

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 the invention, there is provided a fire barrier for use over an opening formed in a door, window or wall structure, comprising at least one barrier element and a means for releasing the barrier element in the event of a fire, and wherein at least one guide is mounted above the opening, and wherein the barrier element is below the opening before being released and is connected by means of a rope or wire via the guide(s) to a counterweight.

The barrier element is rectangular, having a front face, a rear face and perimeter edges defining a top, bottom, left, and right edge. The said rope or wire is connected between a tab projecting from the top edge of the barrier element via said guide(s) and the counterweight.

The guide or each guide is a pulley. Expediently, two pulleys are mounted above the opening. The said rope or wire is connected between two tabs projecting from the top edge of the barrier element via said guides and the counterweight.

The counterweight mounted at a height equivalent to the distance the barrier elements need to travel to cover the opening.

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. The means includes a retractable pin wherein one end of the retractable pin or rod is releasably attached to the counterweight.

The retractable pin is urged into disengagement by a spring which is released when a trigger melts due to high temperature. The retractable pin is contained in a housing attached to the structure into which the opening is formed.

The opening includes a retaining bracket adjacent to the top side and bottom side of the opening. The opening includes a guide bracket adjacent to each of the left and right sides of the opening. Each guide bracket may be Z-shaped in cross section.

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.

In an alternative embodiment, there are two barrier elements.

A catch means projects from the top edge of the barrier element at an acute angle to the back of the barrier element. A catch means projects from the bottom edge of the barrier element at an acute angle to the front of the barrier element. Said catch means extends along the entire top and bottom edges of the barrier element.

One of the barrier elements includes an L-shaped in cross section projection from the bottom edge of the barrier element. The L-shaped projection extends along the entire bottom edge of the barrier element.

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.

The barrier elements are supported by the L-shaped projection of one of the 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 a pair of guide brackets and a pulley mechanism (single barrier element).

Figure 2 is a perspective side view of a barrier element.

Figure 3 is a perspective side view of a pair of guide brackets and a pulley mechanism (2 barrier elements).

Figure 4 is a perspective side view of two interconnected barrier elements.

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

Figure 6 is a perspective side view of an unreleased fire barrier, the single barrier yet to be released from below the opening.

Figure 7 is a perspective side view of a released fire barrier, the single barrier released from below the opening.

Figure 8 is a perspective side view of an unreleased fire barrier, the two barrier elements of the barrier yet to be released from below the opening.

Figure 9 is a perspective side view of a released fire barrier, the two barrier elements of the barrier released from below the opening.

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 a single, 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 below 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 2 element 11a (for single barrier use) has a downwardly inclined top catch means 12 and the bottom includes an L- shaped in cross section portion 14. The element includes two tabs 21 to which the rope or steel wires 23 are attached.

Element 11b is an optional intermediate having a downwardly inclined top catch means 12 and an upwardly inclined bottom catch means 13 and includes two tabs 21 to which the rope or steel wires 23 are attached.

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 intermediate elements when in the nested position. It is substantially the same as element 11a minus tabs 21.

The catch means 12, 13 and L-shaped portions preferably extend the whole length of the elements 11, and 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.

At predetermined locations along the each side of the opening, there is a spring element (not shown) which serves to urge the barrier elements against the guides 20 ensuring that the catch means of two (when present) adjacent barrier elements engage together as they rise.

Figures 6 and 8 show an unreleased fire barrier with barrier element(s) 11 located below the opening. The barrier element(s) seen in Figures 2, 4 and 5 are held together. Wire rope 23 is inserted through openings in tabs 21 on barrier element 11a or 11b leading to pulleys 24,25 located above the opening. As Figure 3 best shows, one of the pulleys 24 is a double pulley which has a counterweight 26 attached to it.

The means 15 for automatically releasing the barrier element(s) 11 in the event of a fire has a retractable pin or rod 16 that secures the counterweight 26.

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 counterweight 26 which drops with gravity raising element(s) 11.

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 one barrier element and a means for releasing the barrier element in the event of a fire, and wherein at least one guide is mounted above the opening, and wherein the barrier element is below the opening before being released and is connected by means of a rope or wire via the guide(s) to a counterweight.
2. A fire barrier according to claim 1, wherein the barrier element is rectangular, having a front face, a rear face and perimeter edges defining a top, bottom, left, and right edge.
3. A fire barrier according to claims 2, wherein the said rope or wire is connected between a tab projecting from the top edge of the barrier element via said guide(s) and the counterweight.
4. A fire barrier according to any one of claims 1 to 3, wherein the guide or each guide is a pulley.
5. A fire barrier according to any one of claims 1 to 4, wherein two pulleys are mounted above the opening.
6. A fire barrier according to claim 5, wherein the said rope or wire is connected between two tabs projecting from the top edge of the barrier element via said guides and the counterweight.
7. A fire barrier according to any one of claims 1 to 6, wherein the counterweight mounted at a height equivalent to the distance the barrier elements need to travel to cover the opening.

8. A fire barrier according to any one of claims 1 to 7, 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.
9. A fire barrier according to claim 8, wherein the means includes a retractable pin wherein one end of the retractable pin or rod is releasably attached to the counterweight.
10. A fire barrier according to claim 8, wherein the retractable pin is urged into disengagement by a spring which is released when a trigger melts due to high temperature.
11. A fire barrier according to claim 9 or 10, wherein one end of the retractable pin is contained in a housing attached to the structure into which the opening is formed.
12. A fire barrier according to any one of claims 1 to 11, wherein the opening includes a retaining bracket adjacent to the top side and bottom side of the opening.
13. A fire barrier according to any one of claims 1 to 12, wherein the opening includes a guide bracket adjacent to each of the left and right sides of the opening.
14. A fire barrier according to claim 13, wherein each guide bracket may be Z-shaped in cross section.
15. A fire barrier according to any one of claim 13 or 14, 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.

16. A fire barrier according to any one of the preceding claims, wherein there are two barrier elements.

17. A fire barrier according to any one of claims 1 to 16, wherein a catch means projects from the top edge of the barrier element at an acute angle to the back of the barrier element.

18. A fire barrier according to any one of claims 17, wherein a catch means projects from the bottom edge of the barrier element at an acute angle to the front of the barrier element.

19. A fire barrier according to claims 17 or 18, wherein said catch means extends along the entire top and bottom edges of the barrier element.

20. A fire barrier according to any one of claims 16 to 19, wherein one of the barrier elements includes an L-shaped in cross section projection from the bottom edge of the barrier element.

21. A fire barrier according to claim 20, wherein the L-shaped projection extends along the entire bottom edge of the barrier element.

22. A fire barrier according to any one of claims 16 to 21, 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.

23. A fire barrier according to claim 20, wherein the barrier elements are supported by the L-shaped projection of one of the barrier elements.