

INSULATED FIRE SHUTTER

FIELD OF THE INVENTION

[0001] This invention pertains to fire shutters, more particularly to fire shutters which effectively resist heat transfer.

BACKGROUND OF THE INVENTION

[0002] 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 provided with ways for preventing flames from passing through them. Fire doors or shutters must be capable of resisting the effects of a fire for a period of time often stipulated by regulations. However, enormous heat can be generated by such fires. Known fire shutters are uninsulated. When subjected to the effects of fire, they can turn red hot and emit radiated heat to the other side of an opening, thus allowing the fire to spread. It would be desirable to provide a fire shutter which meets both requirements for prevention of transmission of fire and also resists heat transfer during such fires – i.e., acts as an insulating device.

SUMMARY OF THE INVENTION

[0003] In accordance with a first aspect, a fire shutter adapted to close off an area comprises a shutter curtain movable from an up position to a closed position, wherein the shutter curtain closes off the area when in the closed position, and at least one retractable guide, movable from a retracted position to an extended position and having a camber. The shutter curtain engages the at least one retractable guide as the shutter curtain moves from the up position toward the closed position, biasing the at least one retractable guide to the retracted position, and in the closed position the shutter curtain engages the camber and allows the at least one retractable guide to move to the extended position.

[0004] In accordance with another aspect, the shutter curtain comprises front slats and rear slats, and an insulation package is deployable from a non-deployed position to a deployed position within a space between the front slats and the rear slats.

[0005] From the foregoing disclosure and the following more detailed description of various embodiments it will be apparent to those skilled in the art that the present invention provides a significant advance in the technology of fire shutters. Particularly significant in this regard is the potential the invention affords for providing a high quality, low cost fire shutter resistant to heat transfer. Additional features and advantages of various embodiments will be better understood in view of the detailed description provided below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Fig. 1 is an isometric view of a fire shutter in accordance with one embodiment, shown positioned in a doorway.

[0007] Fig. 2 is an isometric view of the fire shutter of Fig. 1, shown with a shutter curtain lowered to a point above a camber.

[0008] Fig. 3 is an isometric view of the fire shutter of Fig. 1, shown with a shutter curtain lowered past the camber.

[0009] Fig. 4 is a cross section view taken through line 4-4 in Fig. 2, showing the shutter curtain and a retractable guide in a retracted position.

[0010] Fig. 5 is a cross section view taken through line 5-5 in Fig. 3, showing the shutter curtain and the retractable guide in an extended position.

[0011] Fig. 6 is a cross section view taken through line 6-6 in Fig. 2, showing the retractable guide in the retracted position.

[0012] Fig. 7 is a cross section view taken through line 7-7 in Fig. 3, showing the retractable guide in the extended position.

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2 [0013] Fig. 8 is a side view showing an insulation package within a space within the
3 shutter curtain in an initial position.

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5 [0014] Fig. 9 is a side view showing the insulation package in a deployed position.

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7 [0015] It should be understood that the appended drawings are not necessarily to scale,
8 presenting a somewhat simplified representation of various features illustrative of the
9 basic principles of the invention. The specific design features of the fire shutter as
10 disclosed here, including, for example, the specific dimensions of the slats, will be
11 determined in part by the particular intended application and use environment. Certain
12 features of the illustrated embodiments have been enlarged or distorted relative to
13 others to help provide clear understanding. In particular, thin features may be thickened,
14 for example, for clarity of illustration. All references to direction and position, unless
15 otherwise indicated, refer to the orientation illustrated in the drawings.

16 17 DETAILED DESCRIPTION OF CERTAIN EMBODIMENTS

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19 [0016] It will be apparent to those skilled in the art, that is, to those who have knowledge
20 or experience in this area of technology, that many uses and design variations are
21 possible for the fire shutter disclosed here. The following detailed discussion of various
22 alternate features and embodiments will illustrate the general principles of the invention
23 with reference to a fire shutter suitable for use closing a doorway. Other embodiments

1 suitable for other applications will be apparent to those skilled in the art given the benefit
2 of this disclosure.

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4 [0017] Turning now to the drawings, Fig. 1 shows an insulated fire shutter 10 in
5 accordance with one embodiment positioned in a frame 24, such as the frame of a door
6 or other space separating element. The fire shutter 10 has a shutter curtain 20 which is
7 deployable from an up position where the shutter curtain is retracted to a closed
8 position, where the shutter curtain closes off an area 29 defined by the frame 24. The
9 shutter curtain may be maintained in the up position by mounting above the area 29 to
10 be closed off, for example, as shown in the Figs. Shutter curtain 20 can comprise a
11 plurality of slats 22. The slats 22 are pivotably connected to one another, as shown.
12 Each slat 22 is an elongate member which extends between sides of the frame. The
13 slats can comprise, for example, fire and heat resistant materials such as an exterior
14 skin made of galvanized steel and an infill made of a ceramic fiber. Other combinations
15 of materials suitable for use in such slats will be readily apparent to those skilled in the
16 art given the benefit of this disclosure.

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18 [0018] Fig. 2 shows the shutter curtain 20 which has moved in a first direction from the
19 up position to an intermediate position close to the closed position. The shutter curtain
20 has front slats 21 and rear slats 23, and a space 39 between the front slats 21 and the
21 rear slates 23. As shown in Figs. 2 and 3, one or two slats form a bend connecting the
22 front slats to the rear slats, and help define space 39. Space 39 between the front slats

21 and the rear slats 23 is advantageous in helping to reduce heat transfer from one side where a fire would be to the other side which does not have a fire.

[0019] Figs. 4-7 are various section views of the fire shutter showing the interrelationship between the shutter curtain 20 and a retractable guide 30 mounted on the frame 24. The retractable guide 30 has a ramped surface or camber 25 extending at a lower end 99. Also, the retractable guide is biased by a biasing member or pivoting linkage 26 mounted between the frame 24 and the guide 30. Pivoting linkage 26 biases the retractable guide 30 toward an extended position. However, in accordance with a highly advantageous feature, the slats of the shutter curtain resist this biasing force, and force the retractable guide 30 to stay in a retracted position (shown in Figs. 2, 4 and 6) as long as the slats engage the retractable guide. This occurs while the shutter curtain is in the up position, and as it travels along the first direction toward the closed position. The camber 25 becomes progressively thinner towards the lower end. Once the bend of slats reaches the camber 25, the slats no longer provide a counteracting force to the retractable guide. Thus, the retractable guide is free to move in a second direction generally perpendicular to the first direction, to the extended position.

[0020] Frame 24 defines a pair of flanges 27, 28 which extend towards one another. Each flange 27, 28 has a corresponding ramped foot 31, 32, respectively, adjacent the lower end of the retractable guide 30, best seen in Fig. 2. When the retractable guide is in the closed position (Figs. 3, 5 & 7), the ramped feet 31, 32 bias

1 the front slats 21 and rear slats 23 toward one another, effectively providing a wedging
2 effect to hold the shutter curtain firmly in the closed position. Significant temperature
3 variations of a fire can induce air flow which can transmit fire and heat. It is highly
4 desirable to provide a fire shutter which resists such air flow. As shown in Fig. 1, a
5 second retractable guide may be used, one on each side of the frame 24, which works
6 in the same manner as the first retractable guide in combination with a second pair of
7 flanges on the frame. The second retractable guide is movable from a retracted
8 position to an extended position, is attached to the frame, just like the first retractable
9 guide. As can be seen in Fig. 1, the second retractable guide faces the first retractable
10 guide. The retractable guides cooperate with the shutter curtain to close off the area
11 when the shutter curtain is in the closed position.

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13 [0021] Figs. 8 and 9 show another advantageous feature of the invention. An insulation
14 package 40 is provided which is deployable from a non-deployed position (Fig. 8) to a
15 deployed position (Fig. 9) in the space 39 between the front slats 21 and the rear slats
16 23. The insulation package 40 can be mounted on a suspended roll 44. During rotation
17 of the roll the insulation package moves from the non-deployed position to the deployed
18 position. The insulation package 40 comprises an insulating material 41 resistant to
19 heat transfer. The insulating material can comprise, for example, an aluminized coated
20 fiberglass cloth, or simply an aluminised fiberglass, a silica, etc. Other insulating
21 materials suitable for use as an insulation package will be readily apparent to those
22 skilled in the art given the benefit of this disclosure.

1 [0022] The insulation package 40 is seen to comprise a sheet of insulating material
2 which can extend into the space 39 to help resist heat transfer. In accordance with a
3 highly advantageous feature, the insulation package is provided with a link attached to
4 hold the insulation package in the non-deployed position. The link may be a fusible link
5 which is temperature sensitive so that above a predetermined temperature the link
6 breaks and allows the insulation package to move to the deployed position. Thus, the
7 insulation package may not deploy at all unless the environment gets too hot. In such
8 circumstances the shutter curtain will have been moved to the closed position, as
9 shown. Optionally a weight such as weight bar 46 may be added to increase the force
10 of gravity urging the insulation package to the deployed position.

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12 [0023] From the foregoing disclosure and detailed description of certain preferred
13 embodiments, it will be apparent that various modifications, additions and other
14 alternative embodiments are possible without departing from the true scope and spirit of
15 the invention. The embodiments discussed were chosen and described to provide the
16 best illustration of the principles of the invention and its practical application to thereby
17 enable one of ordinary skill in the art to use the invention in various embodiments and
18 with various modifications as are suited to the particular use contemplated. All such
19 modifications and variations are within the scope of the invention as determined by the
20 appended claims when interpreted in accordance with the breadth to which they are
21 fairly, legally, and equitably entitled.

CLAIMS

What is claimed is:

1. A fire shutter adapted to close off an area comprising, in combination:
a shutter curtain movable from an up position to a closed position, wherein the shutter curtain closes off the area when in the closed position; and
at least one retractable guide, movable from a retracted position to an extended position and having a camber;

wherein the shutter curtain engages the at least one retractable guide as the shutter curtain moves from the up position toward the closed position, biasing the at least one retractable guide to the retracted position, and in the closed position the shutter curtain engages the camber and allows the at least one retractable guide to move to the extended position.

2. The fire shutter of claim 1 wherein the shutter curtain comprises a series of pivotably connected slats.

3. The fire shutter of claim 2 wherein each slat comprises an exterior skin surrounding an infill.

4. The fire shutter of claim 1 further comprising a frame which defines at least a first pair of flanges which extend toward each other, and the shutter curtain comprises front slats and rear slats.

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5. The fire shutter of claim 4 wherein the at least one retractable guide has a lower end, each flange has a ramped foot adjacent the lower end, and the front slats and rear slats are biased toward each other by the ramped feet when the shutter curtain is in the closed position.

6. The fire shutter of claim 1 wherein the shutter curtain travels in a first direction as the shutter curtain moves from the up position to the closed position, and the at least one retractable guide moves in a second direction generally perpendicular to the first direction when the at least one retractable guide moves from the retracted position to the extended position.

7. The fire shutter of claim 1 further comprising a biasing member operatively connected between a frame and the at least one retractable guide, wherein the biasing member biases the at least one retractable guide toward the extended position.

8. The fire shutter of claim 1 wherein the camber is an extension of the at least one retractable guide, and the camber becomes progressively thinner towards a lower end.

9. The fire shutter of claim 1 wherein the shutter curtain comprises front slats and rear slats, and an insulation package is deployable from a non-deployed position to a deployed position within a space between the front slats and the rear slats.

1 10. The fire shutter of claim 1 further comprising
2 a frame; and
3 a second retractable guide movable from a retracted position to an extended
4 position, attached to the frame and facing the at least one retractable guide, wherein the
5 retractable guides cooperate with the shutter curtain to close off the area when the
6 shutter curtain is in the closed position.

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8 11. A fire shutter adapted to close off an area comprising, in combination:
9 a shutter curtain comprising front slats and rear slats, and the shutter curtain is
10 movable from an up position to a closed position, wherein the shutter curtain closes off
11 the area when in the closed position; and
12 an insulation package deployable from a non-deployed position to a deployed
13 position in a space between the front slats and the rear slats.

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15 12. The fire shutter of claim 11 wherein the insulation package comprises an
16 insulating material comprising one of silica and aluminized fiberglass.

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18 13. The fire shutter of claim 11 wherein the insulation package is attached to a
19 suspended roll, and during rotation of the roll the insulation package moves from the
20 non-deployed position to the deployed position.

1 14. The fire shutter of claim 13 further comprising a weight bar attached to the
2 insulation package, wherein the weight bar urges the insulation package toward the
3 deployed position.

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5 15. The fire shutter of claim 13 further comprising a link attached to the insulation
6 package which holds the insulation package in the non-deployed position, wherein the
7 link is temperature sensitive so that above a pre-determined temperature the link breaks
8 and allows the insulation package to move to the deployed position.