

PATENT SPECIFICATION (11)

1 357 010

1 357 010

(21) Application Nos. 12698/71 (22) Filed 3 May 1971
43474/71 17 Sept. 1971

(23) Complete Specification filed 21 April 1972

(44) Complete Specification published 19 June 1974

(51) International Classification A62C 35/02

(52) Index at acceptance
A5A 14E2 14E5 4 7

(72) Inventor FRANK CHARLES LOCKWOOD

(19)



(54) FIRE-EXTINGUISHING APPARATUS

(71) We, CHUBB FIRE SECURITY LIMITED, formerly known as The Pyrene Company Limited, a British company of Pyrene House, Sunbury-on-Thames, Middlesex, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

In some forms of equipment housed in casings or compartments there is a serious risk of fire. Examples of such equipment include television receivers, particularly colour television receivers, radio apparatus, computers, photocopiers and business machinery, housed in cabinets. Another example is an engine housed in an engine compartment. Our object is to provide a cheap automatic fire extinguisher suitable for permanent mounting in such a casing or compartment.

A fire extinguisher according to the invention comprises a tube having a tube wall of thermoplastics material and containing a fire extinguishing liquid under pressure, the tube being flexible substantially throughout its length so as to permit its path to be shaped as desired and having an external surface which is exposed substantially throughout its length, the tube thus constituting a continuous detector and extinguisher along the said path, the said pressure and the strength of the tube wall being such that the tube resists the pressure of the liquid at normal ambient temperatures but softens and bursts at any point along its length when the said point is subjected to a temperature developed by a fire to thereupon release the contained liquid at that point. The expression "continuous detector and extinguisher" is intended to indicate that the tube is an uninterrupted line detector and also an uninterrupted line dispenser for the extinguishant. It is highly advantageous to have continuous protection and uninterrupted availability of extinguish-

ant along a line, rather than protection and extinguishant at a series of points within the apparatus to be protected. The strength of the tube wall will depend, for example, on the material used for the tube, its thickness and its curvature in transverse cross-section. When such an extinguisher is in use in apparatus to be protected, whatever the fire occurs within the protected space there the tube will soften and will burst and the extinguishant will be directed on to the seat of the fire. The tube is mounted so as to pass over the main points of risk in the apparatus; in general, these points are not located in a straight line and so the tube is usually mounted in a curved or curled configuration.

The extinguisher may also comprise a pressure or heat-sensitive isolating device such as a pressure switch or a fuse; the isolating device can be connected to the electronic equipment or engine housed in the casing or compartment so as to stop the operation of the equipment or engine in case of fire. The isolating device may alternatively or additionally raise an alarm when the pressure in the tube falls.

Thus, in one arrangement a pressure switch closes one end of the tube and is normally held closed by the pressure within the tube but it is biased to open once the pressure falls below a predetermined value. This pressure loss may be due to the bursting of the tube as a consequence of fire or may be due to leakage if the tube is not properly sealed. The equipment or engine is therefore unable to operate when, due to loss of pressure within the extinguisher, it is not properly safeguarded.

For larger spaces, for example for large engine compartments (particularly if there is a forced draft which cannot be switched off), the tube itself may not contain sufficient extinguishing liquid. To overcome this difficulty the tube may be connected at one end to a reservoir bottle. This arrangement

still provides the same advantage of a continuous detector, permanently mounted, and dispensing of the fire extinguishant directly on to the seat of the fire.

- 5 In apparatus of the kind in question, and particularly in a television receiver, there are usually one or two specific points of risk, that is to say, points at which hot spots may develop and lead to fire. A tube according to the invention extends close to, and preferably just above, any such known points of risk. The tube should be long enough to extend across all or substantially all the electronic equipment in the cabinet or casing, and it may be looped or curved to come close to any specific point of risk.

- 10 The fire extinguishant is introduced into the tube in a liquid state, and to allow for expansion of it in the tube under normal fluctuations of temperature it is desirable not to fill the tube completely but to allow an ullage space. Preferably, the tube is transparent or sufficiently translucent to permit verification that it is charged ready for use by visual inspection.

- 15 A suitable thermoplastic material for the tube is nylon, for example Nylon 6.6. This material is strong at normal ambient temperatures but is weakened sufficiently under fire conditions to release the contents of the tube if these are at about 200 p.s.i. or more. The ends of the tube may be fusion-sealed or ultrasonically welded.

- 20 The liquid should have so high a vapour pressure at the expected temperature of the fire as to expel the fluid quickly.

- 25 A suitable fire-extinguishing liquid is bromo chloro difluoro methane, known as B.C.F., which has a b.p. of -4°C . At 20°C its vapour pressure is 38 p.s.i. (absolute) and at 90°C its vapour pressure is 215 p.s.i. Thus, if this liquid is used as the fire extinguishant the tube must be sufficiently strong to withstand 38 p.s.i. and more at all ordinary ambient temperatures but be ruptured by the pressure developed at the expected temperatures of the fire.

- 30 In some cases, when B.C.F. is used, local heating does not raise the pressure in the tube sufficiently to produce a rapid enough discharge. For such cases, the detector tube should be located at the top of the space to be protected so that on the occurrence of a fire the tube is heated substantially over its whole length; softening and bursting still occur selectively over the hottest part of the apparatus.

- 35 The detection time of the device can be shortened and the temperature at which it will operate can be reduced by adding to the extinguishant a suitable compatible liquid which has a lower boiling point. As an example, when B.C.F. is used as the extinguishant, the mixture within the tube may consist of 80% B.C.F. and 20% "Arcton"

12 ("Arcton" is a Registered Trade Mark).

An alternative extinguishant liquid which may be used is dibromo tetrafluoro ethane, the boiling point of which is 47°C and the vapour pressure of which at 90°C is 50 p.s.i. If this or any similar liquid of relatively low vapour pressure is used, it is desirable additionally to introduce a low boiling point liquid, as proposed for B.C.F., or a gas under pressure, preferably an inert gas such as nitrogen, so as to provide an initial pressure which is increased by the rise in vapour pressure of the liquid if fire occurs.

In order that the invention may be better understood, some examples of extinguishers embodying the invention and apparatus incorporating such extinguishers will now be described with reference to the accompanying drawings, in which:—

Figure 1 shows an extinguisher suitable for a television set;

Figure 2 illustrates an extinguisher suitable for an engine compartment;

Figures 3 and 4 show diagrammatically typical arrangements of extinguisher tubes embodying the invention in television sets; and

Figure 5 shows a typical arrangement of an extinguisher tube embodying the invention in an engine compartment.

In Figure 1, an extinguisher 3 consists of a clear flexible tube 4 of plastics material which is filled with a halogenated hydrocarbon of which the vapour pressure increases substantially in the temperature range from room temperature upwards, for example with B.C.F. A tube having a length of 1520 mm. and an outer diameter of 6.35 mm. may require about 40 grammes of B.C.F., the liquid level being indicated by the line 5 in Figure 1. For such a tube, the maximum working temperature is about 60°C . In the example shown, one end 6 of the tube is closed by being ultrasonically sealed and at the other end of the tube there is a pressure switch 7 having electrical contacts 8. The pressure within the tube normally acts on the pressure switch to hold the latter open, i.e. to break the circuit between the contacts 8. When the pressure falls the switch closes to complete the electrical connection between the contacts 8 within the switch and, as stated earlier, this may be used to isolate the apparatus from the electrical supply or to raise an alarm.

The extinguisher shown in Figure 2 is intended for apparatus such that a fire outbreak might require more extinguishant than is present in a tubular detector of the kind shown in Figure 1. In Figure 2, a tube 4 similar to that shown in Figure 1 has one end connected to the outlet of a steel reservoir bottle 9, containing a backing supply of the extinguishant liquid. As before, the tube is made to run over the points of risk in the

apparatus to be protected and if a fire breaks out under one portion of the tube this portion will soften and burst. The extinguishant in the tube will then be ejected on to and around the seat of the fire and fresh extinguishant from the reservoir will take the place of that expelled from the tube and will in turn be ejected on to the fire. A pressure indicator 10 is arranged on the reservoir bottle 9 in the example shown in the drawing.

The end 11 of the continuous detection-dispenser tube 4 may be sealed, as shown in the drawing, or it may complete a ring circuit back to the reservoir.

Figure 3 shows diagrammatically the back of a television set. The main cabinet 15 has a projecting portion 16 housing most of the components associated with the cathode ray tube (not shown) and a further projecting portion 17 to accommodate the end of the cathode ray tube. The extinguisher 3, in the example shown, extends along the top of the space inside the projection 16. In the example shown in Figure 4, however, the extinguisher 3 is looped around the upper space of the whole of the casing, including the main cabinet 15 and the projecting portion 16.

In Figure 5, an extinguisher of the kind shown in Figure 2 consisting of a tube 4 and reservoir 9 is placed in the engine compartment 20 of a small boat 21.

WHAT WE CLAIM IS:—

1. A fire extinguisher comprising a tube having a tube wall of thermoplastics material and containing a fire extinguishing liquid under pressure, the tube being flexible substantially throughout its length so as to permit its path to be shaped as desired and having an external surface which is exposed substantially throughout its length, the tube thus constituting a continuous detector and extinguisher along the said path, the said pressure and the strength of the tube wall being such that the tube resists the pressure of the liquid at normal ambient temperatures but softens and bursts at any point along its length when the said point is subjected to a temperature developed by a fire to thereupon release the contained liquid at that point.

2. A fire extinguisher in accordance with claim 1, additionally including a pressure or heat-sensitive isolating device for connection to equipment with which the fire extinguisher is housed.

3. A fire extinguisher in accordance with claim 2, in which the isolating device is a

pressure switch which closes one end of the tube, the switch being normally held open or closed by the pressure within the tube, the extinguisher further including biasing means arranged to close or open respectively the pressure switch once the pressure falls below a predetermined value.

4. A fire extinguisher in accordance with claim 1, 2 or 3, in which the closed tube is of Nylon 6.6.

5. A fire extinguisher in accordance with any one of claims 1—4, in which the tube is of a material permitting the passage of light to such an extent that the presence of the extinguishing liquid can be determined by visual inspection.

6. A fire extinguisher in accordance with any one of the preceding claims, in which the fire extinguishing liquid is bromo chloro difluoro methane.

7. A fire extinguisher in accordance with any one of claims 1—4, in which the fire extinguishing liquid is dibromo tetrafluoro ethane.

8. A fire extinguisher in accordance with claim 7, in which the tube is partially filled with the fire extinguishing liquid and in which an inert gas is also present.

9. A fire extinguisher in accordance with any one of claims 1—7, in which the tube is partially filled with a fire extinguishing liquid to which has been added a compatible low boiling point liquid.

10. Fire extinguishing apparatus including a fire extinguisher in accordance with any one of claims 1—9, and further including a reservoir of the fire extinguishing liquid having an outlet connected with an end of the said tube so as to supply the tube with further fire extinguishing liquid when the tube has burst at some point along its length.

11. A casing or compartment housing equipment or an engine and including a fire extinguisher in accordance with any claim appendant to claim 2, or including fire extinguishing apparatus according to claim 10, as appendant to claim 2, in which the isolating device has means for connection to the equipment or engine housed in the casing or compartment and operative to stop the operation of the equipment or engine or to initiate an alarm in case of fire.

12. A television set including a fire extinguisher in accordance with any one of claims 1—9.

13. An engine compartment including a fire extinguisher in accordance with any one of claims 1—9.

14. A fire extinguisher in accordance with claim 1, substantially as herein de-

65

70

75

80

85

90

95

100

105

110

115

120



* C L M S *

apparatus to be protected and if a fire breaks out under one portion of the tube this portion will soften and burst. The extinguishant in the tube will then be ejected on to and around the seat of the fire and fresh extinguishant from the reservoir will take the place of that expelled from the tube and will in turn be ejected on to the fire. A pressure indicator 10 is arranged on the reservoir bottle 9 in the example shown in the drawing.

The end 11 of the continuous detection-dispenser tube 4 may be sealed, as shown in the drawing, or it may complete a ring circuit back to the reservoir.

Figure 3 shows diagrammatically the back of a television set. The main cabinet 15 has a projecting portion 16 housing most of the components associated with the cathode ray tube (not shown) and a further projecting portion 17 to accommodate the end of the cathode ray tube. The extinguisher 3, in the example shown, extends along the top of the space inside the projection 16. In the example shown in Figure 4, however, the extinguisher 3 is looped around the upper space of the whole of the casing, including the main cabinet 15 and the projecting portion 16.

In Figure 5, an extinguisher of the kind shown in Figure 2 consisting of a tube 4 and reservoir 9 is placed in the engine compartment 20 of a small boat 21.

WHAT WE CLAIM IS:—

1. A fire extinguisher comprising a tube having a tube wall of thermoplastics material and containing a fire extinguishing liquid under pressure, the tube being flexible substantially throughout its length so as to permit its path to be shaped as desired and having an external surface which is exposed substantially throughout its length, the tube thus constituting a continuous detector and extinguisher along the said path, the said pressure and the strength of the tube wall being such that the tube resists the pressure of the liquid at normal ambient temperatures but softens and bursts at any point along its length when the said point is subjected to a temperature developed by a fire to thereupon release the contained liquid at that point.

2. A fire extinguisher in accordance with claim 1, additionally including a pressure or heat-sensitive isolating device for connection to equipment with which the fire extinguisher is housed.

3. A fire extinguisher in accordance with claim 2, in which the isolating device is a

pressure switch which closes one end of the tube, the switch being normally held open or closed by the pressure within the tube, the extinguisher further including biasing means arranged to close or open respectively the pressure switch once the pressure falls below a predetermined value.

4. A fire extinguisher in accordance with claim 1, 2 or 3, in which the closed tube is of Nylon 6.6.

5. A fire extinguisher in accordance with any one of claims 1—4, in which the tube is of a material permitting the passage of light to such an extent that the presence of the extinguishing liquid can be determined by visual inspection.

6. A fire extinguisher in accordance with any one of the preceding claims, in which the fire extinguishing liquid is bromo chloro difluoro methane.

7. A fire extinguisher in accordance with any one of claims 1—4, in which the fire extinguishing liquid is dibromo tetrafluoro ethane.

8. A fire extinguisher in accordance with claim 7, in which the tube is partially filled with the fire extinguishing liquid and in which an inert gas is also present.

9. A fire extinguisher in accordance with any one of claims 1—7, in which the tube is partially filled with a fire extinguishing liquid to which has been added a compatible low boiling point liquid.

10. Fire extinguishing apparatus including a fire extinguisher in accordance with any one of claims 1—9, and further including a reservoir of the fire extinguishing liquid having an outlet connected with an end of the said tube so as to supply the tube with further fire extinguishing liquid when the tube has burst at some point along its length.

11. A casing or compartment housing equipment or an engine and including a fire extinguisher in accordance with any claim appendant to claim 2, or including fire extinguishing apparatus according to claim 10, as appendant to claim 2, in which the isolating device has means for connection to the equipment or engine housed in the casing or compartment and operative to stop the operation of the equipment or engine or to initiate an alarm in case of fire.

12. A television set including a fire extinguisher in accordance with any one of claims 1—9.

13. An engine compartment including a fire extinguisher in accordance with any one of claims 1—9.

14. A fire extinguisher in accordance with claim 1, substantially as herein de-

65

70

75

80

85

90

95

100

105

110

115

120



scribed with reference to Figures 1 or 2 of the accompanying drawings.

15. A casing or compartment in accordance with claim 11, substantially as herein
5 described with reference to Figures 3, 4 or 5 of the accompanying drawings.

For the Applicants:
GILL, JENNINGS & EVERY,
Chartered Patent Agents,
51/52, Chancery Lane,
London, WC2A 1HN.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1974.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,
from which copies may be obtained.