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(54) AUTOMATED NITROGEN- WATER FIRE - FIGHTING COMPLEX

(57) Achieved is a significant reduction in water requirements and use of an accessible alternative fire- extinguishing medium for which there is no need for a pumping station, a water supply source, and an electric power substation. This is achieved in a robotized nitrogen -water fire - fighting complex comprising two or more robotized fire - fighting units (1) mounted on a pipeline (2); a control panel (7), a control device (10) generating control instructions for barrel pointing and fire - fighting; an ignition detection and remote observation device (11) mounted on the barrels, being connected to a video signal processing device (17) determining the coordinates of the ignition sources, and connected to the video monitoring device (14) and the control device, the complex further comprising a nitrogen generator (23) connected to a receiver (22) containing nitrogen and connected to the pipeline for supplying nitrogen to the carriage -mounted barrels (3), and ejecting devices (24) supplying water into the nitrogen flow.

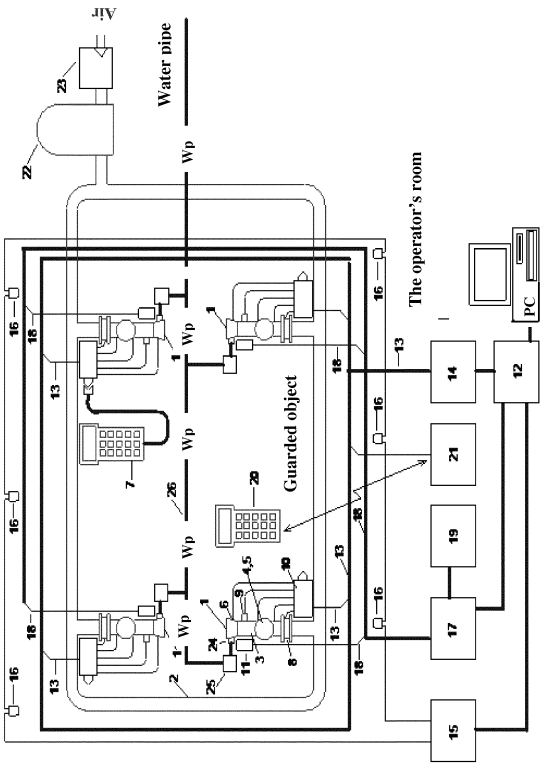

Fig.1

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Description

Technical Field

[0001] The invention relates to fire-fighting equipment, particularly, to robotized fire-fighting units.

Background Art

[0002] A prior art robotized fire-fighting unit is disclosed, for example, in Russian Patent RU No. 2122874 published on December 10, 1998.

[0003] A deficiency of prior art units is that they cannot determine the ignition coordinates in a three-dimensional coordinate system.

[0004] The prior art unit closest to the claimed invention in technical idea is the robotized fire-fighting complex disclosed in Russian Patent RU No. 2319530 published on March 20, 2008 that comprises two or more robotized fire-fighting units mounted on a fire pipeline and each comprising a carriage-mounted barrel having vertical and horizontal aiming drives; a nozzle provided with a drive to vary the jet spray angle; a control panel connected at the input thereof to a switching unit and at the output thereof to a control device generating control instructions to point the barrels and extinguish the fire; a device mounted on the barrel to detect fire and observe remotely the same such that the optical axis thereof extends in the direction of fire-extinguishing material flow, said device being connected to a video signal processing device that uses a program to perform algorithms to determine ignition source coordinates, said device being connected to a video monitoring device and the control device.

[0005] The prior art complex is deficient because it uses much water flowing through its carriage-mounted barrels and requires a pumping station, water-supply source, and an electric power substation that complicate the design of the complex and make the complex little suitable for protecting properties having limited water resources.

Disclosure of Invention

[0006] It is an object of the invention to develop a more economical robotized fire-fighting complex intended to serve multiple purposes.

[0007] The claimed invention achieves the following technical results in operation: water requirements are reduced significantly, and an alternative readily available fire-fighting material can be used without requiring a capital-intensive pumping station, water supply source, and an electric power substation to be used.

[0008] These technical results are achieved in a robotized nitrogen-water fire-fighting complex comprising two or more robotized fire-fighting units mounted on a fire pipeline, each comprising a carriage-mounted barrel having vertical and horizontal aiming drives; a nozzle having a drive to vary the jet spray angle; and a control panel, all connected to a switching unit at the inlet thereof, and at the outlet thereof to a control device generating control instructions to point the barrels and to extinguish the fire; a device mounted on the barrel to detect ignition and conduct remote observation such that the optical axis thereof extends in the direction of fire-extinguishing material flow, said device being connected to a video signal processing device having a program to perform algorithms for determining the coordinates of the ignition source and to a video monitoring device and the control device, said fire-fighting complex further comprising a nitrogen generator connected to a receiver containing nitrogen under working pressure and to the fire pipeline to deliver nitrogen to the carriage-mounted barrels, and ejection devices delivering water into the nitrogen flow and built into the through-flow part of the nozzle of the carriage-mounted barrels, said ejection devices being connected to containers connected to the water pipe.

[0009] The claimed invention helps reduce significantly the water requirements because water is ejected in small quantities and delivered in spray form in the nitrogen stream that is, in turn, an efficient fire-fighting material drawn from the ambient air, and does not require capital-intensive structures such as pumping stations, water supply sources, and electric power substations to be used with the complex.

Brief Description of Drawings

[0010] The idea of the invention will be clear from the drawing wherein FIG. 1 is a functional diagram of the robotized nitrogen-water fire-fighting complex.

Best Mode for Carrying out the Invention

[0011] The claimed robotized fire-fighting complex comprises robotized fire-fighting units 1 combined in a robotized nitrogen-water fire-fighting complex and mounted on a fire pipeline 2. A robotized fire-fighting unit 1 comprises a carriage-mounted barrel 3 having vertical and horizontal aiming drives 4 and 5, respectively; a nozzle 6 having a drive to vary the jet spray angle; a control panel 7; an electrical valve 8 mounted at the inlet of the barrel and a pressure sensor 9 mounted at the outlet of the barrel ahead of the nozzle, all connected to a control unit 10, and an ignition detection and remote observation device 11. The robotized fire-fighting complex comprises a control device 12 with a display connected by a communication channel 13, for example, RS-485, to control unit 10 through a network controller 14, said control device being connected through a reception monitoring device 15 to address fire alarms 16, and a video signal processing device 17 connected by a two-channel television line 18 (video channel and IR channel) to ignition detection and remote observation device 11, video monitoring device 19, and control device 12. Online control is exercised through a radio channel comprising a radio panel 20 and radio control unit 21 connected to communication channel 13. Fire pipeline 2 delivering nitrogen

to carriage-mounted barrels is connected to a receiver 22 containing pressurized nitrogen and connected to nitrogen generator 23. Ejecting devices 24 delivering water into the nitrogen flow from containers 25 connected to water pipe 26 are built into the through-flow part of nozzle 6 of carriage-mounted barrels 3.

[0012] The robotized fire-fighting complex operates as follows:

When an ignition source develops in any one of the areas protected and two alarms 16 go off, reception monitoring device 15 sends an address "Alarm" signal to control device 12 that sends control signals about setting coordinates by communication channel 13 to respective switching units 10 of robotized fire-fighting units 1 protecting the area in question. Vertical and horizontal drives 4 and 5, respectively, point barrels 3 at the center of the protected area monitored by address alarms 16. Ignition detection and remote observation device 11 sends video and IR signals by a two-channel television line 15 to video signal processing device 17. After the program has processed the information received, device 17 identifies ignition, determines its coordinates and size in space, selects a fire-extinguishing program, and issues an instruction to point the barrels at the ignition source. Simultaneously, video monitoring device 19 of the round-the-clock duty post shows a color image of the area monitored, and the display of control device 12 shows the last-minute instruction and a mnemonic diagram for controlling the robotized fire-fighting complex. Acting on the information received, the operator makes a decision to start up the fire-fighting complex. If the system is in the automatic mode, it is started up automatically. As the "Start" instruction is executed, technological instructions are given to open electrical valve 8 of robotized fire-fighting units 1 that are involved in fire-fighting program execution. Nitrogen flows under pressure from receiver 23 through fire pipeline 2 to a carriage-mounted barrel 3 of robotized fire-fighting units 1, and water is ejected within nozzle 6 from container 25 to produce a nitrogen stream carrying sprayed dispersed water particles and is directed by drives 4 and 5 to the ignition area. Water particles that have enough energy and a high initial velocity increase the jet range, and as they enter the high-temperature area they vaporize and absorb a significant quantity of heat. An efficient fire-fighting medium itself, nitrogen displaces oxygen from the ignition area, and as the specific oxygen content decreases below 10%, burning stops. When pressure in the nozzle goes down below working pressure, nitrogen generator 24 turns on to fill up receiver 23 with nitrogen from the ambient air that contains 78% of nitrogen. On the basis of video information received from video monitoring device 19, the operator can make changes in the direction in which barrels 3 are pointed by giving other target coordinates or selecting other robotized fire-fighting units 1 from control panel 7.

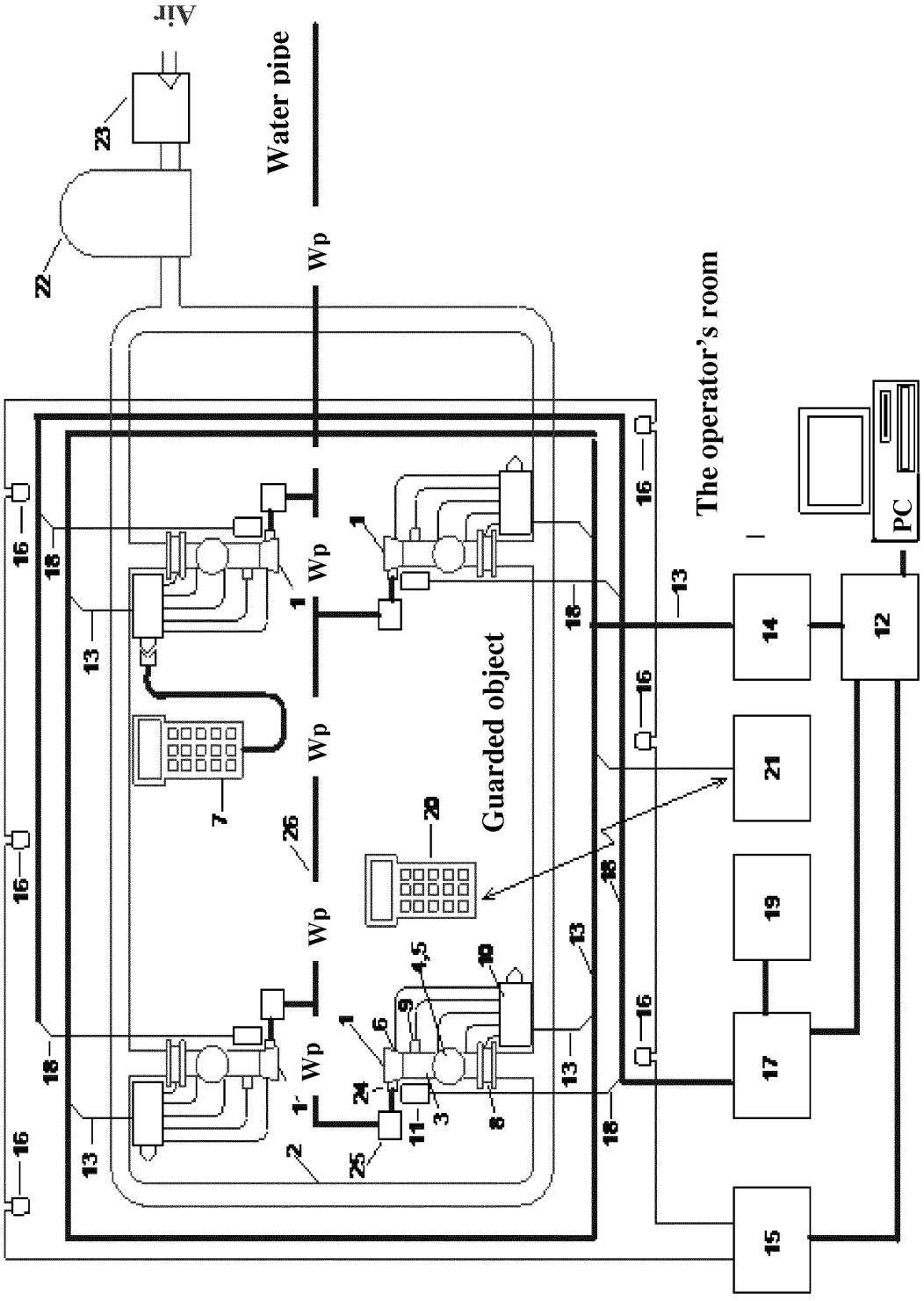
[0013] The claimed robotized nitrogen-water fire-fighting complex is an efficient automatic and remotely controlled device that gives safety to the properties it protects and allows fire-extinguishing medium to be directed straight at the ignition sources detected in an early phase, and to release humans from exposure to extremely health-threatening areas.

[0014] Unlike prior art fire-fighting equipment, the claimed robotized fire-fighting complex uses significantly smaller quantities of water for fire-fighting purposes and an efficient alternative fire-extinguishing medium drawn, in need, from the ambient air.

[0015] These distinctions of the claimed complex make it suitable for deploying fire-fighting systems in areas having limited water resources, on the one hand, and reducing significantly the damage from fire caused by the negative effect of large quantities of water to put out the fire, on the other hand.

Claims

1. A robotized nitrogen-water fire-fighting complex comprising two or more robotized fire-fighting units mounted on a fire pipeline, each containing a carriage-mounted barrel having vertical and horizontal aiming drives; a nozzle having a drive to vary the jet spray angle; and a control panel, all connected to a switching unit at the input thereof and at the output thereof to a control device that generates control instructions for barrel pointing and fire-fighting; an ignition detection and remote observation device mounted on the barrel such that the optical axis thereof extends in the direction of fire-extinguishing material flow and connected to a video signal processing device in which the program performs the algorithms for determining the coordinates of the ignition source, said device being connected to a video monitoring device and the control device, said complex further comprising a nitrogen generator connected to a receiver containing nitrogen under working pressure and connected to the fire pipeline to supply nitrogen to the carriage-mounted barrels, and ejecting devices delivering water into the nitrogen flow, said ejecting devices being built into the flow-through part of the nozzles of the carriage-mounted barrels and connected to containers that are connected to the water pipeline.


Air
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The operator's room
PC
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Fig.1

INTERNATIONAL SEARCH REPORT

International application No
PCT/RU2011/000519

A. CLASSIFICATION OF SUBJECT MATTER
INV. A62C31/00 A62C35/68 A62C5/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A62C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2007/107988 A2 (OPGAL OPTRONIC IND LTD [IL]; BEIT ALFA TECHNOLOGIES COOPERA [IL]; LAPI) 27 September 2007 (2007-09-27) paragraph [0024] - paragraph [0036] figure 1	1
A	FR 2 947 732 A1 (DESAUTEL [FR]) 14 January 2011 (2011-01-14) abstract	1
A	US 2004/163827 A1 (PRIVALOV GEORGE [US] ET AL) 26 August 2004 (2004-08-26) figures	1

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"P" document published prior to the international filing date but later than the priority date claimed

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Date of the actual completion of the international search	Date of mailing of the international search report
17 April 2012	14/05/2012

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/RU2011/000519

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2007107988 A2	27-09-2007	NONE	
FR 2947732 A1	14-01-2011	NONE	
US 2004163827 A1	26-08-2004	NONE	

Form PCT/ISA/210 (patent family annex) (April 2005)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- RU 2122874 **[0002]**
- RU 2319530 **[0004]**