Dec. 30, 1969 D. K. GOODLOE ET AL 3,486,562

FIRE PREVENTION, DETECTION AND EXTINGUISHING SYSTEM

Filed March 8, 1968

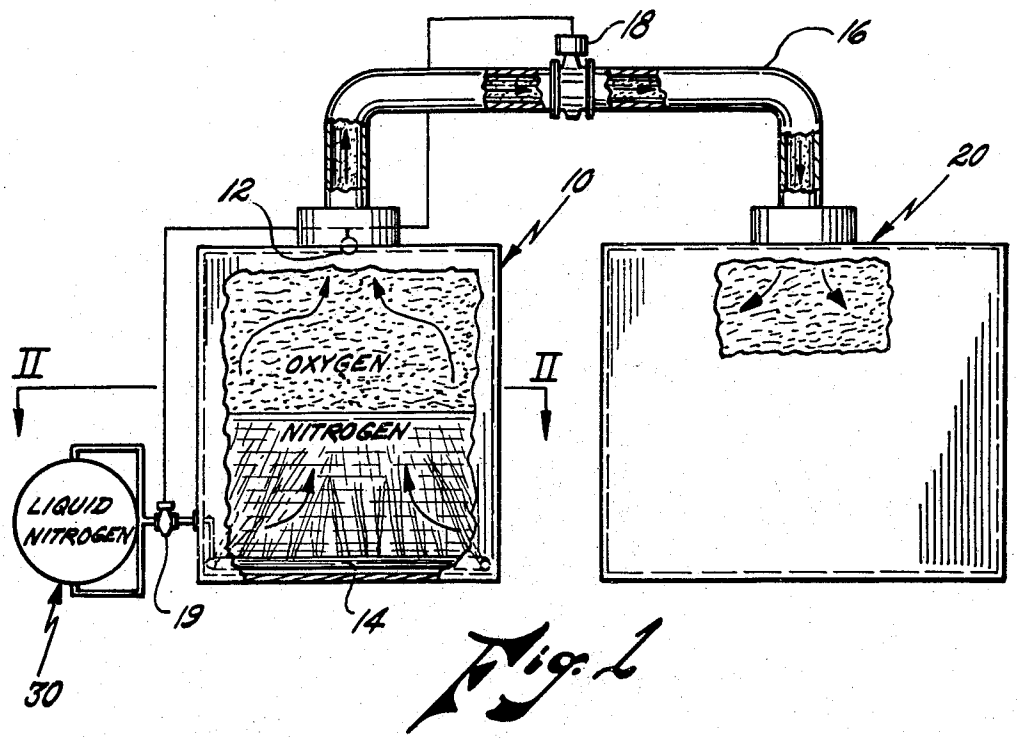


Fig. 1

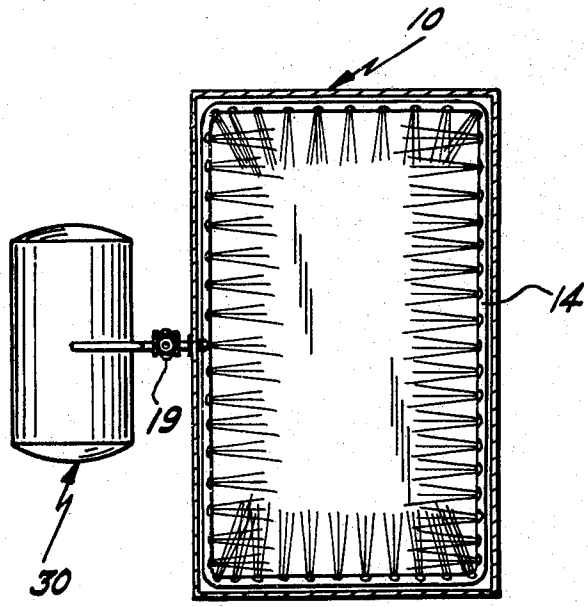


Fig. 2

INVENTORS
DAVID K. GOODLOE
JIMMY W. MARSHALL
BY Harry A. Herbert Jr. and
Arsen Tashjian
ATTORNEYS

United States Patent Office 3,486,562 Patented Dec. 30, 1969

3,486,562

FIRE PREVENTION, DETECTION AND EXTINGUISHING SYSTEM

David K. Goodloe, 223 Rock Valley Drive 78227, and Jimmy W. Marshall, 138 Nancy Place 78204, both of San Antonio, Tex.

Filed Mar. 8, 1968, Ser. No. 711,562
Int. Cl. A62c *1/14*; B64d *13/02*
U.S. Cl. 169—11 2 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus for detecting and extinguishing a fire in an enclosed environment. When a preselected temperature is reached in the enclosed environment, a heat sensor activates means for evacuating the gaseous contents of the enclosed environment to an accumulator which is at a much lower pressure than the enclosed environment. At the same time, means are provided for cutting off air and power to the enclosed environment, while nitrogen is being introduced into the enclosed environment in place of the evacuated gases.

BACKGROUND OF THE INVENTION

This invention relates to an apparatus for detecting and extinguishing a fire in an enclosed environment.

This invention is particularly well suited for use in a flash-fire type environment, such as the pure oxygen atmosphere used in space capsules, altitude chamber simulators, and the like.

It may be stated, fairly and accurately, that prior art automatic apparatuses for detecting and extinguishing fires have not been extensively utilized in enclosed environments. In fact, in connection with the inherently dangerous pure oxygen atmosphere used in the Apollo command module, it should be noted that only portable, or manually operated, fire extinguishing apparatuses have been made available. The reason for the failure to use an automatic fire extinguishing apparatus in even that flash-fire type enclosed environment appears to be the consistently successful operations carried out in that environment. However, there have been notable and tragic exceptions, such as the conflagration which killed three American astronauts in January of 1967.

Even in flash-fire type of enclosed environments, the philosophy has been to attempt to prevent initiation of combustion, rather than to extinguish the fire. These attempts have included: Precluding the temperature in the enclosed environment from rising excessively; minimizing the use of flammable materials in the enclosed environment; spacing the flammable materials; keeping the flammable materials away from possible fire sources, such as electric wiring and electrical connectors; heavily insulating electric wiring and connectors to prevent sparking, arcing or the like; and keeping the pressure of the enclosed environment as low as possible, since an increase in pressure increases the rate of flame propagation and, in some cases, also lowers the ignition temperature.

Our invention obviates these peripheral techniques and directly attacks and resolves the problem of preventing, or of detecting and extinguishing, a fire in an enclosed environment, even of the pure oxygen flash-fire type.

SUMMARY OF THE INVENTION

This invention provides for an apparatus for detecting and quickly extinguishing a fire in an enclosed environment.

Therefore, an object of this invention is to sense a preselected increase in temperature in the enclosed environment.

Another object of this invention is to provide an apparatus which is responsive to an in-being combustion.

Still another object of this invention is to provide an apparatus for extinguishing a fire in an enclosed environment.

A further object of this invention is to provide an automatic fire detecting and fire extinguishing system which, because of its simplicity and reliability, is ideally suited for use in a flash-fire type of enclosed environment, such as a pure oxygen atmosphere.

These, and still other objects of this invention, will become readily apparent after a consideration of the description of the invention and of the drawings.

DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a front elevation view, partially fragmented, in schematic form, of a preferred embodiment of the invention; and

FIGURE 2 is a partial cross sectional view, taken along line II—II, of FIGURE 1.

DESCRIPTION OF THE EMBODIMENT

With reference to FIGURE 1, altitude chamber simulator **10** contains a heat sensor **12**, such as a detector of the infrared type, set to activate at a preselected temperature. Wholly within simulator **10** is spray bar **14** connected to liquid nitrogen source **30**, which is external to simulator **10**. A hollow, conduit-like member **16** connects an outlet port on simulator **10** with an inlet port on accumulator **20**. A gas impervious valve **18** is positioned to control the flow of gas through conduit-like member **16**.

With reference to FIGURE 2, spray bar **14** is perforated to admit into simulator **10** a spray of nitrogen from liquid nitrogen source **30**. Valve **19** is positioned to control the flow of the nitrogen.

The inlet and the outlet of enclosed environment **10** are located, relative to each other, to promote purging.

It may be assumed, for the purpose of discussion, that simulator **10** is at an internal pressure equivalent to an altitude of 18,000 feet and that it contains an atmosphere of 100% pure oxygen; and, that accumulator **20** is at an internal pressure equivalent to an altitude of 40,000 feet.

MODE OF OPERATION OF THE PREFERRED EMBODIMENT

When the preselected temperature is reached in the enclosed environment defined by simulator **10**, heat sensor **12** activates valve **18** to its open position. Valve **18** may be of the conventional electrically operated solenoid type.

As a result of the difference in pressures in simulator **10** and accumulator **20**, the gaseous contents, pure oxygen in this assumed case, flow rapidly from simulator **10** to accumulator **20**, through conduit-like member **16**.

Simultaneously, while the oxygen atmosphere is being evacuated from simulator **10**, liquid nitrogen from external source **30** is introduced into simulator **10** through perforations in spray bar **14**. Valve **19** is activated and operates in the same manner as valve **18**.

The nitrogen vaporizes and acts as a cooling agent. In addition, since it is nonreactive under the existing circumstances, it will not support combustion.

While there has been shown and described the fundamental features of the invention, as applied to the preferred embodiment, it is understood that various substitutions and omissions may be made by those skilled in the art without departing from the spirit of the invention. For example: Other nonreactive or inert gases, such as helium, could be substituted for nitrogen. In addition, a number of means could be included, such as: (a) means for automatically cutting-off the source of oxygen when the preselected temperature is sensed; (b) means for shutting-off

electric power to all instruments and the like within the simulator when the preselected temperature is sensed; (c) means for preventing the pressure within the simulator from falling, during evacuation, below 3.5 p.s.i., which is the pressure generally accepted by medical authorities as the minimum to support human life; and (d) means for giving a visual or audible warning signal, either external to or within the simulator, when the preselected temperature is sensed.

It is, of course, also understood that, although a simulator has been used in describing this invention, a simulator is but only one of many types of enclosed environments and that the invention may be used in any enclosed environment.

What is claimed is:

1. An apparatus for detecting and extinguishing a fire in an enclosed environment with an inlet and an outlet, comprising:

(a) an accumulator, at a substantially lower pressure than said enclosed environment, with a suitably located inlet;

(b) a hollow, conduit-like member connecting the outlet of the enclosed environment with said inlet of said accumulator;

(c) a gas impervious valve to control the flow of gas from the enclosed environment to said accumulator through said conduit-like member;

(d) means for sensing a preselected temperature in the enclosed environment;

(e) means for opening said valve to permit the flow of gas from the enclosed environment to said accumulator when said preselected temperature is sensed;

(f) a source of liquid nitrogen external to the enclosed environment with said source connected to the inlet of the enclosed environment; and

(g) means for introducing nitrogen into said enclosed environment from said nitrogen source when said valve is opened.

2. The apparatus, as set forth in claim **1**, wherein said means for introducing said nitrogen into said enclosed environment includes a hollow member, within and at the base of said enclosed environment, said hollow member being perforated to permit the passage of nitrogen and configurated to conform to the periphery of the base of said enclosed environment.

References Cited

UNITED STATES PATENTS

3,438,445 4/1969 MacCracken ---------- 169—1

M. HENSON WOOD, JR., Primary Examiner

MICHAEL Y. MAR, Assistant Examiner

U.S. Cl. X.R.

98—1.5; 244—1