

- 1 -

A Fire Suppression System

FIELD OF THE INVENTION

5 The present invention relates to a fire suppression system, a valve for use in a fire suppression system and a method of providing a fire suppression system. In particular, the present invention relates to a fire suppression system including a multi-directional control valve, a multi-directional control valve for a fire suppression system and a method of simultaneously actuating a first fire
10 suppression supply system and a second fire suppression supply system.

BACKGROUND TO THE INVENTION

A fire extinguishing system generally includes a pressurised cylinder containing an
15 extinguishant. Such fire suppression systems may be installed in fire hazard areas such that the extinguishant is released automatically when a fire is detected. In some fire suppression systems the pressurised cylinder can be connected to a length of detection tubing. The length of the detection tubing comprises an outer wall which is arranged to be ruptured by heat from a nearby fire and the
20 extinguishant is released through the rupture. Accordingly, with such systems, the extinguishant will be automatically and directly released in the proximity of the fire.

The detection tubing is positioned and secured in a fire risk area for which the system is designed to protect. If a fire subsequently starts within this area then the
25 heat will rupture the detection tubing at the hottest area and this will cause the extinguishant to flow through the rupture in order to extinguish, or at least suppress, the original source of the fire. This system is currently available from Firetrace Limited as a direct automatic fire suppression system.

30 Similar systems are available which are called indirect automatic fire suppression systems. In these systems, the extinguishant is arranged to be discharged through a diffuser head located on a discharge tube. Accordingly, the

- 2 -

extinguishant does not flow through the detection tubing and out of the rupture. These indirect systems generally include a valve which is controlled by the pressure in the detection tubing such that the valve is opened when pressure is released from the detection tubing. On the release of this pressure, the discharge
5 valve opens and the extinguishant flows through the discharge tube and out of the diffuser head.

A user or installer therefore has the option of selecting whether to use a direct fire suppression system or an indirect fire suppression system depending upon the
10 particular circumstances. For example, to protect an area having multiple chambers, an indirect system may be selected in which there is a diffuser head located in each of the chambers. Alternatively, a direct system may be installed where it is preferred to only have the source of the heat directly extinguished without having to guess where to install a diffuser head. A direct system may
15 therefore be more targeted and prevent any components or equipment being unnecessarily covered with an extinguishant.

It is an aim of the present invention to overcome at least one problem associated with the prior art whether referred to herein or otherwise.

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SUMMARY OF THE INVENTION

According to a first aspect of the present invention there is provided a fire suppression system comprising extinguishant supply means, a control valve, a
25 detection tube and a discharge tube wherein rupture of the wall of the detection tube causes a release of pressure from within the detection tube and this release of pressure is arranged to open extinguishant release passageways to both the detection tube and the discharge tube in order for extinguishant to be released through both the detection tube and the discharge tube.

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Preferably the release of pressure from the rupture is arranged to simultaneously open extinguishant release passageways to both the detection tube and the

- 3 -

discharge tube in order for extinguishant to be released through both the detection tube and the discharge tube.

Preferably the extinguishant is released through the rupture created in the
5 detection tube.

The fire suppression system may comprise a single control valve.

The control valve may comprise an equalising passageway to enable pressurised
10 fluid to flow therethrough when the valve member is in the first position. The equalising passageway may be open when the detection tube is pressurised and the equalising passageway may be closed when the detection tube is ruptured. Preferably the equalising passageway is biased towards a normally open position. The equalising passageway may be arranged to close during activation and
15 preferably during the release of extinguishant from the system.

Preferably the equalising passageway is arranged to maintain an operating pressure in the detection tube.

20 Preferably the equalising passageway is arranged to maintain a balance of pressure on either side of a valve member in order to maintain the valve member in a first position prior to rupture of the detection tube. Preferably the equalising passageway is arranged to maintain a balance of pressure on either side of a valve member in order to maintain the extinguishant release passageways closed
25 prior to rupture of the detection tube.

Preferably the equalising passageway is arranged to maintain a (substantially) equal pressure in the detection tube and in a pressurised cylinder containing an extinguishant. The equalising passageway may extend from a primed chamber
30 and/or a pressurised cylinder to a detection chamber and/or the detection tube.

Preferably the equalising passageway is arranged to maintain a (substantially)

- 4 -

equal pressure in the detection tube and in the extinguishant supply means.

The control valve may comprise a body with an inlet, a first outlet port and a second outlet port.

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The control valve may comprise a valve member movable within the body for opening and closing the extinguishant release passageways between the inlet and both the first outlet port and the second outlet port.

10 Preferably the valve member is movable between;

a first position where the extinguishant release passageways are closed between the inlet and both the first outlet or the second outlet;

a second position where the extinguishant release passageways are open between the inlet and both the first and second outlet ports.

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The equalising passageway may be open when the valve member is in the first position and the equalising passageway may be closed when the valve member is in the second position.

20 Preferably the first outlet port is arranged, in use, to be connected to a detection tube.

Preferably the rupture of the wall of the detection tube causes a release of pressure from within the detection tube and this release of pressure is arranged to

25 move the valve member from the first position to the second position.

Preferably the fire suppression system is arranged to be activated by the detection of a fire and/or heat above a predetermined threshold temperature.

30 Preferably the inlet is connected to a pressurised cylinder containing an extinguishant.

- 5 -

Preferably the first outlet port is connected to a pressurised detection tube. Preferably the pressure in the pressurised detection tube determines whether the extinguishant release passageways are open or closed between the pressure inlet and the first outlet port and the second outlet port.

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Preferably the detection tube is arranged to activate the system through the detection of a fire and/or heat above a predetermined threshold temperature

Preferably the detection tube is arranged to contain a pressurised fluid and more preferably a gas. Preferably the detection tube comprises a wall which is arranged to rupture on exposure to heat and/or fire. Preferably the wall is arranged to rupture once heated above a predetermined threshold temperature. Preferably extinguishant contained within a pressurised cylinder is arranged to be released through the rupture of the detection tube.

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Preferably the second outlet port is connected to a discharge tube. The discharge tube may comprise an unpressurised tube. The discharge tube may comprise one or more discharge heads located along the length thereof. The or each discharge head may be arranged to release extinguishant contained within a pressurised cylinder on activation of the system.

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Preferably the valve member comprises two parts. The first part may comprise a carrier component and the second part may comprise a sealing component.

The carrier component may define a seat into which the sealing component may be housed.

The valve member may comprise an equalising passageway to enable pressurised fluid to flow therethrough when the valve member is in the first position.

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The valve member may comprise an internal valve mechanism to control the fluid

- 6 -

flow through the equalising passageway. Preferably the internal valve mechanism is configurable between a first open position and a second closed position. Preferably the internal valve mechanism comprises a ball which engages within a passageway such that the periphery of the ball is engageable with the
5 passageway to prevent fluid flow therethrough. The passageway may comprise a tapered passageway in which the internal diameter decreases from a first end towards a second end.

Preferably the internal valve mechanism is arranged to be normally open such that
10 fluid can flow through the equalising passageway. This open passageway may provide equal pressures on either side of the valve member.

Preferably the rupture of the detection tube causes the internal valve mechanism to close and to prevent fluid flow through the equalising passageway.

15 Preferably the valve member is slidably retained in the body of the valve.

Preferably the valve member is sealingly retained within the body of the valve. The body may comprise a seal (O-ring seal) which sealingly retains the valve
20 member.

Preferably the carrier component is slidably retained in the body of the valve.

Preferably the carrier component is sealingly retained within the body of the valve.
25 The body may comprise a seal (O-ring seal) which sealingly retains the carrier component. The carrier component may comprise an outer sealing surface which acts with the seal to provide a seal between the carrier component and the body.

The carrier component may comprise a fluid passageway defined along an outer
30 peripheral wall which is arranged to provide a fluid passageway passed the seal when the fluid passageway spans the seal. The fluid passageway may extend from a first end to a second end. In the first position, both ends of the fluid

- 7 -

passageway are arranged to be located between the seal and the inlet such that no fluid can flow passed the seal. Preferably in the second position, one end of the fluid passageway locates between the seal and the first outlet and one end of the fluid passageway locates between the seal and the inlet such that the fluid
5 passageway permits the flow of fluid from the inlet (and the pressurised cylinder) and the first outlet (and the detection tube).

The fluid passageway may be provided by a plurality of slots or grooves defined around the outer periphery of the carrier component. The slots or grooves may
10 comprise longitudinally extending slots which open at one end of the carrier component and extend partially down the outer periphery of the carrier component. The slots or grooves may provide open channels down the outer periphery of the carrier component.

15 Preferably the sealing component comprises a disc and more preferably comprises a sealing disc.

The sealing disc is arranged to locate on a seat surface of the carrier component. The carrier component may comprise one or more re-pressurising or equalising
20 passageways defined through the carrier component. The or each re-pressurising or equalising passageway may have an open end located on the seat surface of the carrier. The open end(s) may be arranged to locate underneath the sealing component.

25 The sealing component may define a passageway which connects to the equalising passageway defined in the carrier component. The passageway of the sealing component may extend from a central position to a peripheral position,

The valve member may have a fluid passageway defined therein to permit fluid
30 flow from the inlet to the first outlet when the valve member is in the second position.

- 8 -

In the second position, an abutment face of the valve member is arranged to abut an internal end wall of the body. The fluid passageway permits the flow of fluid to the first outlet whilst the valve member is in the second position. The fluid passageway may comprise a plurality of passageways defined on a second end of the carrier member. The fluid passageways may comprise channels defined in
5 and/or across an end face of the carrier member. The end face of the carrier member may comprise a plurality of channels (or grooves) extending across wherein the channels intersect in a central region and define a void in the face of the valve member.

10 Preferably the second outlet includes an outlet conduit. The outlet conduit may comprise a sealing surface which is arranged to engage the valve member to prevent or permit the flow of extinguishant to the second outlet. The sealing surface may comprise an annular sealing surface which surrounds an entry region
15 of the outlet conduit. Preferably the sealing surface is arranged to sealingly engage with the sealing component of the valve member.

20 Preferably the sealing surface provides a seal when the valve member is in the first position. Preferably the sealing surface permits the flow of extinguishant (pressurised fluid) from the inlet to the second outlet when the valve member is in the second position.

The outlet conduit may comprise an internal conduit in the body of the valve and may have an exit forming an outlet port on the side of the body. The conduit may
25 extend through 90 degrees.

The body of the valve may define a primed chamber and a detection chamber.

30 Preferably the valve member has a surface area exposed to the pressure in the detection chamber which is greater than a surface area exposed to the pressure in the primed chamber when the detection tube is pressurised.

- 9 -

The primed chamber may be separated from the detection chamber by the valve member.

5 Preferably the valve member is adapted to simultaneously open and close extinguishant release passageways between the inlet port and both the first outlet port and the second outlet port

10 Preferably the fire suppression system control valve comprises a fire suppression system multi-directional control valve and more preferably comprises a fire suppression system bi-directional control valve.

The detection tube may be connected to an auxiliary pressurised cylinder.

15 The fire suppression system may comprise a first control valve and a second control valve. The first control valve may comprise a direct control valve and the second control valve may comprise an indirect control valve. The detector tube may be connected to the direct control valve and also to an activation port of the indirect control valve. The rupture of the detection tube may open an extinguishant release passageway between a first pressurised cylinder and the
20 detection tube and may open an extinguishant release passageway between a second pressurised cylinder and a discharge tube.

25 The extinguishant supply means may comprise a first pressurised cylinder containing an extinguishant. The extinguishant supply means may comprise a plurality of pressurised cylinders containing an extinguishant.

30 The extinguishant supply means may comprise a first pressurised cylinder containing an extinguishant and a second pressurised cylinder containing an extinguishant wherein the first pressurised cylinder is arranged to supply the extinguishant to the detector tube and the second pressurised cylinder is arranged to supply the extinguishant to the discharge tube.

- 10 -

According to a second aspect of the present invention there is provided a valve for use in a fire suppression system in accordance with the first aspect of the present invention, the control valve comprising:

- a body with an inlet, a first outlet port and a second outlet port; and
- 5 a valve member movable within the body for opening and closing extinguishant release passageways between the inlet and both the first outlet port and the second outlet port,
- the valve member being movable between;
- a first position where the extinguishant release passageways are closed
- 10 between the inlet and both the first outlet and the second outlet;
- a second position where the extinguishant release passageways are open between the inlet and both the first and second outlet ports.

According to a third aspect of the present invention there is provided a method of

15 providing a fire suppression system comprising providing extinguishant supply means and a control valve, the method comprising installing a detection tube and a discharge tube within a fire prevention area, wherein rupture of the wall of the detection tube causes a release of pressure from within the detection tube and this release of pressure is arranged to open extinguishant release passageways to

20 both the detection tube and the discharge tube in order for extinguishant to be released through both the detection tube and the discharge tube.

The method comprising moving a valve member between;

- a first position where the extinguishant release passageways are closed
- 25 between an inlet and both a first outlet and a second outlet of the control valve;
- and
- a second position where the extinguishant release passageways are open between the inlet and both the first and second outlet ports.

30 BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described, by way of example only, with a

- 11 -

reference to the drawings that follow, in which:

Figure 1 is a side cross-section schematic view of a preferred embodiment of a bi-directional control valve in accordance with the present invention with the valve in
5 the closed position.

Figure 2 is a side cross-section schematic view of a preferred embodiment of a bi-directional control valve in accordance with the present invention with the valve in the open and activated (discharging) position.
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Figure 3 is a side cross-section schematic view of another embodiment of a bi-directional control valve in accordance with the present invention with the valve in the closed position.

Figure 4 is a side cross-section schematic view of a further embodiment of a bi-directional control valve in accordance with the present invention with the valve in the closed position.
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Figure 5 is a top view of a valve member for uses in a bi-directional control valve in accordance with the present invention.
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Figure 6 is a side view of a valve member for use in a bi-directional control valve in accordance with the present invention.

Figure 7 is a bottom view of a valve member for use in a bi-directional control valve in accordance with the present invention.
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Figure 8 is a schematic view of a preferred embodiment of a fire suppression system in accordance with the present invention.
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Figure 9 is a schematic view of another embodiment of a fire suppression system in accordance with the present invention.

- 12 -

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in Figure 1, a preferred embodiment of a multi-directional control valve comprises a bi-directional control valve 10. In particular, this control valve 10 is specifically for a fire suppression system comprises an inlet 12, a first fluid communication passageway or outlet (port) 14 and a second fluid communication passageway or outlet (port) 16. The first outlet port 14 is arranged to be connected to a detector tube 18 whereas the second outlet port 16 is arranged to be connected to a discharge tube 20. The detector tube 18 comprises a heat sensitive tube which will be ruptured and/or penetrated as a result of exposure to significant heat. As a result of this rupture, the pressure contained within the detector tube 18 will be released and this is then arranged to actuate the control valve 10 such that the fire extinguishant contained within a cylinder 22 is simultaneously released through the detector tube 18 and also through the dedicated discharge tube 20. It should be noted that the discharge tube 20 is separate from the detection tube 18 even though the detection tube 18 actually functions to discharge extinguishant through the heat/fire created rupture. In addition, the detection tube 18 is pressurised whereas the discharge tube 20 is unpressurised.

As explained previously, Firetrace Limited currently provide a direct discharge system using a single outlet port similar to the first outlet port 14 only or an indirect discharge system using a single outlet port similar to the second outlet port 16 only. Accordingly, the present invention now provides a fire suppression system which enables a combination of both a direct extinguishant release and an indirect extinguishant release.

This new function has been enabled through the use of a combination of control valves or a new control valve 10 which provides a first extinguishant release passageway and a second extinguishant release passageway. The valve member 30 has a first part 32 and a second part 34. The first part 32 generally comprises

- 13 -

a carrier member or component 32. The second part 34 generally comprises a sealing member or component 34. The sealing component 34 is mounted on the carrier component 32 and the sealing component 34 is carried by the carrier component 32. The valve member 30 includes an internal valve mechanism which acts to maintain an optimum operational pressure with the detector tube 18 as will be described later. The combination of this valve member 30 together with the valve housing 36 provided by the body 11 of the control valve 10 enables two fluid flow paths (extinguishant release passageways) to be created (simultaneously) by the release of pressure from the detector tube 18.

As shown in Figure 1, in a normal and un-activated state, the control valve 10 does not provide any extinguishant release passageways through the control valve 10. In this condition, the pressurised extinguishant is contained within the cylinder 22. The detector tube 16 is attached to the first outlet port 14. This port 14 is not solely an outlet but freely provides for fluid flow in both directions. The detector tube 16 is pressurised such that the pressure in the detector tube 16 and the associated detector chamber 40 urges the valve member 30 into a closed position.

The valve body 11 also defines a primed chamber 42. This primed chamber 42 is in direct communication with the extinguishant contained within the pressurised cylinder 22. This primed chamber 42 locates on the opposite side of the valve member 30 with respect to the detector chamber 40. Accordingly, the pressure within the primed chamber 42 acts on the first side of the valve member 30 and the pressure within the detector chamber 40 acts on the second opposite side of the valve member 30.

In the initial primed condition, the force created by pressure within the detector chamber 40 is greater than the force created by the pressure within the primed chamber 42. These unbalanced forces result in the valve member 30 being retained in a closed position with the valve member 30 being urged towards the primed chamber 42.

- 14 -

The pressure within the primed chamber 42 acts on a lesser (surface) area of the valve member 30 compared to the pressure within the detector chamber 40. As shown in Figure 1, the valve body 11 includes a central portion 50 to provide a passageway to the second outlet 16. The central portion 50 comprises a
5 cylindrical body which is centrally and concentrically arranged with the respect to the cylindrical body 11 of the valve 10.

The central portion 50 provides a passageway which extends from an entry region 52 to an exit region 54 provided by the second outlet port 16. The entry region 52
10 is surrounded by an annular seal providing an annular sealing face 56. With the control valve 10 in the closed and active position, the annular sealing face 56 is arranged to abut and seal against the valve member 30 to prevent any flow of extinguishant from the cylinder 22/primed chamber 42 into the discharge tube 20. In particular, the annular sealing face 56 is arranged to seal against a sealing face
15 of the sealing component 34 of the valve member 30.

The central portion 50 thereby prevents the valve member 30 from being exposed to a full maximum potential force created by the pressure within the primed chamber 42 to a certain extent. The pressure contained within the primed
20 chamber 42 acts against only an annular area of the valve member 30 defined around this central portion 50 and/or the annular sealing face 56. Accordingly, as mentioned above, the pressure within the primed chamber 42 acts on a significantly smaller surface area compared to the pressure within the detection chamber 40.

25 During installation and activation of the fire suppression system, the detector tube 18 is pressurised. As indicated above, the pressure in the detector tube 18 and hence in the detection chamber 40 must produce a force on the valve member 30 which is great enough to maintain the valve member 30 in a closed position with
30 the sealing face 35 of the sealing component 34 sealing the cylinder contents from the second outlet port 16. The valve member 30 is contained within the body 11 of the valve 10 by a seal 60 comprising an O-ring seal. This seal 60 together with

- 15 -

the valve member 30 effectively partitions the detector chamber 40 from the primed chamber 42.

If the detector tube 18 is exposed to significant heat or fire, then the detector tube
5 18 is arranged to rupture. This rupture enables the pressure contained within the detector tube 18 to be uncontrollably released to the atmosphere. This will cause a rapid decrease in the pressure contained within the detector tube 18 and the detection chamber 40 until the force applied on the valve member 30 from within the primed chamber 42 overcomes the force applied from the detection chamber
10 40. This reversal of the order of the balance of the forces will cause the valve member 30 to move within the body 11 of the control valve 10, as shown in Figure 2. In particular, the valve member 30 will move away from the primed chamber 42 and into or towards the detection chamber 40.

As shown in Figure 2, the movement of the valve member 30 causes the sealing
15 face 35 of the sealing component 34 of the valve member 30 to be spaced from the annular sealing face 56 surrounding the entry region 52 to the passageway of the second outlet port 16. Accordingly, this opens the second outlet port 16 and enables the pressurised extinguishant to be released from the cylinder 22 through
20 the second outlet port 16 and into the discharge tube 20. The discharge tube 20 may have one or more discharge heads to enable the extinguishant to be released at pre-determined locations.

As the valve member 30 moves to the open position, the valve member 30 is
25 arranged to simultaneously open a passageway between the pressurised extinguishant in the cylinder 22 and the detection tube 18. This provides for a simultaneous release of extinguishant to the source of the detected heat/fire as well as a release of extinguishant to the pre-determined locations.

30 The valve member 30 is sealingly contained within the valve body 11 by a seal 60 comprising an O-ring. This O-ring is statically positioned in a groove 61 provided in the internal wall of the valve body 11. This effectively defines a border or

- 16 -

partition between the detection chamber 40 and the primed chamber 42. The valve member 30 is arranged to sealingly move within the O-ring.

As shown in Figure 5, Figure 6 and Figure 7, the second part or carrier component 32 of the valve member 30 includes a first series or array of grooves 70, splines or ribs. These grooves 70 are provided around the outer surface of the carrier component 30. The grooves 70 extend longitudinally down the outer surface for a proportion of the length of the carrier component 32. In particular, the length of these grooves 70 is such that in the closed position, the ends 71 of the grooves 70 (and the entire grooves 70) are spaced apart (below) from the O-ring 60. The other ends 73 of the grooves 70 are open towards the primed chamber 42.

As the valve member 30 moves towards the open position, the distal ends 71 of the grooves 70 will also be moved towards the O-ring seal 60. At a critical position, the ends 71 of the grooves 70 will pass over the seal 60 created by the O-ring 60 and this will then enable fluid to flow from the primed chamber 42 through the grooves 70 and flow past the O-ring seal 60 and into the detection chamber 40.

The carrier member 32 is provided with a second series or array of grooves 74, splines or ribs. These grooves 74 provide a passageway from the distal side of the O-ring seal 60 into a central void 78 and out of the first outlet port 14. Accordingly, this provides a simultaneous activation of a first fire suppression supply through the actual detector tube 18 and out of the rupture, together with a second fire suppression supply through the discharge tube 20 and through the discharge head(s).

If there is a leak or fault within the discharge tube 18 or a change of pressure caused by temperature etc. then this would cause a risk of a release of extinguishant or pressure from the system and the fire suppression system would fail. For example, a slow release of pressure would cause the valve member 30 to slowly open in order for the extinguishant to be released through the discharge

- 17 -

tube 20 and any discharge heads and/or from the site of the leak. The discharge tube 20 and any discharge heads may actually be unpressurised and/or open to allow any free flow of air into and out of the discharge tube 20. Overall, any release or leak or change of pressure in the detection tube 18 could have significant consequences. For example, a slow release of pressure from the detector tube 18 would eventually cause the system to be falsely activated.

The present invention provides an equalising function to automatically re-pressurise the detection tube 18 if the detection tube 18 slowly loses pressure. The valve member 30 includes a first part (carrier component) 32 and a second part (sealing component) 34 wherein the second part 34 is effectively carried and mounted to the first part 32.

The valve member 30 includes a re-pressurising or equalising passageway 90 including an internal valve mechanism. In particular, the carrier component 32 includes a passageway 90 defined therethrough. This passageway 90 co-operates with a passageway 94 provided in the sealing member 34. These two passageways connect to provide a continuous passageway from the primed chamber 42 to the detection chamber 40. However, an internal valve mechanism is arranged to selectively restrict the flow through this connecting passageway.

The internal valve mechanism comprises a ball 94 or spherical valve member which is arranged to seal the connecting passageway 90 on the detection of a fire. In a normal inoperative condition, the ball 90 is contained within the passageway 90 but there is an equalising passageway extending from the detection chamber 40 to the primed chamber 42 such that the pressures will be equalised. As shown in Figure 1, a greater pressure within the detection chamber 40 would only force the ball member 94 away from the tapered or flared sealing surface of the passageway 90. A slight decrease or gradual decrease in the pressure within the detection chamber 40 would not produce a sufficient force or move the ball 94 into engagement with the sealing surface of the passageway 90. Accordingly, a small or gradual decrease in the pressure within the detection chamber 40 will be

- 18 -

equalised by the flow of the pressurised gas from the cylinder 22 and/or the prime chamber 42 through the passageway 90 and into the detection chamber 40. However, on detection of a fire, the detector tube 18 will rupture and will cause catastrophic and rapid decrease in the pressure within the detection chamber 40.

5 This will cause the ball 94 to be moved towards the detection chamber 40 such that the ball 94 creates a seal and prevents any further flow through the passageway 90 defined by the valve member 30. This seal then causes a significant imbalance in pressure such that the pressure within the primed chamber 42 is significantly greater than the pressure within the detection chamber

10 40 since this is now open to the atmosphere. This resulting change in pressure differential causes the force acting on the valve member 30 to be greater from the primed chamber 42 side than the detection chamber 40 side. Accordingly, this causes the valve member 30 to move towards the detection chamber 40 such that two extinguishant release passageways are opened. The first extinguishing

15 passageway relates to the release of the extinguishant from the cylinder 22 through the grooves in the valve member 30 and around the seal and out through the detector tube 18. The second extinguishing passageway relates to the release of the extinguishant from the cylinder 22 through the central portion 50 and to the discharge tube 20 and any discharge heads 21. Accordingly, the movement of the

20 valve member 30 also creates this free passageway of the extinguishant through the discharge tube 20.

Another embodiment of a control valve 10 is shown in Figure 3. This embodiment essentially operates in the same way as described above apart from the equalising

25 passageway. This equalising feature is provided by the second part 34 comprising a resilient sealing member which is normally located within a seat 38 provided in the first part 32. The resilient sealing member 34 comprises a sealing disc member which is mounted on a central shaft. The sealing disc allows the passage of an equalising pressure around the periphery of the sealing disc and to

30 equalising passageways 90 provided in the valve member 30. The carrier part 32 includes a plurality of channels 90 with an exit region 92 in the detection chamber 40 and an entry region 91 located on the seat 38 at a location which would

- 19 -

normally be adjacent to the periphery of the sealing disc 34.

The seat 38 may be normally spaced from the sealing disc 34 by a certain amount (or a predetermined distance) and the edge or periphery of the disc 34 may be spaced from or flexed or deformed such that pressurised fluid (gas) can escape and flow around the edge of the sealing disc 34. This therefore enables gas from within the primed chamber 42 to flow into the detection chamber 40 in a restricted flow. This flow of pressurised gas will tend to maintain substantially equal pressures in the detection chamber 40 and the primed chamber 42. Accordingly, this maintains the integrity of the overall system.

An alternative embodiment of the present invention is shown in Figure 4. The valve essentially works and operates in the same way as the embodiments described above. However, in this alternative version, the detection chamber 40 includes an abutment stop 82 which holds an end of the carrier component 32 in a spaced position from the end of the detection chamber 40. The first outlet 14 then provides exit regions 81, 83 on this stop component 82. Accordingly, in the open, discharging position, the extinguishant flows through the grooves 70 and past the O-ring 60 and then into an annular void 84 surrounding the central stop portion 82. The pressurised extinguishant can then flow from through the exit regions 81, 83 and into the detection tube 18 in order to flow out of the rupture.

A preferred embodiment of a fire suppression system is shown schematically in Figure 8. The fire suppression system comprises a single pressurised cylinder 22 containing an extinguishant. The fire suppression system further comprises a bi-directional valve 10, a pressurised detection tube 18 and an unpressurised discharge tube having discharge heads 21 provided thereon. The discharge heads 21 may be mounted or installed in separate chambers 96, 98 or (partially) concealed locations which may not necessarily receive a release of the extinguishant from the detection tube 18. The discharge heads 21 may be directed towards any essential, critical or expensive components. In this embodiment, a rupture of the detection tube 18 causes the activation of the bi-

- 20 -

directional control valve 10 which simultaneously causes a release of extinguishant from the single cylinder 22 through both the detection tube 18 and the discharge tube 20.

- 5 An alternative embodiment of a fire suppression system is shown in Figure 9. In this embodiment, two separate pressurised cylinders 22 are used with a first cylinder 22 providing the extinguishant to the detection tube 18 and the second cylinder providing the extinguishant to the discharge tube 20. In this embodiment, a direct control valve 66 of Firetrace Limited is mounted to the first cylinder and an
- 10 indirect control valve of Firetrace Limited is mounted to the second cylinder. The system comprises a shared detection tube 18 that extends from the direct valve 66 to the activation port of the indirect valve 68. Accordingly, the rupture of the detection tube 18 will causes the direct valve 66 to activate and the extinguishant from the first cylinder will be released from the detection tube. In addition, the
- 15 rupture of the detection tube 18 will activate the indirect valve 68 such that the extinguishant from the second cylinder will be released through the discharge tube 20 and any associated discharge heads 21. Accordingly, again, in these systems the rupture of the single detection tube 18 causes two extinguishant release passageways to be opened causing extinguishant to be released through the
- 20 actual rupture in the detection tube 18 and through the discharge heads 21.

- 21 -

CLAIMS

1. A fire suppression system comprising extinguishant supply means, a control valve, a detection tube and a discharge tube wherein rupture of the wall of the detection tube causes a release of pressure from within the detection tube and this release of pressure is arranged to open extinguishant release passageways to both the detection tube and the discharge tube in order for extinguishant to be released through both the detection tube and the discharge tube.
2. A fire suppression system according to Claim 1 in which the control valve comprises an equalising passageway to enable pressurised fluid to flow therethrough when a valve member is in a first position.
3. A fire suppression system according to Claim 2 in which the equalising passageway is open when the detection tube is pressurised and the equalising passageway is closed when the detection tube is ruptured.
4. A fire suppression system according to Claim 2 or Claim 3 in which the equalising passageway is arranged to maintain an operating pressure in the detection tube.
5. A fire suppression system according to any preceding claim in which the control valve comprises a body with an inlet, a first outlet port and a second outlet port, the control valve further comprising a valve member movable within the body for opening and closing the extinguishant release passageways between the inlet and both the first outlet port and the second outlet port.
6. A fire suppression system according to Claim 5 in which the valve member is movable between;
 - a first position where the extinguishant release passageways are closed between the inlet and both the first outlet or the second outlet;
 - a second position where the extinguishant release passageways are open

- 22 -

between the inlet and both the first and second outlet ports.

7. A fire suppression system according to Claim 6 in which an equalising
passageway is open when the valve member is in the first position and the
5 equalising passageway is closed when the valve member is in the second
position.

8. A fire suppression system according to Claim 6 or Claim 7 in which the first
outlet port is arranged, in use, to be connected to a detection tube.

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9. A fire suppression system according to any one of Claim 6 to Claim 8 in
which the second outlet port is connected to a discharge tube.

10. A fire suppression system according to any preceding claim in which a body
15 of the valve defines a primed chamber and a detection chamber.

11. A fire suppression system according to Claim 10 in which the primed
chamber is separated from the detection chamber by a valve member and in
which the valve member has a surface area exposed to the pressure in the
20 detection chamber which is greater than a surface area exposed to the pressure in
the primed chamber when the detection tube is pressurised.

12. A fire suppression system according to any preceding claim in which the
detection tube is connected to an auxiliary pressurised cylinder.

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13. A fire suppression system according to any preceding claim in which the fire
suppression system comprise a first control valve and a second control valve.

14. A fire suppression system according to Claim 13 in which the first control
30 valve comprises a direct control valve and the second control valve comprises an
indirect control valve and in which the detector tube is connected to the direct
control valve and also to an activation port of the indirect control valve, wherein a

- 23 -

rupture of the detection tube opens an extinguishant release passageway between a first pressurised cylinder and the detection tube and opens an extinguishant release passageway between a second pressurised cylinder and a discharge tube.

5 15. A valve for use in a fire suppression system in accordance with any preceding claim, the control valve comprising:

a body with an inlet, a first outlet port and a second outlet port; and

a valve member movable within the body for opening and closing extinguishant release passageways between the inlet and both the first outlet port
10 and the second outlet port,

the valve member being movable between;

a first position where the extinguishant release passageways are closed between the inlet and both the first outlet and the second outlet;

a second position where the extinguishant release passageways are open
15 between the inlet and both the first and second outlet ports.

16. A method of providing a fire suppression system comprising providing extinguishant supply means and a control valve, the method comprising installing a detection tube and a discharge tube within a fire prevention area, wherein
20 rupture of the wall of the detection tube causes a release of pressure from within the detection tube and this release of pressure is arranged to open extinguishant release passageways to both the detection tube and the discharge tube in order for extinguishant to be released through both the detection tube and the discharge tube.

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17. A method of providing a fire suppression system according to Claim 16, the method further comprising moving a valve member between;

a first position where the extinguishant release passageways are closed between an inlet and both a first outlet and a second outlet of the control valve;

30 and

a second position where the extinguishant release passageways are open between the inlet and both the first and second outlet ports.

- 24 -

18. A fire suppression system substantially as herein described with reference to, and as shown in, any one of the accompanying Figures.

5 19. A valve for use in a fire suppression system as herein described with reference to, and as shown in, any one of the accompanying Figures.

20. A method of providing a fire suppression system as herein described with reference to, and as shown in, any one of the accompanying Figures.