invention

A preferred embodiment of a fire barrier will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a perspective side view of an unreleased fire barrier, the three barrier elements of the barrier yet to be released from above the opening.

Figure 2 is a cross-section through the unreleased fire barrier of Figure 1 at axis B:B.

Figure 3 is a perspective side view of a released fire barrier, the three barrier elements of the barrier having been released from above the opening.

Figure 4 is a cross-section through the released fire barrier of Figure 3 at axis A:A.

Figure 5 is a perspective side view of two interconnected barrier elements.

Figure 6 is a perspective side view of two separated barrier elements.

Figure 7 is a perspective side view of three interconnected barrier elements.

Figure 8 is a perspective side view of three separated barrier elements.

Figure 9 is a perspective side view of a pair of guide brackets.

The fire barrier 10 of the present invention is designed to, in use, block off a usually glazed window opening as found, for example, in an elevator door, or alternatively any standard window, door or duct opening as found in fabricated structures such as buildings, ships and the like to prevent the ingress of flames.

The fire barrier 10 may contain two or more barrier elements 11. An advantage of using more than one barrier element 11 is that the fire barrier 10 can be more compact when not in use. This is because the barrier elements 11 can overlap one

another causing them to take up less space enabling the barrier 10 to be mounted above the opening.

The barrier elements 11 are of a suitable size to suit the size of the opening. In the preferred embodiment, the barrier elements 11 are rectangular with a thickness of approximately 1 mm.

The barrier elements 11 may be made out of any suitable fire resistant material. In the preferred embodiment, the barrier elements 11 are made out of materials known in the United Kingdom and other countries as class 'O' materials, such as, metal and metal alloys including steel. The material used enables the fire barrier 10 to meet the one hour fire rating requirement under BS 476 Part 22.

Each barrier element 11 includes at least one catch means 12, adapted to engage a complementary catch means 13 mounted on the opening (catch means 13a) or an adjacent barrier element (catch means 13b). In a preferred embodiment, the catch means may project from the barrier element at an acute angle.

There are three different types of barrier element 11. Referring to Figure 8 element 11a in which catch means 12 is slightly larger as shown as 12a in Figures 4, 5 and 6. This element is the uppermost (back) position. Element 11b is an optional intermediate having a downwardly inclined top catch means 12 and an upwardly inclined bottom catch means 13. Element 11c has a downwardly inclined top catch means 12 and the bottom includes an L- shaped in cross section portion 14 which in use supports the upper and intermediate elements when in the nested position as shown in Figure 2.

Three barrier elements 11 with catch means 12 or 13 can be seen engaged in Figure 7 and separated in Figure 8. Two barrier elements 11 can be seen engaged in Figure 5 and separated in Figure 6.

The catch means 13 preferably extend the whole length of the elements 11, are designed to prevent flames from passing between the barrier elements 11 as well as assist in constructing the fire barrier 10.

The opening is surrounded at the top by retaining bracket 18 and at the bottom by retaining bracket 19. The opening is surrounded on the left and right side by Z-shaped in cross section guide brackets 20 to guide and support the barrier elements 11 when they are released as shown more clearly in Figure 1.

Release means 15 are provided for releasing the barrier elements 11 in the event of a fire. Release means 15 may be triggered by heat and/or smoke or by the activation of a fire alarm. In the preferred embodiment, means 15 may comprise a base plate 17, a low temperature alloy trigger (not shown), a retractable pin 16 and a spring (not shown). When the temperature of the surrounding exceeds 70 degrees centigrade, the release means activates. The low temperature alloy trigger will melt causing the spring to force its way inwards retracting the pin thereby releasing the barriers elements 11 which drop with gravity.

Figures 1 and 2 show an unreleased fire barrier 10 with barrier elements 11 mounted above the opening. The three barrier elements 11 seen in Figures 1 and 2 are held against the upper retaining bracket 18 by the pin of release means 15 for releasing the barrier elements in the event of a fire. The retractable pin 16 is inserted into an opening in a tab 21 on barrier element 11c. Barrier element 11c also has the L-shaped projection as previously described that supports the other barrier elements 11a, 11b and prevents them from being released before the retractable pin 16 is withdrawn.

At predetermined locations along the each side of the opening, there is a spring element 22 which serves to urge the barrier elements against the guides 20 ensuring that the catch means of two adjacent barrier elements engage together as they descend.

After the pin 16 is retracted, the barrier elements are released and fall due to gravity. The catch means 12a of the top element 11a catches on the complementary means 13a located at the top of the opening, and catch means 12/13 between adjacent barrier element will engage, so as to form a fire barrier that extends over the opening.

Figures 3 and 4 both show the released fire barrier 10. A catch means 12a of barrier element 11a has engaged with the corresponding catch means 13a of the upper retaining bracket 18 and the catch means 12/13 of barrier elements 11b and 11c have engaged with each other to cover the entire opening.

While some preferred aspects of the invention have been described by way of example, it should be appreciated that modifications and/or improvements can occur without departing from the scope of the invention as set out in the claims.

The terms comprise, comprises, comprising, or comprised, if and when used herein, should be interpreted non-exclusively, that is, as conveying “consisting of or including”.

CLAIMS

What we claim is:

1. A fire barrier for use over an opening formed in a door, window or wall structure, comprising at least two barrier elements and a means for releasing the barrier elements in the event of a fire, and wherein each said barrier element slides with respect to one another and includes at least one catch means adapted to engage a complementary catch means on the opening or an adjacent barrier element.
2. A fire barrier according to claim 1, wherein the catch means projects from the barrier element at an acute angle.
3. A fire barrier according to claim 1 or 2, wherein the barrier element is rectangular, having a front face, a rear face and perimeter edges defining a top, bottom, left, and right edge.
4. A fire barrier according to any one of claims 1 to 3, wherein a catch means projects from the top edge of the barrier element at an acute angle to the back of the barrier element.
5. A fire barrier according to any one of claims 1 to 4, wherein a catch means projects from the bottom edge of the barrier element at an acute angle to the front of the barrier element.
6. A fire barrier according to any one of claims 1 to 5, wherein said catch means extends along the entire top and bottom edges of the barrier element.

7. A fire barrier according to any one of claims 1 to 6, wherein one of the barrier elements includes an L-shaped in cross section projection from the bottom edge of the barrier element.
8. A fire barrier according to claim 7, wherein the L-shaped projection extends along the entire bottom edge of the barrier element.
9. A fire barrier according to any one of claims 1 to 8, wherein one of the barrier elements includes at least one hole.
10. A fire barrier according to claims 9, wherein the hole is in a tab projecting from the top edge of the barrier element.
11. A fire barrier according to any one of claims 1 to 10, wherein the opening includes a retaining bracket adjacent to the top side and bottom side of the opening.
12. A fire barrier according to any one of claims 1 to 11, wherein the opening includes a guide bracket adjacent to each of the left and right sides of the opening.
13. A fire barrier according to any one of claim 12, wherein each guide bracket may be Z-shaped in cross section.
14. A fire barrier according to any one of claim 12 or 13, wherein one flange of each guide bracket includes fixing holes to enable said bracket to be fastened and/or welded into the structure into which the opening is formed.
15. A fire barrier according to any one of claims 12 to 14, wherein there is at least one spring element mounted on a flange of the guide bracket to urge the catch means of two adjacent barrier elements to engage.

16. A fire barrier according to any one of claims 1 to 15, wherein the means for releasing the barrier elements in the event of a fire is triggered by heat and/or smoke or by the activation of a fire alarm.
17. A fire barrier according to claim 16, wherein the means includes a retractable pin.
18. A fire barrier according to claim 17, wherein the retractable pin is urged into disengagement by a spring which is released when a trigger melts due to high temperature (around 70 degrees).
19. A fire barrier according to claim 17 or 18, wherein one end of the retractable pin is contained in a housing attached to the structure into which the opening is formed.
20. A fire barrier according to any one of claims 1 to 19, wherein the barrier elements are mounted above the opening.
21. A fire barrier according to claim 20, wherein the barrier elements are supported by the L-shaped projection of one of the barrier elements.
22. A fire barrier according to claim 20 or 21, wherein one end of the retractable pin or rod is releasably attached to the barrier element with the L-shaped projection.
23. A fire barrier according to any one of the preceding claims, wherein there are three barrier elements.