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(54) **FIRE-FIGHTING UNIT**

(57) The fire-fighting unit (1) according to the invention comprises: an inlet connection (7) for supplying an extinguishing substance to the fire-fighting unit (1); a controller (6) having inputs (22) for input data and outputs for control signals; a hydrant (5) flow-connected to the inlet connection (7) by means of a valve (9); a sensor (11) for detecting the opening of the valve (9), electrically connected to one of the inputs (22) of the controller (6); and a distributor (15) flow-connected to the inlet connection (7). The distributor (15) comprises electrovalves (16), which are output connections (24) for discharging the extinguishing substance from the fire-fighting unit (1), and these electrovalves (16) are electrically connected to the outputs of the controller (6).

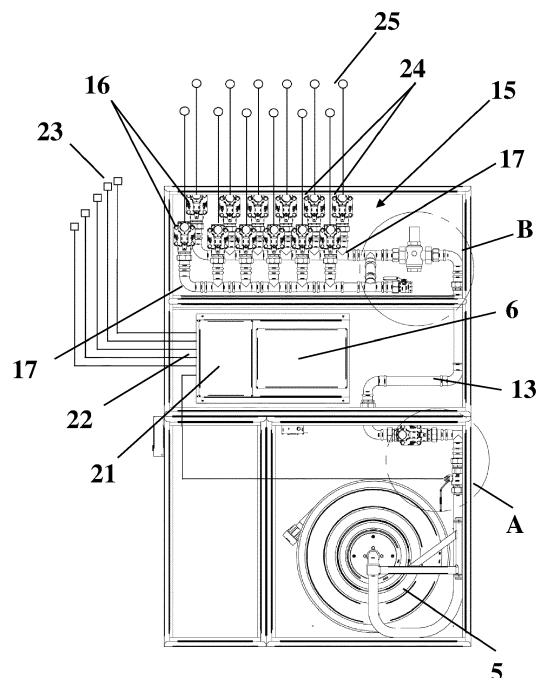


Fig. 3

Description

[0001] The subject matter of the present invention relates to a fire-fighting unit, in particular the fire-fighting unit to be installed in an existing or planned fire protection system and enabling automatic extinguishing of selected zones of a protected room and manual fire extinguishing by a human without affecting an existing system.

[0002] The state of the art knows indoor hydrants, which are devices for manual operation by extinguishing a fire with a jet of water. Indoor hydrants are supplied by pumping systems. These devices are installed in places located and described in regulations by the legislature of a country concerned. The range of the device is limited by the length of the extinguishing hose and the range of the extinguishing jet. It is an effective solution, but it requires the presence of a human and his/her activity in the face of fire hazard.

[0003] The state of the art also knows automatic sprinkler, spray and fog systems, which are mostly stand-alone devices. In the case of such systems, fire detection is performed based on smoke and/or heat sensors and then a pump is activated, which supplies water to sprinklers or fog heads through appropriate pipes. These devices are an effective way of extinguishing fires and securing large areas of construction facilities but at the same time are costly due to the need to build all components, such as water supply, pumping systems and pumping stations in separate rooms, water distribution, piping, electrovalves and a fire detection system, together as one unit. In addition, such systems do not enable interchangeable extinguishing of separate zones, whether automatically or manually by a human.

[0004] The aim of the present invention is to develop a fire-fighting unit that enables the automatic extinguishing of selected zones and, if necessary, undertaking a traditional extinguishing action with the use of a hydrant. In particular, it is the aim of the present invention to provide a solution that enables combining an indoor hydrant with a sprinkler and/or fog head and/or water nozzle system, supplied with water from a single source of a hydrant pump system.

[0005] The fire-fighting unit according to the invention is characterized in that it comprises: an inlet connection for supplying an extinguishing substance to the fire-fighting unit; a controller having inputs for input data and outputs for control signals; a hydrant flow-connected to the inlet connection by means of a valve; a sensor for detecting the opening of the valve, electrically connected to one of the inputs of the controller; and a distributor flow-connected to the inlet connection, wherein the distributor comprises electrovalves, which are output connections for discharging the extinguishing substance from the fire-fighting unit, and these electrovalves are electrically connected to the outputs of the controller.

[0006] Preferably, the fire-fighting unit further comprises a housing that is internally divided into at least three separate sections, wherein each of the controller, the hy-

drant and the distributor is located in a separate section.

[0007] Preferably, the distributor is flow-connected to the inlet connection by means of a pressure-reducing valve.

5 **[0008]** Preferably, the distributor is flow-connected to the inlet connection also by means of an electrovalve, wherein the electrovalve is electrically connected to one of the outputs of the controller.

10 **[0009]** Preferably, the electrovalve is located between the inlet connection and the pressure-reducing valve.

[0010] Preferably, the fire-fighting unit comprises a heating unit located in the housing.

15 **[0011]** Preferably, the distributor comprises a release valve for removing the extinguishing substance from the distributor.

[0012] Preferably, the electrovalves are normally closed valves.

[0013] Preferably, the valve is a manual valve.

20 **[0014]** The solution according to the present invention makes it possible to combine an indoor hydrant with a sprinkler and/or fog and/or nozzle system into one zonal stand-alone fire-fighting unit.

25 **[0015]** The solution according to the present invention is a device intended for fire protection and is particularly suitable for the automatic extinguishing of separated zones with an increased risk of fire.

30 **[0016]** The subject matter of the present invention is preferably used in locations where fire outbreak, due to production or storage technologies, is probable or in places where fire outbreak is particularly dangerous due to the safety of people or difficulties in undertaking effective extinguishing operations by fire brigades.

35 **[0017]** The subject matter of the present invention has a particularly advantageous application in parking areas for electrical vehicles, for example, cars, scooters and bicycles, due to batteries used. The batteries used in such vehicles are a potential source of fire due to the emission of gases and possible short circuits.

40 **[0018]** The subject matter of the present invention has a particularly advantageous application in multi-station technological lines, where in the event of a fire it is possible to undertake an extinguishing action only at a given station, without the need to spray the extinguishing substance on the remaining stations, thus significantly reducing the risk of damaging those stations by the extinguishing substance.

45 **[0019]** The fire-fighting unit according to the present invention is a combination of a hydrant and a distributor for an extinguishing substance. Thanks to this solution, a designated zone can be automatically protected by a sprinkler, a fog head or another spraying device based on fire detection in the designated zone, and at the same time, a human can activate the hydrant manually and continue to extinguish the fire, if necessary.

55 **[0020]** The fire-fighting unit according to the present invention can be connected to a common pumping system or to a supply of a pressurized extinguishing substance. The fire-fighting unit according to the present in-

vention combines the advantages of an automatic station fire extinguishing system with the possibility of disconnecting the spraying system and switching to extinguishing by means of an indoor hydrant, all the time using the same water supply system (a pump or water from a pipeline under a required pressure).

[0021] The solution according to the present invention enables automatization of the extinguishing process and installation on an already existing hydrant fire protection systems, without the need to redesign and expand them, while maintaining the required performance of both the indoor hydrant and the sprinkler and/or fog head and/or nozzle system.

[0022] The subject matter of the invention is illustrated in its embodiments in the drawing, in which:

Fig. 1 shows a perspective view of the fire-fighting unit;

Fig. 2 shows a perspective view of the fire-fighting unit of fig. 1 with the front wall of the housing removed;

Fig. 3 shows a front view of the fire-fighting unit of fig. 1 with the front wall of the housing removed;

Fig. 4 shows a detail A of fig. 3, and

Fig. 5 shows a detail B of fig. 3.

[0023] The fire-fighting unit 1 according to the present invention may comprise a housing 2 in which individual components of the unit are housed.

[0024] In the embodiment shown in the figures, the housing 2 is divided internally by internal walls 3 into at least three and preferably four separate sections I, II, III, IV. Each section I, II, III, and IV has a door 4 that enables access to the interior of the sections I, II, III, and IV. The section I houses a hydrant 5 in its interior. The section II houses a controller 6 in its interior. The section III houses a distributor 15 in its interior. The section IV may be designed to accommodate additional fire-fighting equipment, such as a blanket, an axe or a fire extinguisher.

[0025] In the embodiment shown in the figures, the housing 2 has a mixed configuration, i.e. the sections I and IV are arranged next to each other, whereas the sections II and III are arranged one on top of the other vertically above the sections I and IV. Nevertheless, in another embodiment, the housing 2 may have a vertical configuration in which all the sections I, II, III, and IV are positioned vertically on top of each other. In yet another embodiment, the housing 2 may have a horizontal configuration in which the sections I, II, III, and IV are positioned next to each other. Moreover, the housing 2 need not be divided into the sections I, II, III, and IV, in this case the housing 2 has one common internal space for the components of the fire-fighting unit 1. In addition, the housing 2 and hence the fire-fighting unit 1 need not have

all of the above-mentioned sections, the section IV may be omitted.

[0026] The fire-fighting unit 1 comprises an inlet connection 7 which is in turn connected to an external pumping system, a pipeline or other extinguishing substance supply to supply an extinguishing substance to the fire-fighting unit 1. The extinguishing substance may be water, a special liquid adapted to extinguish a given type of fire (for example a high-temperature fire, an electrical system fire or a chemical fire), foam, etc. In this way, the extinguishing substance is supplied through the inlet connection 7 to the entire fire-fighting unit 1. In the embodiment shown in the figures, the inlet connection 7 is located in the section I accommodating the hydrant 5, but it can also be placed in other sections or elsewhere on the housing 2, and if the fire-fighting unit 1 is not equipped with the housing 2, the inlet connection 7 may be a stand-alone, separate component.

[0027] The inlet connection 7 is then connected by means of a tee 8, a valve 9 and a pipe 10 to the hydrant 5. Generally, the inlet connection 7 is flow-connected via the valve 9 to the hydrant 5. According to the present invention, a flow connection between two elements is understood to mean such a connection, for example by pipes, hoses, couplings, tees and/or other hydraulic elements, which enables the flow of the extinguishing substance from one element to the other. The door 4 allowing access to the hydrant 5 can be locked with a key in an authorized access system. The valve 9 is a manual valve. The fire-fighting unit 1 is further equipped with a sensor 11 for detecting the opening of the valve 9. Detection of the opening of the valve 9 can be performed in several ways. In one embodiment, the sensor 11 can be, for example, a limit switch placed on a handle of the valve 9 itself, which signals the turning of the handle and thus the opening of the valve 9. The sensor 11 can also be a sensor detecting a pressure drop on the valve 9, located upstream of the valve 9 itself, in particular between the inlet connection 7 and the valve 9, or on the valve 9 itself, the pressure drop across the valve 9 signals that the valve 9 is open. In yet another embodiment, the sensor 11 may be a sensor, e.g. an ultrasonic one, for detecting flow through the valve 9, arranged downstream of the valve 9, in particular between the valve 9 and the hydrant 5, the presence of flow downstream of the valve 9 indicates that the valve 9 is open. Generally, the sensor 11 is located at the flow connection between the inlet connection 7 and the hydrant 5. The sensor 11 is further electrically connected to the controller 6, as will be described in more detail below.

[0028] The inlet connection 7 is further connected by means of the tee 8, an electrovalve 12, a pipe 13 and a pressure-reducing valve 14 to the distributor 15. Generally, the inlet connection 7 is flow-connected by means of the electrovalve 12 and the pressure-reducing valve 14 to the distributor 15, the electrovalve 12 is located at this flow connection between the pressure-reducing valve 14 and the inlet connection 7, in this case on the

pipe 13. The distributor 15 comprises electrovalves 16, which are flow-connected by their inlets, by means of pipes 17, to the pressure-reducing valve 14. The electrovalves 16 are, by way of their outlets, the outlet connections 24 of the fire-fighting unit 1 to which external spraying devices 25, such as sprinklers or fog heads, shown only schematically in figure 3, are flow-connected. The electrovalves 16 (the outlet connections 24) are used for discharging the extinguishing substance from the fire-fighting unit 1 to the spraying devices 25. Generally, the function of the distributor 15 is to selectively distribute, by means of the electrovalves 16, the incoming stream of the extinguishing substance from the inlet connection 7 to the designated spraying devices 25. The electrovalve 12 and the electrovalves 16 are normally closed valves and are electrically connected to the controller 6, as will be described in more detail below (for reasons of clarity of the figures, these electrical connections are not shown in the figures).

[0029] However, the use of the pressure-reducing valve 14 is not necessary for the operation of the fire-fighting unit 1. The function of the pressure-reducing valve 14 is to ensure the correct pressure of the extinguishing substance supplied to the distributor 15. If the extinguishing substance supplied to the inlet connection 7 is already supplied at an appropriate pressure required for the proper operation of the distributor 15, the pressure-reducing valve 14 need not be used.

[0030] The electrovalves 16 may be arranged in several configurations as desired. For example, all the electrovalves 16 can form a single group and are all connected to a single pipe 17 which is in turn connected to the pressure-reducing valve 14. In the embodiment shown in the figures, the electrovalves 16 are divided into two groups, each group connected to a separate pipe 17, and these pipes 17 are then connected by means of a tee 18 to the pressure-reducing valve 14. Obviously, depending on the needs, the electrovalves 16 can be divided into more groups.

[0031] The distributor 15 can comprise a release valve 19 located at the flow connection between the electrovalves 16 and the pressure-reducing valve 14, in particular, the release valve 19 is located on the pipe 17 connecting the electrovalves 16 to the pressure-reducing valve 14 or is connected to this pipe 17 by means of a separate tee 20.

[0032] The fire-fighting unit 1 comprises the controller 6. The controller 6 may be equipped with a battery 21 and/or it may be connected to an external electrical network. The controller 6 may have multiple input and output cards. Generally, the controller 6 has inputs 22 for input data, shown only schematically in figure 3. The input data are understood in the context of the present invention as different signals or information that reach the controller 6 from different devices or components external to the controller 6, the controller 6 is configured to read such input data and, based on the input data, to control other components of the fire-fighting unit 1, as will be described

in more detail below. One of the inputs 22 of the controller 6 is electrically connected to the sensor 11 for detecting the opening of the valve 9. External sensors 23 for fire detection are connected to the other inputs 22. As can be seen, the input data can be signals about the opening of the valve 9 or signals about a fire in a protected building. The sensors 23 may be, for example, smoke and/or heat detectors as well as thermal imaging cameras. The controller 6 comprises outputs for control signals (for reasons of clarity of the figures, these outputs are not marked on the figures). The control signals in this context are signals sent by the controller 6 to control the operation of components external to the controller 6. The controller 6 is configured to generate different output signals for different external elements. The control signals are generated based on the input data received by the controller 6. The outputs of the controller 6 are electrically connected to the electrovalves 16 and are used to control their operation, i.e. they open and close the electrovalves 16. Likewise, one output of the controller 6 is electrically connected to the electrovalve 12, whereby the controller 6 controls its opening and closing. In a fire protection system installed in a building, the sensors 23 are arranged such that each of them is responsible for a specific area of the building. Such a fire protection system also comprises a plurality of spraying devices 25. Each of the spraying devices 25 is associated with one sensor 23, in particular is located near a given sensor 23 to be able to extinguish a fire in the area monitored by the given sensor 23.

[0033] In another embodiment, when the fire-fighting unit 1 is to be used at a site dedicated to recharging electric vehicles, the controller 6 may be configured to electrically connect to its outputs electric elements that control the supply of charging voltage or current to the batteries. Such elements may be, for example, contactors by means of which power is supplied to appropriate sockets intended for connecting the batteries of the vehicles to be charged. These sockets can, like the sensors 23 and the spraying devices 25, be associated with specific areas of the protected space. If a fire is detected by a given sensor 23, not only will the associated spraying device 25 be activated, but the controller 6 will also send an appropriate control signal to the contactors to cut off power supply to the associated sockets, thus minimizing the risk of short circuits.

[0034] Moreover, in yet another embodiment, again when the fire-fighting unit 1 is to be used in a location for charging electric vehicles, it is very common for a power supply equipment for charging the batteries to measure the so-called leakage current on an ongoing basis. In the event of a short circuit, this leakage current increases rapidly, which may pose a fire hazard. Such power supply devices may in turn be electrically connected to the inputs 22 of the controller 6 and send leakage current data to the controller 6. The controller 6 may be configured such that in the event of a sudden increase in leakage current it controls, by means of its outputs, the elements that

control the supply of charging voltage or current (e.g., contactors) to the batteries to cut off power supply to the sockets and hence the batteries, minimizing the risk of fire.

[0035] The fire-fighting unit 1 can be used both inside and outside buildings. When used outdoors, the fire-fighting unit 1 may be equipped with a heating unit located in the housing 2 and/or the housing 2 can have insulating material applied to its walls. In this way, frost protection of the components of the fire-fighting unit 1 is ensured.

[0036] The fire-fighting unit 1 may also be supplied without the housing 2, for installation in housings already made at the site or even in rooms and/or spaces specifically designed for installing the fire-fighting unit 1 without a housing.

[0037] The fire-fighting unit 1 may comprise, for example on the housing 2, control lamps 26 and/or a touch and/or push button panel electrically connected to the controller 6. The control lamps 26 indicate various operating states of the fire-fighting unit 1, whereas the touch panel may enable controlling the operation and programming of the controller 6, various servicing activities, and controlling the operation of the unit.

[0038] The controller 6 may be adapted to operate any number of the sensors 23, the electrovalves 12, 16 or the valves 9. For example, the controller 6 may be adapted to operate 4 sensors 23 and 4 electrovalves 16. Alternatively, the controller 6 may be adapted to operate 5-24 sensors 23 and 5-24 electrovalves 16.

[0039] In another embodiment of the present invention, if an existing protection system in a building still comprises a plurality of the sensors 23, but is at the same time equipped with a control unit which collects signals from the sensors 23 and then generates one signal describing the status of all sensors 23, the controller 6 of the fire-fighting unit 1 can be easily configured to read such a signal and open the respective electrovalve(s) 16. In this case, a control unit is connected to only one input 22 of the controller 6, and the controller 6 itself can receive fire data for the entire building only by means of this one input 22. Therefore, in general, the controller 6 includes the inputs 22 for input data, which inputs 22 comprise, but are not limited to, one input 22 to be connected to the sensor 11 for detecting the opening of the valve 9 and at least one input 22 for receiving fire data. The inputs 22 may also include, but not necessarily, inputs 22 for receiving leakage current data from power supply devices for charging electric vehicle batteries. Similarly and generally, the outputs for control signals of the controller 6 may include, but are not limited to, outputs for controlling the electrovalves 12, 16 as well as outputs for controlling elements that control the supply of charging voltage or current to electric vehicle batteries.

[0040] The operation of the fire-fighting unit 1 is as follows. The fire-fighting unit 1 is installed in a fire protection system comprising the sensors 23 for fire detection, the spraying devices 25 and the extinguishing substance supply and/or the pumping unit. The inputs 22 of the con-

troller 6 are electrically connected to the sensors 23 for detecting a fire in a given room or a building, or one input 22 of the controller 6 is electrically connected to the control unit collecting signals from all sensors 23 and generating one signal describing the status of all sensors 23. Each sensor 23 is responsible for a separate section of a protected room/area. The outputs of the controller 6 are electrically connected to the electrovalves 16 of the distributor 15 and to the electrovalve 12. The outputs of the controller 6 control the operation of the electrovalves 12, 16. The electrovalves 16 are additionally flow-connected to the spraying devices 25 by means of pipes, hoses, couplings, tees etc. Each spraying device 25 (and hence each electrovalve 16) is associated with a given sensor 23 and serves to extinguish a fire in the zone covered by that sensor 23. The sensor 11 for detecting the opening of the valve 9 is also connected to one input 22 of the controller 6. The input connection 7 of the fire-fighting unit 1 is connected to the extinguishing substance supply or the pumping unit.

[0041] In the absence of a fire, the valve 9, the electrovalve 12 and the electrovalves 16 are closed. If a fire is detected in a certain zone of a room, the associated sensor 23 or the control unit collecting signals from the sensors 23 sends a fire signal to the controller 6. Upon receiving this signal, the controller 6 opens the electrovalve 12 so that water or other extinguishing substance can flow into the distributor 15. Simultaneously, the controller 6 opens the corresponding electrovalve 16 flow-connected to the spraying device 25 which is associated with the sensor 23 that has detected the fire. As a result, this starts the extinguishing action with this spraying device 25 and spraying the extinguishing substance in the area where the fire is present. Obviously, in the event of detecting a fire by several sensors 23, several corresponding electrovalves 16 leading to the corresponding spraying devices 25 are opened.

[0042] If the user considers that it is necessary to carry out an extinguishing action with the hydrant 5, he/she opens the valve 9. Opening of the valve 9 causes the sensor 11 to send a signal to the controller 6, indicating that the valve 9 is open. Upon receiving this signal, the controller 6 closes all electrovalves 12, 16 so that the whole extinguishing substance supplied to the input connection 7 can now be directed only to the hydrant 5 to enable an effective extinguishing action.

[0043] It should be noted that, in various embodiments of the present invention, the use of the electrovalve 12 is not necessary. The electrovalve 12 is essential from the anti-freeze point of view of the entire fire protection system. If a section of the fire-fighting unit 1 containing the distributor 15 is not heated, the use of the electrovalve 12 means that before the detection of a fire there is no extinguishing substance in this distributor 15, so there is no risk of it being frozen. Moreover, the use of the electrovalve 12 facilitates maintenance work by being able to cut off the distributor 15 from the supply of the extinguishing substance. However, since the electrovalves 16

are normally closed, they will not pass the extinguishing substance to the spraying devices 25 without any control signal from the controller 6, regardless of the state of the electrovalve 12. Moreover, a unit supplying the fire-extinguishing substance to the fire-fighting unit 1 can be provided, just upstream of the inlet connection 7 of the fire-fighting unit 1, with a valve with which the supply of the extinguishing substance to the entire fire-fighting unit 1 can be cut off. Therefore, the use of the electrovalve 12 is not necessary for the proper conduct of the extinguishing action in a separated zone of a building.

[0044] After the extinguishing action is completed, the extinguishing substance can be removed from the distributor 15, the electrovalves 16 and lines connecting the electrovalves 16 to the spraying devices 25 by opening the release valve 19 to prevent the extinguishing substance from freezing in the fire protection system outside the building when it is not heated or insulated.

[0045] In other embodiments, in a fire protection system equipped with the fire-fighting unit 1, when the need arises and a given sensor 23 covers a large area or an area of particular interest, more than one spraying device 25, and hence more than one electrovalve 16, may be associated with a given sensor 23. The controller 6 is configured such that upon receiving a fire signal from such sensor 23, it sends an opening signal to several electrovalves 16, which in turn causes the extinguishing substance to be sprayed from several spraying devices 25 associated with a given sensor 23.

[0046] In yet another embodiment, in a fire protection system equipped with the fire-fighting unit 1, two sensors 23 are responsible for a given area. This solution is used to provide additional protection in the event of failure of one of the sensors 23 or to eliminate false signals. One or more spraying devices 25 may in turn be associated with such two sensors 23 as desired.

[0047] Moreover, in an existing or planned fire protection system, the sensors 23 and the spraying devices 25 can be arranged on different surfaces of a protected room, for example on the ceiling, on walls or on the floor.

Claims

1. A fire-fighting unit (1), **characterized in that** it comprises:

an inlet connection (7) for supplying an extinguishing substance to the fire-fighting unit (1);
 a controller (6) having inputs (22) for input data and outputs for control signals;
 a hydrant (5) flow-connected to the inlet connection (7) by means of a valve (9);
 a sensor (11) for detecting the opening of the valve (9), electrically connected to one of the inputs (22) of the controller (6); and
 a distributor (15) flow-connected to the inlet connection (7), wherein the distributor (15) comprises

es electrovalves (16), which are output connections (24) for discharging the extinguishing substance from the fire-fighting unit (1), and these electrovalves (16) are electrically connected to the outputs of the controller (6).

2. The fire-fighting unit (1) according to claim 1, **characterized in that** it further comprises a housing (2) that is internally divided into at least three separate sections (I, II, III, IV), wherein each of the controller (6), the hydrant (5) and the distributor (15) is located in a separate section (I, II, III, IV).
3. The fire-fighting unit (1) according to claim 1 or 2, **characterized in that** the distributor (15) is flow-connected to the inlet connection (7) by means of a pressure-reducing valve (14).
4. The fire-fighting unit (1) according to any one of the preceding claims, **characterized in that** the distributor (15) is flow-connected to the inlet connection (7) also by means of an electrovalve (12), wherein the electrovalve (12) is electrically connected to one of the outputs of the controller (6).
5. The fire-fighting unit (1) according to claim 4, **characterized in that** the electrovalve (12) is located between the inlet connection (7) and the pressure-reducing valve (14).
6. The fire-fighting unit (1) according to any one of claims 2 to 5, **characterized in that** it comprises a heating unit located in the housing (2).
7. The fire-fighting unit (1) according to any one of the preceding claims, **characterized in that** the distributor (15) comprises a release valve (19) for removing the extinguishing substance from the distributor (15).
8. The fire-fighting unit (1) according to any one of the preceding claims, **characterized in that** the electrovalves (12, 16) are normally closed valves.
9. The fire-fighting unit (1) according to any one of the preceding claims, **characterized in that** the valve (9) is a manual valve.

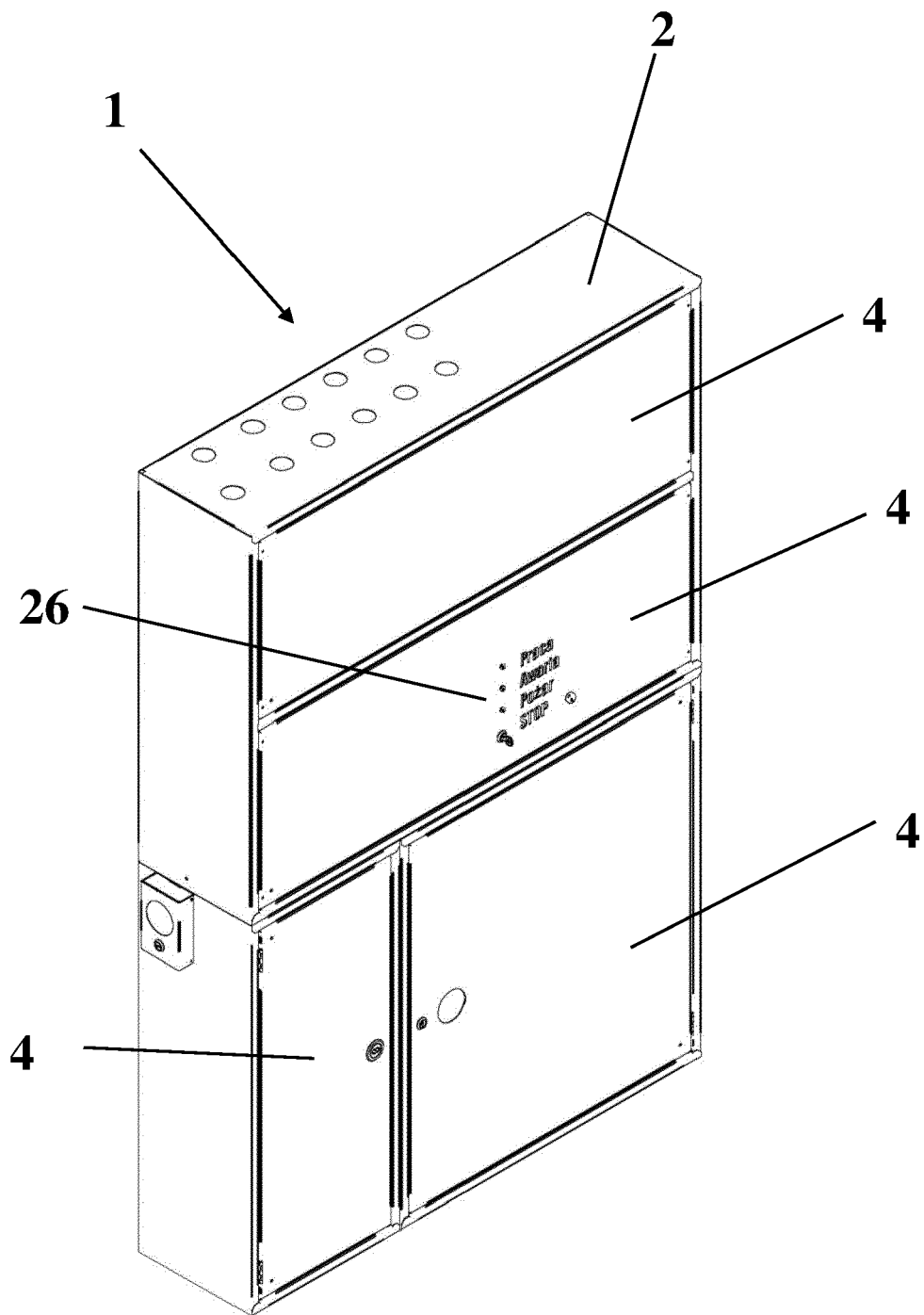


Fig.1

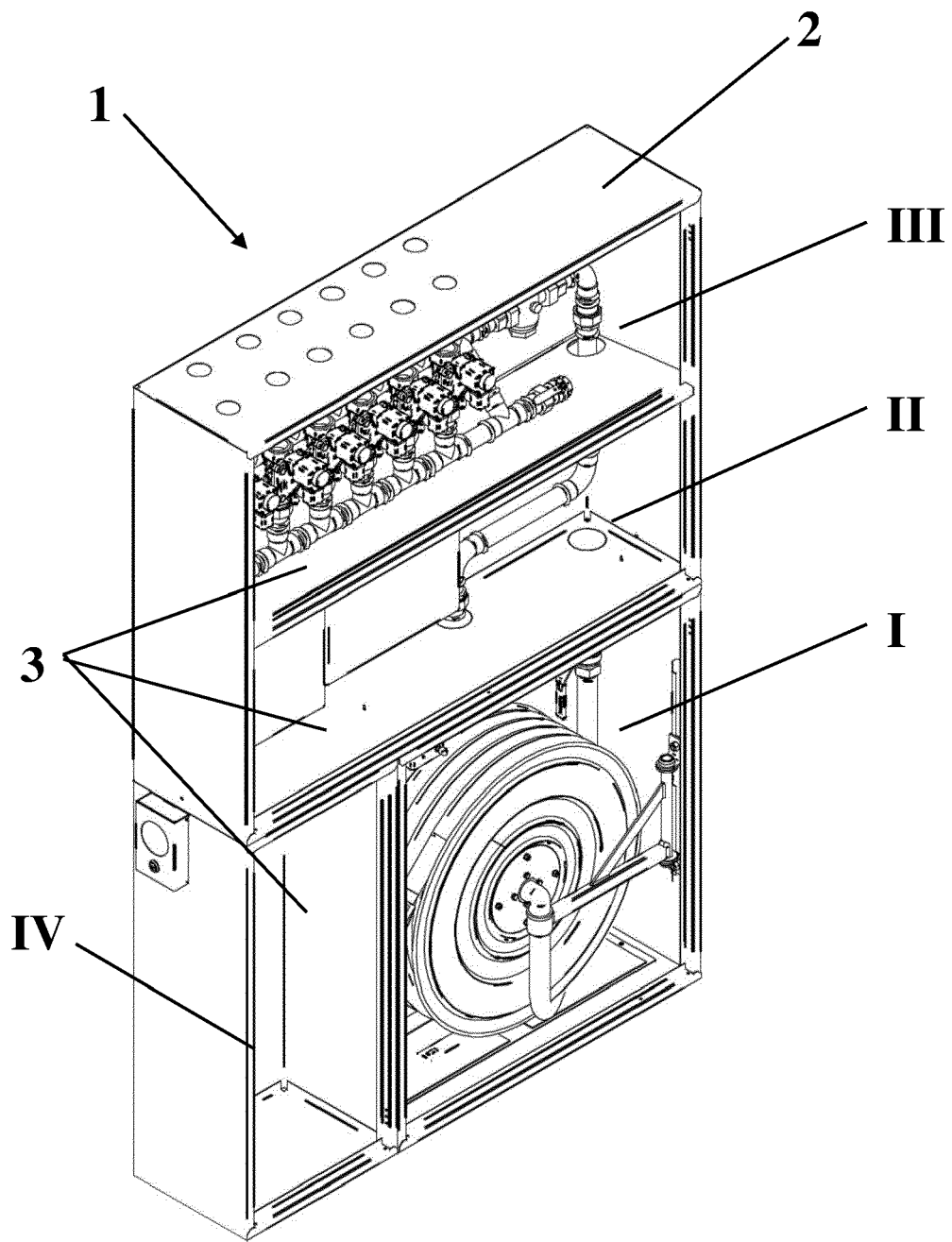


Fig. 2

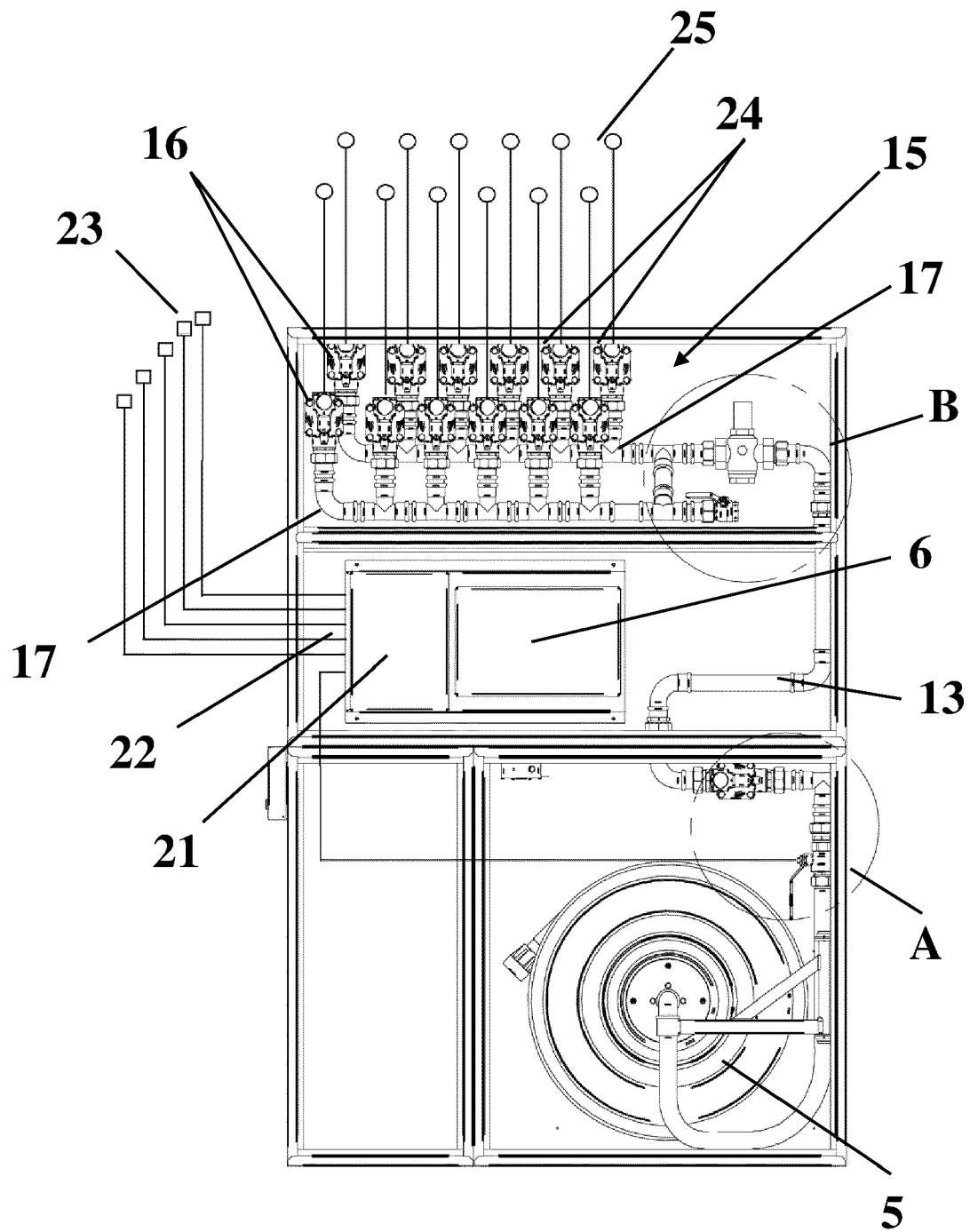
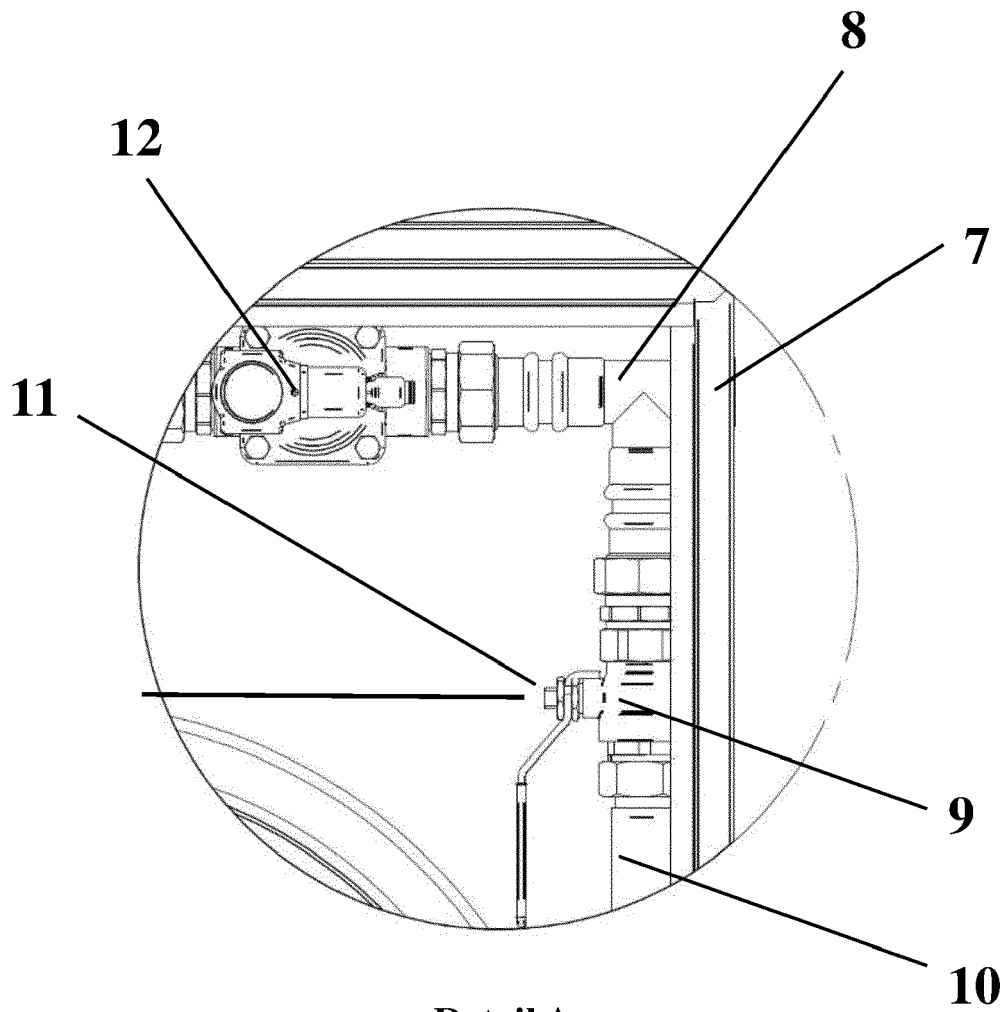
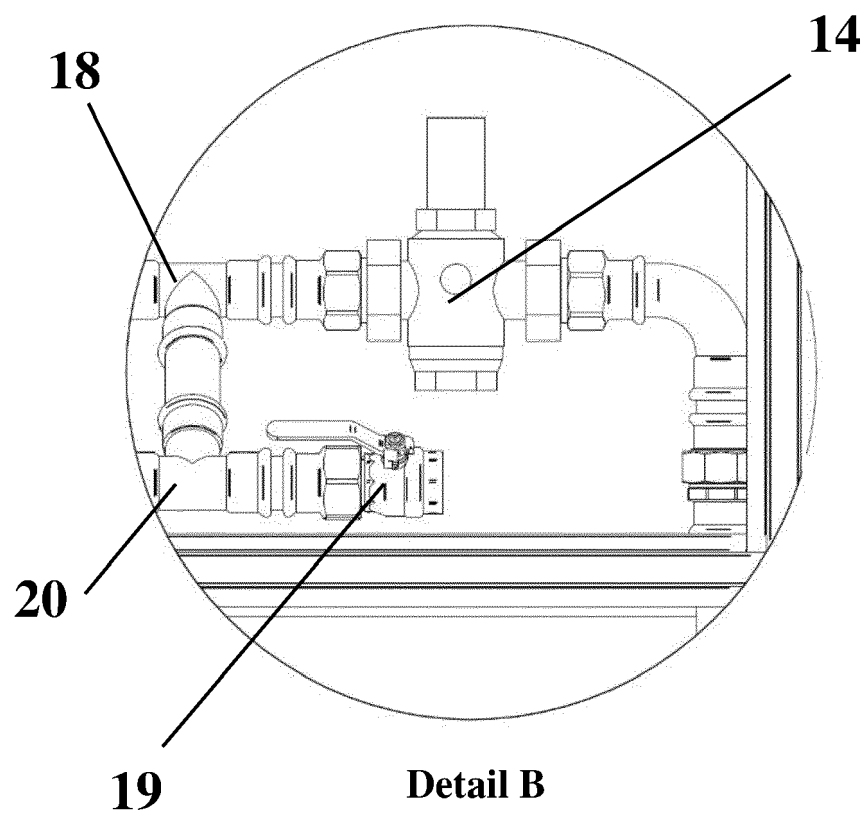


Fig. 3



Detail A

Fig. 4



Detail B

Fig. 5



EUROPEAN SEARCH REPORT

Application Number

EP 23 15 4838

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 31 May 2023	Examiner Andlauer, Dominique
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