In order to isolate the metal structures exposed to potential low-temperature liquid leaks, these structures are covered beforehand with at least one layer of low-temperature insulating paint that preserves the structural integrity.

In the case of very low-temperature liquid storage vessels, other systems are also used to isolate the deck equipment with respect to any liquid leaks from the storage tanks, such as wood floors.

Such isolating systems are difficult to implement due to their complexity during manufacturing of the equipment, their implementation time, and their cost.

~~One aim~~Embodiments of the invention ~~is~~ seek to provide an isolating system making it possible to simply, inexpensively and very effectively protect a surface of a piece of low-temperature fluid storage equipment, able to be placed in contact with the fluid.

~~To that end, the invention relates to a panel of the aforementioned type, characterized in that the panel includes at least one element for heating the body, received in the body.~~

According to a first aspect of the present invention, there is provided a protective panel designed to be placed on a surface of temperature fluid processing equipment at a temperature below -100°C, comprising: a planar body; at least one element for detecting the presence of fluid in gas or liquid form, received in the body; wherein the panel includes at least one element for heating the body, received in the body.

The panel according to embodiments of the invention may comprise one or more of the following features, considered alone or according to any technically possible combination:

- it includes a control unit, received in the body, the control unit being connected to the detection element to measure a parameter for detecting the presence of a low-temperature fluid in gas or liquid form, the control unit being connected to the heating element, to activate the heating element;

- the control unit includes a communication assembly with an outside command unit, advantageously a wireless communication assembly of the Wi-Fi or Bluetooth type;

- it defines a lower face, designed to be pressed on the surface of the fluid processing equipment, and an upper face, situated opposite the lower face, the detection element being situated near or flush with the upper face, the heating element being situated near or flush with the lower face;

- the detection element is chosen from among a thermocouple or an optical fiber, the heating element being chosen from among a heating cable and/or heating resistance;

- the body is manually deformable, advantageously being able to be wound and unwound;

- the planar body is rigid.

~~The invention also relates to~~According to a second aspect of the present invention, there is provided a protective assembly for low-temperature fluid processing equipment at a temperature below -100°C, ~~characterized in that~~ wherein it includes:

- at least one panel ~~as defined above~~ according to the first aspect, designed to be pressed on a surface of the equipment;

- a control unit, positioned away from the panel, the control unit being connected to the panel, the control unit being able to collect at least one leak detection parameter measured by the detecting assembly, and being able to activate the heating element.

The assembly according to embodiments of the invention may include one or more of the following features, considered alone or according to any technically possible combination(s):

- it includes a plurality of panels designed to be applied on a surface of the fluid processing equipment, each panel being connected to the command unit.

~~The invention also relates to low-temperature fluid processing equipment~~ According to a third aspect of the present invention, there is provided an equipment for fluid processing at a temperature below -100°C, ~~characterized in that~~ wherein it includes:

- a surface able to come in contact with the low-temperature fluid;

- a protective assembly ~~as defined above~~ according to the second aspect, the panel being applied on the surface.

~~The invention also relates to a method for protecting low-temperature fluid processing equipment, including the following steps:~~

~~- providing an assembly as defined above, the panel being applied on a surface of the equipment likely to come in contact with the low-temperature fluid;~~

~~- verifying, at regular intervals, the presence of fluid in gas or liquid form on the panel by means of the detection assembly.~~

According to a fourth aspect of the present invention, there is provided a protective method for equipment for fluid processing at a temperature below -100°C, including the following steps: a protective assembly according to the second aspect, the panel being applied on a surface of the equipment that may come into contact with fluid at a temperature below -100°C; verifying, at regular intervals, the presence of fluid in gas or liquid form on the panel by means of the detection assembly.

The method according to embodiments of the invention may include one or more of the following features, considered alone or according to any technically possible combination(s):

- detecting low-temperature fluid in gas or liquid form on the panel using the detection assembly;

- activating the heating assembly to heat the panel.

The invention will be better understood upon reading the following description, provided solely as an example and done in reference to the appended drawings, in which:

- figure 1 is a diagrammatic side view of first low-temperature fluid processing equipment, provided with a plurality of protective panels according to the invention;

- figure 2 is a three-quarters front perspective view of a protective panel according to the invention; and

- figure 3 is a sectional view along plane III-III in figure 2.

The first piece of low-temperature fluid processing equipment 10 according to the invention is diagrammatically illustrated by figure 1.

The equipment 10 is designed for the storage, transfer, and optionally treatment of the fluid. It advantageously includes at least one fluid tank 12.

The fluid is preferably kept in liquid form, at a low temperature, in particular at a temperature below -100°C.

CLAIMS

1.- A protective panel ~~(24)~~ designed to be placed on a surface ~~(16)~~ of temperature fluid processing equipment ~~(10)~~ at a temperature below -100°C, comprising:

- a planar body ~~(26)~~;

- at least one element ~~(28)~~ for detecting the presence of fluid in gas or liquid form, received in the body ~~(26)~~;

~~characterized in that~~wherein the panel ~~(24)~~ includes at least one element ~~(30)~~ for heating the body ~~(26)~~, received in the body ~~(26)~~.

2.- The panel ~~(24)~~ according to claim 1, ~~characterized in that~~ wherein it includes a control unit ~~(32)~~, received in the body ~~(26)~~, the control unit ~~(32)~~ being connected to the detection element ~~(28)~~ to measure a parameter for detecting the presence of a fluid in gas or liquid form at a temperature below -100°C, the control unit ~~(32)~~ being connected to the heating element ~~(30)~~, to activate the heating element ~~(30)~~.

3.- The panel ~~(24)~~ according to claim 2, ~~characterized in that~~ wherein the control unit ~~(32)~~ includes a communication assembly ~~(40)~~ with an outside command unit ~~(22)~~, advantageously a wireless communication assembly ~~(40)~~ of the Wi-Fi or Bluetooth type.

4.- The panel ~~(24)~~ according to any one of ~~the preceding~~ claims 1 to 3, ~~characterized in that~~ wherein it defines a lower face ~~(34)~~, designed to be pressed on the surface ~~(16)~~ of the fluid processing equipment ~~(10)~~, and an upper face ~~(36)~~, situated opposite the lower face ~~(34)~~, the detection element ~~(28)~~ being situated near or flush with the upper face ~~(36)~~, the heating element ~~(30)~~ being situated near or flush with the lower face ~~(34)~~.

5.- The panel ~~(24)~~ according to any one of ~~the preceding~~ claims 1 to 3, ~~characterized in that~~ wherein the detection element ~~(28)~~ is chosen from among a thermocouple or an optical fiber, the heating element ~~(30)~~ being chosen from among a heating cable and/or heating resistance.

6.- The panel ~~(24)~~ according to any one of ~~the preceding~~ claims 1 to 3, ~~characterized in that~~ wherein the body ~~(26)~~ is manually deformable, advantageously being able to be wound and unwound.

7.- The panel ~~(24)~~ according to any one of claims 1 to ~~5~~3, ~~characterized in that~~ wherein the body ~~(26)~~ is rigid.

8.- The panel ~~(24)~~ according to any one of ~~the preceding~~ claims 1 to 3, ~~characterized in that~~ wherein the body ~~(26)~~ includes an enclosure delimiting a cavity receiving the heating element ~~(30)~~ and a filler material fixing the heating element ~~(30)~~ in the cavity.

9.- A protective assembly ~~(20)~~ for low-temperature fluid processing equipment ~~(10)~~ at a temperature below -100°C, ~~characterized in that~~ wherein it includes:

- at least one panel ~~(24)~~ according to any one of ~~the preceding~~ claims 1 to 3, designed to be pressed on a surface ~~(16)~~ of the equipment;

- a control unit ~~(22)~~, positioned away from the panel ~~(24)~~, the control unit ~~(22)~~ being connected to the panel ~~(24)~~, the control unit ~~(22)~~ being able to collect at least one leak detection parameter measured by the detecting assembly ~~(28)~~, and being able to activate the heating element ~~(30)~~.

10.- The assembly ~~(20)~~ according to claim 9, ~~characterized in that~~ wherein it includes a plurality of panels ~~(24)~~ designed to be applied on a surface ~~(16)~~ of the fluid processing equipment, each panel ~~(24)~~ being connected to the command unit ~~(22)~~.

11.- Equipment ~~(10)~~ for fluid processing at a temperature below -100°C, ~~characterized in that~~ wherein it includes:

- a surface ~~(16)~~ able to come in contact with the low-temperature fluid;

- a protective assembly ~~(20)~~ according to ~~any one of claims 9 or 10~~ 9, the panel ~~(24)~~ being applied on the surface ~~(16)~~.

12.- A protective method for equipment ~~(10)~~ for fluid processing at a temperature below -100°C, including the following steps:

- a protective assembly ~~(20)~~ according to ~~any one of claims 9 or 10~~ 9, the panel ~~(24)~~ being applied on a surface ~~(16)~~ of the equipment that may come into contact with fluid at a temperature below -100°C;

- verifying, at regular intervals, the presence of fluid in gas or liquid form on the panel ~~(24)~~ by means of the detection assembly ~~(28)~~.

13.- The method according to claim 12, ~~characterized in that~~ wherein it comprises the following steps:

- detecting fluid in gas or liquid form at a temperature below -100°C on the panel ~~(24)~~ using the detection assembly ~~(28)~~;

- activating the heating assembly ~~(30)~~ to heat the panel ~~(24)~~.