SUMMARY OF THE INVENTION

[0003] A hazard control system according to various aspects of the present invention is configured to deliver a control material in response to detection of a hazard and signal a secondary hazard detection system that an event has occurred. In one embodiment, the hazard control system comprises a pressure tube having an internal pressure that is configured to leak in response to exposure to heat. The leak changes the internal pressure and generates a pneumatic signal. A valve may be coupled to the pressure tube and be configured to release the control material from a container is response to the pneumatic signal. A second valve may also be coupled to the pressure tube and be configured to provide a signal to the secondary hazard detection system in response to the pneumatic signal.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] A more complete understanding of the present invention may be derived by referring to the detailed description and claims when considered in connection with the following illustrative figures. In the following figures, like reference numbers refer to similar elements and steps throughout the figures.

[0005] Figure 1 is a block diagram of a hazard control system according to various aspects of the present invention;

[0006] Figure 2 representatively illustrates an embodiment of the hazard control system;

[0007] Figure 3 is an exploded view of a hazard detection system including a housing;

[0008] Figure 4 is a flow diagram of a process for controlling a hazard; and

a control material which absorbs or dilutes oxygen levels when transmitted into the hazard area 106. As another example, if the hazard control system 100 is configured to control a hazard area 106 such that equipment within hazard area 106 is substantially protected from thermal radiation, the vessel 102 may be configured to provide an extinguishant which absorbs thermal radiation when transmitted into the hazard area 106.

[0016] The delivery system 107 is configured to deliver the control material to the hazard area 106. The delivery system 107 may comprise any appropriate system for delivering the control material. In the present embodiment, the delivery system 107 may include a nozzle 108 connected to the vessel 102 and disposed in or adjacent to the hazard area 106 such that control material exiting the nozzle 108 is deposited in the hazard area 106. For example, if a fire is detected in the hazard area 106, a fire extinguishing agent may be transmitted from the vessel 102 through the nozzle 108 to the hazard area 106 to extinguish the fire.

[0017] The nozzle 108 may be connected directly or indirectly to the vessel 102 to deliver the control material. For example, the nozzle 108 may be indirectly connected to the vessel 102 via a deployment valve 103, which controls a deployment and/or flow rate of the control material through the nozzle 108. The deployment valve 103 controls whether and, if desired, the amount or type of control material delivered through the nozzle 108. The deployment valve 103 may comprise any appropriate mechanism for selectively providing the control material for deployment via the nozzle 108, such as a ball cock, a ball valve, a butterfly valve, a check valve, a double check valve, a gate valve, a globe valve, a hydraulic valve, a leaf valve, a non-return valve, a pilot valve, a piston valve, a plug valve, a pneumatic valve, a

rotary valve, and/or the like. In the present embodiment, the deployment valve 103 responds to a signal, for example a pneumatic signal from the hazard detection system 105, and controls delivery of the extinguishant via the nozzle 108 accordingly.

[0018] The hazard detection system 105 generates a hazard signal in response to a detected hazard. The hazard detection system 105 may comprise any appropriate system for detecting one or more specific hazards and generating a corresponding signal, such as system for detecting smoke, heat, poison, radiation, and the like. In the present embodiment, the hazard detection system 105 is configured to detect a fire and provide a corresponding signal to the deployment valve 103. The hazard signal may comprise any appropriate signal for transmitting relevant information, such as an electrical pulse or signal, acoustic signal, mechanical signal, wireless signal, pneumatic signal, and the like. In the present embodiment, the hazard signal comprises a pneumatic signal generated in response to detection of the hazard condition and provided to the deployment valve 103, which delivers the extinguishant in response to the signal. The hazard detection system 105 may generate the hazard signal in any suitable manner, for example in conjunction with conventional hazard detectors, such as a smoke detector, fusible link, infrared detector, radiation detector, or other suitable sensor. The hazard detection system 105 detects one or more hazards and generates (or terminates) a corresponding signal.

[0019] In the present embodiment, the hazard detection system 105 includes a pressure tube 104 configured to generate a signal in response to a change of internal pressure in the pressure tube 104. Referring again to Figure 2, the hazard detection system may further comprise a smoke detector 110 configured to release the pressure in the pressure tube 104 upon detecting smoke within

CLAIMS

1. A fire protection system, comprising:

a suppressant system;

a detection system adapted to be coupled to the suppressant system and adapted to generate a detection signal in response to a detection of a fire condition; and

a signaling system adapted to be coupled to the detection system and adapted to trigger a secondary fire sensing system in response to the generated detection signal.

2. A fire protection system according to claim 1, wherein the suppressant system further comprises:

a pressure vessel configured to contain a suppressant material;

a deployment valve adapted to be coupled to the pressure vessel and configured to:

seal the pressure vessel under a predetermined pressure;

release the suppressant material upon activation; and

a delivery system adapted to be coupled to the deployment valve configured to deliver the suppressant material.

3. A fire protection system according to claim 2, wherein the delivery system comprises:

a hose adapted to be coupled to the deployment valve and configured to route the suppressant material from the pressure vessel to a predetermined location; and

a nozzle adapted to be coupled to the hose and adapted to eject the suppressant material from the hose to a predetermined area.

4. A fire protection system according to claim 1, wherein the detection system comprises a sealed pressure tube adapted to have an internal pressure, wherein at least a portion of the pressure tube is configured to leak in response to exposure to heat and generate the detection signal.

5. A fire protection system according to claim 1, wherein the signaling system comprises:

a second pressure vessel adapted to be connected to the pressure tube and configured to contain a signaling material;

a trigger valve configured to couple between the pressure tube and the second pressure vessel, wherein the trigger valve is adapted to:

maintain the internal pressure inside the pressure tube until the pneumatic signal is received;

depressurize the second pressure vessel in response to the pneumatic signal; and

allow the signaling material to escape from the second pressure vessel.

6. A fire protection system according to claim 5, further comprising a second delivery system configured to deliver the signaling material to the secondary fire sensing system.

7. A fire protection system according to claim 5, wherein the signaling material comprises a compressed gas.

SUMMARY OF THE INVENTION

[0002a] The invention is defined in the independent claims. Some optional features of the invention are defined in the dependent claims.

[0003] A hazard control system is configured to deliver a control material in response to detection of a hazard and signal a secondary hazard detection system that an event has occurred. In one embodiment, the hazard control system comprises a pressure tube having an internal pressure that is configured to leak in response to exposure to heat. The leak changes the internal pressure and generates a pneumatic signal. A valve may be coupled to the pressure tube and be configured to release the control material from a container is response to the pneumatic signal. A second valve may also be coupled to the pressure tube and be configured to provide a signal to the secondary hazard detection system in response to the pneumatic signal.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] A more complete understanding of the present invention may be derived by referring to the detailed description and claims when considered in connection with the following illustrative figures. In the following figures, like reference numbers refer to similar elements and steps throughout the figures.

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[0008] Figure 4 is a flow diagram of a process for controlling a hazard; and

a control material which absorbs or dilutes oxygen levels when transmitted into the hazard area 106. As another example, if the hazard control system 100 is configured to control a hazard area 106 such that equipment within hazard area 106 is substantially protected from thermal radiation, the vessel 102 may be configured to provide an extinguishant which absorbs thermal radiation when transmitted into the hazard area 106.

[0016] The delivery system 107 is configured to deliver the control material to the hazard area 106. The delivery system 107 may comprise any appropriate system for delivering the control material. In the present embodiment, the delivery system 107 may include a nozzle 108 connected to the vessel 102 and disposed in or adjacent to the hazard area 106 such that control material exiting the nozzle 108 is deposited in the hazard area 106. For example, if a fire is detected in the hazard area 106, a fire extinguishing agent may be transmitted from the vessel 102 through the nozzle 108 to the hazard area 106 to extinguish the fire.

[0017] The nozzle 108 may be connected directly or indirectly to the vessel 102 to deliver the control material. For example, the nozzle 108 may be indirectly connected to the vessel 102 via a hose 111 coupled to a deployment valve 103, which controls a deployment and/or flow rate of the control material through the nozzle 108. The deployment valve 103 controls whether and, if desired, the amount or type of control material delivered through the nozzle 108. The deployment valve 103 may comprise any appropriate mechanism for selectively providing the control material for deployment via the nozzle 108, such as a ball cock, a ball valve, a butterfly valve, a check valve, a double check valve, a gate valve, a globe valve, a hydraulic valve, a leaf valve, a non-return valve, a pilot valve, a piston valve, a plug valve, a pneumatic valve, a

rotary valve, and/or the like. In the present embodiment, the deployment valve 103 responds to a signal, for example a pneumatic signal from the hazard detection system 105, and controls delivery of the extinguishant via the hose 111 and nozzle 108 accordingly.

[0018] The hazard detection system 105 generates a hazard signal in response to a detected hazard. The hazard detection system 105 may comprise any appropriate system for detecting one or more specific hazards and generating a corresponding signal, such as system for detecting smoke, heat, poison, radiation, and the like. In the present embodiment, the hazard detection system 105 is configured to detect a fire and provide a corresponding signal to the deployment valve 103. The hazard signal may comprise any appropriate signal for transmitting relevant information, such as an electrical pulse or signal, acoustic signal, mechanical signal, wireless signal, pneumatic signal, and the like. In the present embodiment, the hazard signal comprises a pneumatic signal generated in response to detection of the hazard condition and provided to the deployment valve 103, which delivers the extinguishant in response to the signal. The hazard detection system 105 may generate the hazard signal in any suitable manner, for example in conjunction with conventional hazard detectors, such as a smoke detector, fusible link, infrared detector, radiation detector, or other suitable sensor. The hazard detection system 105 detects one or more hazards and generates (or terminates) a corresponding signal.

[0019] In the present embodiment, the hazard detection system 105 includes a pressure tube 104 configured to generate a signal in response to a change of internal pressure in the pressure tube 104. Referring again to Figure 2, the hazard detection system may further comprise a smoke detector 110 configured to release the pressure in the pressure tube 104 upon detecting smoke within

CLAIMS

1. A fire protection system, comprising:

a suppressant system;

a detection system adapted to be coupled to the suppressant system and adapted to generate a detection signal in response to a detection of a fire condition; and

a signaling system adapted to be coupled to the detection system and adapted to trigger a secondary fire control system by releasing a signaling material from the signaling system into an area proximate the secondary fire control system in response to the generated detection signal.

2. A fire protection system according to claim 1, wherein the suppressant system further comprises:

a pressure vessel configured to contain a suppressant material;

a deployment valve adapted to be coupled to the pressure vessel and configured to:

seal the pressure vessel under a predetermined pressure;

release the suppressant material upon activation; and

a delivery system adapted to be coupled to the deployment valve and configured to deliver the suppressant material.

3. A fire protection system according to claim 2, wherein the delivery system comprises:

a hose adapted to be coupled to the deployment valve and configured to route the suppressant material from the pressure vessel to a predetermined location; and

a nozzle adapted to be coupled to the hose and adapted to eject the suppressant material from the hose to a predetermined area.

4. A fire protection system according to claim 1, wherein the detection system comprises a sealed pressure tube adapted to have an internal pressure, wherein at least

a portion of the pressure tube is configured to leak in response to exposure to heat and for a decrease in the internal pressure to generate the detection signal.

5. A fire protection system according to claim 1, wherein the signaling system comprises:

a second pressure vessel adapted to be connected to the pressure tube and configured to contain the signaling material;

a trigger valve configured to couple between the pressure tube and the second pressure vessel, wherein the trigger valve is adapted to:

maintain the internal pressure inside the pressure tube until the detection signal is generated;

depressurize the second pressure vessel in response to the generated detection signal; and

allow the signaling material to escape from the second pressure vessel.

6. A fire protection system according to claim 5, further comprising a second delivery system configured to deliver the signaling material to the secondary fire control system.

7. A fire protection system according to claim 5, wherein the signaling material comprises a compressed gas.