Aug. 21, 1962 P. MULTIN 3,050,134

MEANS FOR PROTECTING CONSTRUCTIONS AND BUILDINGS AGAINST THE RISK OF FIRE

Filed April 15, 1960 2 Sheets-Sheet 1

Fig:1

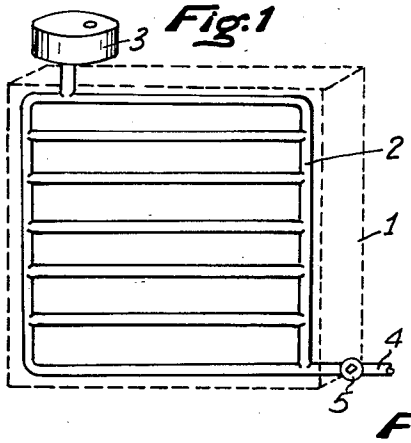


Fig:2

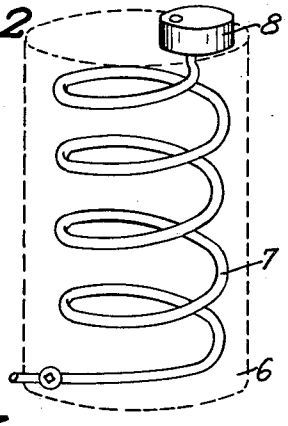


Fig:3

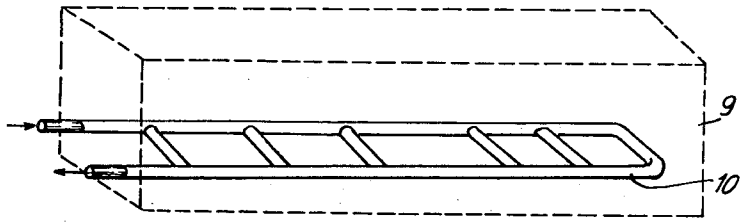


Fig:4

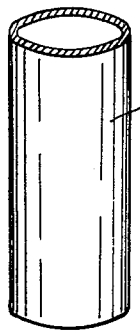


Fig:5

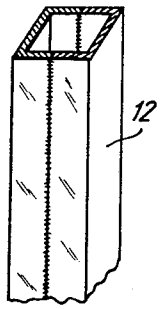


Fig:6

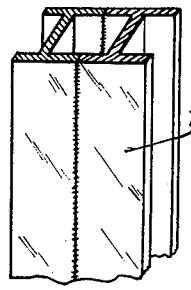


Fig:7

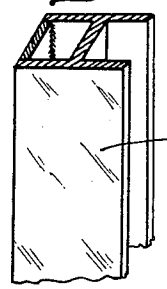
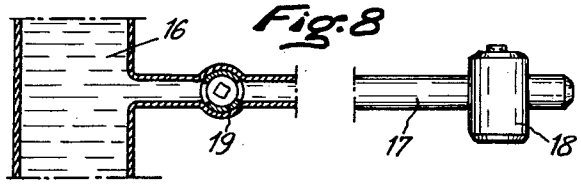


Fig:8



INVENTOR

PAUL MULTIN

By Linton and Linton

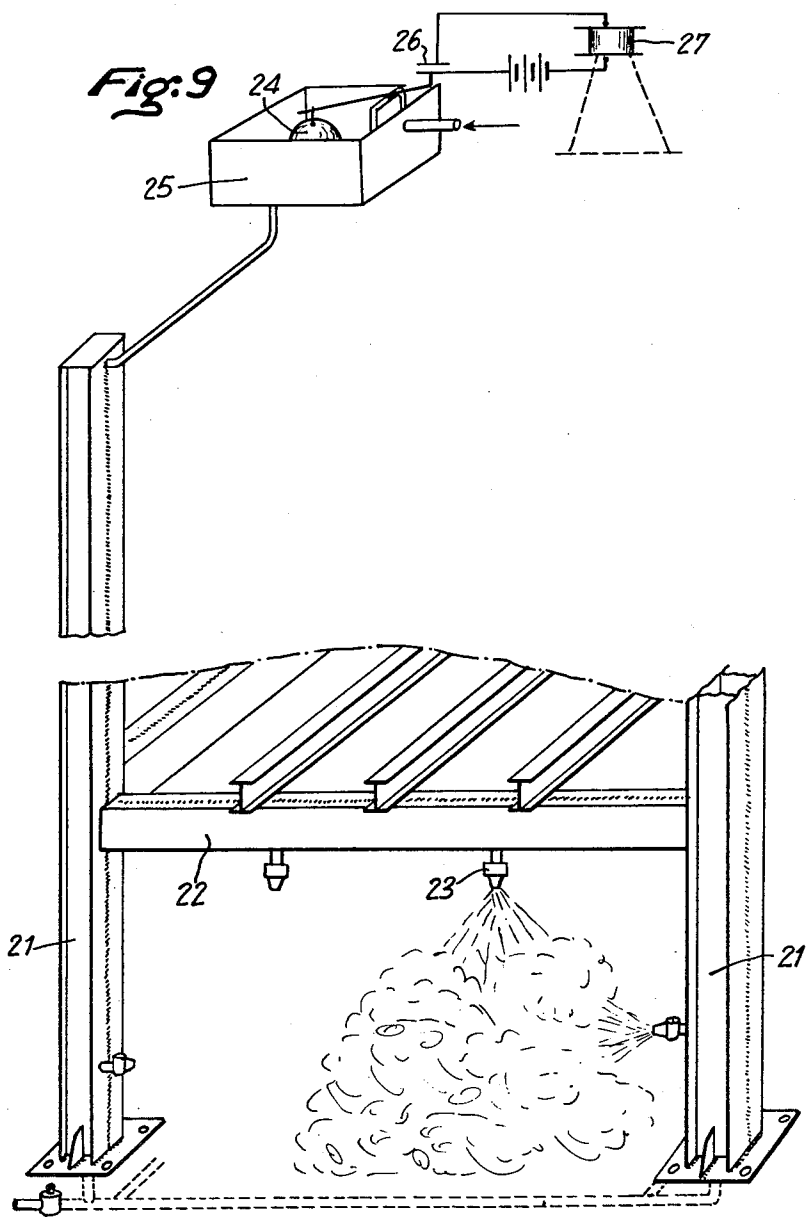
ATTORNEYS

Aug. 21, 1962 P. MULTIN 3,050,134

MEANS FOR PROTECTING CONSTRUCTIONS AND BUILDINGS AGAINST THE RISK OF FIRE

Filed April 15, 1960 2 Sheets-Sheet 2

Fig. 9



INVENTOR

PAUL MULTIN

By Linton and Linton

ATTORNEYS

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3,050,134

MEANS FOR PROTECTING CONSTRUCTIONS AND BUILDINGS AGAINST THE RISK OF FIRE

Paul Multin, 49 Blvd. du Lycee, Vanves, France

Filed Apr. 15, 1960, Ser. No. 22,524
Claims priority, application France Apr. 17, 1959
2 Claims. (Cl. 169—5)

This invention relates to means for protecting constructions and buildings against the risk of uncontrolled fires.

The constructions and buildings to which this invention is applicable comprise notably the framework structures and other frame elements of buildings, fire partitions and bulkheads, ship's bulkheads and other structural elements of transport vehicles, as well as the walls and partitions of machines, apparatus and control rooms, and any other constructions wherein fire protection is required.

It is a well-known fact that the walls, partitions and frameworks of constructions and buildings, even if they are made from completely fireproof materials, are deteriorated as a consequence of the deformation caused by excessive heating in case of moderate or limited fire, and that these constructions and installations are completely destroyed in case of serious fire.

Whereas fire-protection as usually contemplated is based upon the action of fire-detecting and extinguishing means which is directed from outside the elements to be protected, the principle of this invention consists in protecting these elements from within against any abnormal temperature increase, by simply incrementing their thermal capacity.

In other words, this result is obtained by providing within the elements to be protected (for example walls, beams, posts, columns, etc.) cavities adapted to receive a mass of liquid, notably water, free to circulate through these cavities for conveying the absorbed heat to another place.

A satisfactory means or ensuring both a reliable watertightness and a good transfer of heat to the liquid consists in forming these cavities with a metal wall, preferably of steel, if this condition is not already met by construction.

This principle is the same as that governing the water circulation of water-cooled furnaces but whereas this principle was applied up to now only to controlled fires the present invention provides a method and means for applying it to uncontrolled fires such as the seats of fires.

The water circulation may be obtained by resorting to the well known thermo-siphon method (utilizing the natural convection phenomenon) or to the forced-convection system wherein the water level is maintained by supplying water under pressure through the inlet of each cavity. In the first case the heat absorbed is distributed throughout the liquid mass and dissipated if the thermal flux is relatively low; in the other case the circulation is activated by introducing cold water into the cavities as a substitute for the heated water, this action being controlled automatically by the fire itself, if desired.

It may be noted that if the boiling point were attained the physical phenomenon of the transformation of water into steam will take place under constant temperature conditions if the pressure is constant (for example the atmospheric pressure). Therefore, the wall temperature will also remain constant without increasing as long as there is liquid in contact with the heated surfaces. Then the thermal flux is dissipated wholly or partly with the steam thus generated. Thus, a pan can withstand the action of a fire as long as it contains water, but is rapidly destroyed after the liquid has evaporated.

It may also be noted that various proposals have already been made with a view to incorporate water in different materials utilized in constructions for fire-protection purposes. But exhaustive tests proved that the water evaporation caused a systematic destruction of the protection materials as well as the concomitant neutralization of their fire-resisting properties.

This invention differs from this prior means in that water is used in a free state with the possibility of circulating in for renewing the liquid in the heated zones and simultaneously dissipating a thermal flux, irrespective of its magnitude, by increasing the liquid output thus circulated.

With the foregoing and other objects in view, the invention resides in the novel arrangement and combination of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed may be made within the scope of what is claimed without departing from the spirit of the invention.

Other objects and advantages will become apparent from the following description taken in conjunction with the accompanying drawings in which:

FIGURE 1 is a diagrammatic elevational view showing a wall protected according to the method of this invention;

FIGURE 2 is a similar fire-protection applied to a concrete column or post;

FIGURE 3 illustrates the same fire-protection in the case of a horizontal beam or girder;

FIGURES 4 to 7 are typical examples of the use of posts made from tubular and other compound sections with a view to form a water-circulation duct;

FIGURE 8 illustrates diagrammatically the use of the fire-protection method of this invention for spraying water directly onto the seat of the fire, and

FIGURE 9 illustrates the application of the method to the main structural elements of a construction.

Embedded in the wall material **1** (FIG. 1) is a tubular network **2** filled with water. This network may consist of a series of horizontal or inclined parallel tubes connected at their ends to manifolds or headers, but tubes arranged in the fashion of a grid or coiled tubes may also be used. The reference numeral **3** designates an expansion chamber provided for compensating the tube expansion as well as the water expansion, and also for venting any steam produced therein.

A draining device is provided at the bottom of the network to permit maintenance, modifications and repairs works to be carried out, this device comprising for example a drain pipe **4** and a drain cock **5**.

FIGURE 2 shows a column or post **6** adapted to be protected by embedding or incorporating therein a circuit or network **7** forming in this example a coil and provided with an expansion chamber **8**.

FIGURE 3 illustrates another typical application of this invention to a beam **9** in which a tubular circuit **10** is embedded.

It will be noted that the water circulation pipes are preferably placed as close as possible to the walls in order to protect the maximum volume of material against the detrimental action of high temperatures and also to maintain the surface temperature of the structure to the lowest possible value. It may also be noted that the water-circulation tubes of this invention may also act as reinforcements in the construction in order to participate in the resistance thereof.

Instead of incorporating water-circulation circuits in the walls of different materials, the framework itself may be used to constitute water "tanks" intended for increasing the thermal capacity of the construction. Thus, all steel

sections adapted to constitute tubular or hollow elements may be rendered fluid-tight by welding, so that in many instances a meshed tubular network of the type set forth hereinabove may be obtained by simply filling the structural metal elements with water and interconnecting them by means of adequate pipe lines.

FIGURES 4 to 7 of the drawing illustrate the use of a column or post **11** made from steel tubular stock, of a post **12** made from two U-sections welded to each other along their free edges, of another post **13** consisting of two I-sections disposed side by side and welded to constitute a water-tight cavity, and of a compound post comprising an I-section having welded thereon between two registering edges a flat iron **15** also with a view to form a water-tight cavity.

The water circuits formed in the walls of a building, of a ship or of any other construction or installation may be used for feeding a fire-protection equipment of the type adapted to spray liquid against an external fire. Thus, FIG. 8 shows a water-containing cavity **16** connected through a duct **17** to one or more automatic spray-nozzles **18** under the control of a gate valve **19** controlled automatically by a fire-detector of any suitable and known type (not shown). When the equipment for fighting an external seat of fire is released it causes at the same time the circulation of water in the adjacent cavities likely to be exposed to the fire and this circulation will improve the protection.

FIG. 9 illustrates diagrammatically the protection of the essential elements of a metal framework consisting of posts **21** and beams **22**. The reserve of water stored in the framework is also adapted on the other hand to feed water to fire-extinguishing spray nozzles **23**. It will be noted that with this protection system it is possible not only to dispense with the installation of a conventional fire-protection network but also to utilize it for operating an alarm device. Indeed, a float valve **24** feeding the expansion chamber **25**, in case of decrease in the water level, will actuate automatically a switch **26** controlling the energization of a siren or other alarm device **27**, the water in the protection network being renewed indefinitely and the thermal capacity maintained indefinitely.

In many cases the invention is applicable not only to new constructions but also to existing constructions by resorting only to extremely simple modifications. Thus, in frequent instances metal sections may be closed to provide the necessary cavities, for example by adding sheet metal plates even of very moderate thickness.

The resistance to freezing may be obtained by adding an anti-freezing mixture to the water kept in the construction.

The mass of water thus maintained in a construction may also serve as an auxiliary medium having for example air-conditioning and sound-deadening properties, due to its thermal inertia and its inherent physical properties.

It will be appreciated that the present invention should not be construed as being limited to the few forms of embodiment described hereinabove with reference to the accompanying drawings, as many modifications and alterations may be brought thereto without departing from the spirit and scope of the invention. Similarly, other applications may be contemplated without departing from the principles of this invention. Thus, an application likely to prove particularly interesting is the protection of ships, notably oil tankers. As a matter of fact, with this invention it becomes very easy on board of a ship and even of an oil tanker to limit the consequences of a fire, even a very important one, by equipping the ship with fire-proof bulkheads constructed according to the teachings of this invention and having a practically unlimited resistance so as to ensure a complete safety for the crew and also for that portion of the cargo where the fire has not caught. These bulkheads may consist of metal, box-section elements in which a very large stream of water may be circulated immediately in case of fire.

Other modifications and applications will readily occur to anybody conversant with the art without departing from the spirit and scope of the invention as set forth in the appended claims.

I claim:

1. A heat-resistant frame for a building comprising vertical columns, horizontal girders connecting said columns, said columns and girders having internal cavities extending the length thereof in complete free communication one with the others entirely within said columns and girders, a heat absorbing liquid filling said cavities at all times and means for supplying said liquid under pressure to said cavities, connected to the lowermost end of at least one of said columns and extending under the supporting surface for said columns for being protected from heat thereabove.

2. A heat-resistant structural frame comprising hollow liquid tight interconnected structural elements providing the frame and each having a cavity extending the length thereof with the cavities of connected elements being in communication providing a continuous circuit for fluid through the frame and heat protected means connected to said circuit, maintaining said circuit filled with a heat absorbing liquid at all times including an expansion chamber connected to said circuit, a float valve in said chamber controlling the flow of liquid through said means, an alarm, a switch operatively connected to said float valve for being closed when liquid in said chamber drops, an electrical circuit connecting said alarm and a source of current and controlled by said switch and means for automatically discharging liquid from said circuit onto a fire adjacent thereto lowering the liquid in said chamber and setting off said alarm.

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Notice of Adverse Decision in Interference

In Interference No. 94,756 involving Patent No. 3,050,134, P. Multin, MEANS FOR PROTECTING CONSTRUCTIONS AND BUILDINGS AGAINST THE RISK OF FIRE, final judgment adverse to the patentee was rendered Sept. 7, 1965, as to claim 1.

[*Official Gazette December 14, 1965.*]