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## (54) Modular assembly of compact devices for de-icing installations.

(57) The invention relates to a modular assembly of compact devices for de-icing installations which, by means of a series of compact devices arranged on standard pallets (15) (1200 mm x 1000 mm), which can be combined with one another, starting from unit type (A) (always present), to which different units type (B), (C) or (D) can be added, according to the desired combination based on the required needs, which allows solving the occurrence of ice in areas sensitive to the occurrence thereof, being more cost-effective for those points of the road where, for economic reasons, a lower investment is required, the assembly being easy to install, handle and transport.

The invention has a special application in the road sector in which, due to circumstances, it is necessary to have a solution de-icing, such as for example in roadways at a high risk of frosts, such as viaducts, northern" tunnel openings, certain entrance and exit ramps, etc.

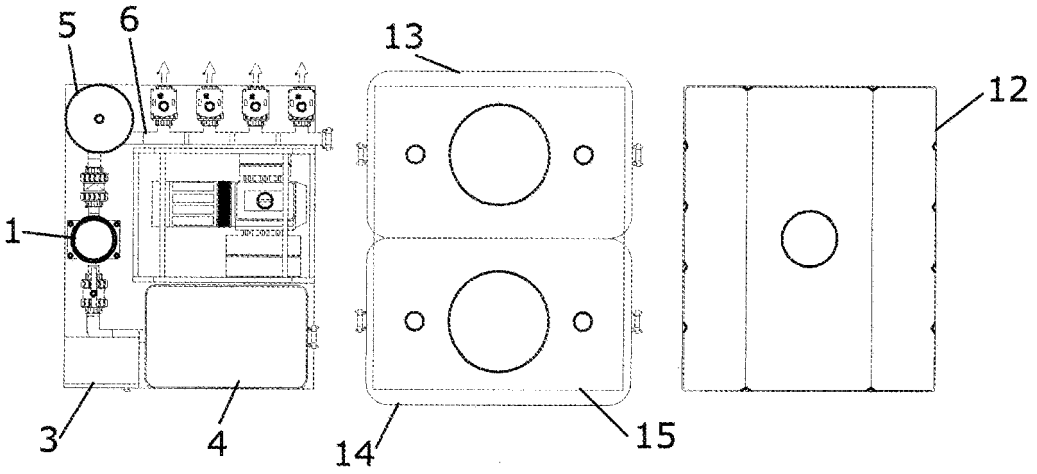


FIG.5

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## Description

### Object of the Invention

**[0001]** The object of the present invention patent is to present a novel modular assembly of compact devices for de-icing installations which, by means of the combination of different compact devices arranged on standard pallets (1200 mm x 1000 mm), allowing solving the occurrence of ice in areas sensitive to the occurrence thereof.

**[0002]** This modular assembly of compact devices for de-icing installations have a special application in the road sector in which due to circumstances, it is necessary to quickly, with no type of civil work, have a de-icing solution, such as for example in roadways at a high risk of frosts, such as viaducts, "northern" tunnel openings, certain entrance and exit ramps, etc.

### Background of the Invention

**[0003]** Different systems have been developed to date to prevent the problems of the formation of patches of ice on the roadway by means of systems for spraying a de-icing agent (brine). These systems are very effective since the response when there is a risk of frosts is virtually immediate. The problem with current systems is that they are not very cost-effective for short sections of roadway or certain specific points of said roadway.

**[0004]** The investment that has to be made with current systems is high (installation of the system and materials; a place must be found to store the brine deposits, pumping units, the need for power supply connection, automation system, etc.).

**[0005]** Until now, any installation for solving the problem of ice involves huge economic investments due to the necessary infrastructure of both a civil work and of necessary workers.

**[0006]** With the current systems it is impossible to focus on specific areas where ice occurs as they are far away from one another.

**[0007]** No modular assembly of compact devices for de-icing installations such as the one described in the present invention patent is described in the current state of the art.

### Description of the Invention

**[0008]** To palliate or where appropriate eliminate the problems mentioned above, this novel modular assembly of compact devices for de-icing installations is proposed, which assembly is more cost-effective for those points of the road where, for economic reasons, a lower investment is required and, however, are points susceptible to frosts and road administration problems, the assembly being easy to install, handle and transport, and it further allows extending it in different ways without a high economic investment.

**[0009]** All the devices forming this novel modular assembly are arranged on standard pallets (1200 mm x 1000 mm), greatly facilitating the transport thereof.

**[0010]** This novel modular assembly of compact devices for de-icing installations can be formed by the combination or not of the different types of independent devices forming it, being able to be easily adapted to any type of possible circumstances, performing modulations with the different "Types", i.e., depending on the technical study in question, by way of example the following combinations could be performed:

1. Type A: for those circumstances in which with this single module is enough to perform the application. This "Type" will always be present, alone or in combination with any of the others.
2. Type A + Type B: for those circumstances in which it is necessary to increase the number of sprinklers and therefore the amount of de-icing agent to be applied. The tanks of both "types" will be communicated, as well as the collectors in which the valves are installed, the programming for opening and closing the valves, etc., will be changed.
3. Type A + Type B + Type C: for those circumstances in which, due to the environmental characteristics of the area and due to the surface of the road on which action is to be taken, it is necessary to increase the capacity of the system, both of valves / sprinklers, and the de-icing agent storage capacity.
4. Type A + Type C: for those circumstances in which, due to the environmental characteristics of the area in which they will be installed, they will operate with a relative regularity and it is therefore necessary to increase the amount of de-icing agent that must be applied.
5. Type A + Type D: for those circumstances in which it is necessary to increase the fuel and de-icing agent capacity.
6. Type A + Type D + Type C: for those circumstances in which it is necessary to increase the fuel and de-icing agent capacity.

### Description of the Drawings

**[0011]** To complement the description that is being made and for the purpose of aiding to better understand the features of the invention, a set of drawings is attached to the present specification as an integral part thereof in which, with an illustrative and non-limiting character, the following has been depicted:

- Figure 1: Views of both profiles, as well as elevational and plan views of device type (A) of the modular assembly of compact devices for de-icing installations, object of the present invention patent.
- Figure 2: Elevational and plan view of device type (B) of the modular assembly of compact devices for de-icing installations, object of the present invention

patent.

- Figure 3: Elevational and plan view of device type (C) of the modular assembly of compact devices for de-icing installations, object of the present invention patent.
- Figure 4: Elevational and plan view of device type (D) of the modular assembly of compact devices for de-icing installations, object of the present invention patent.
- Figure 5: plan view of an example of the arrangement of the modular assembly of compact devices for de-icing installations, with some devices forming it, according to example 6 of the description, of type (A) + type (D) + type (C), for those circumstances in which it is necessary to increase the fuel and de-icing agent capacity.

Preferred Embodiment of the Invention

**[0012]** As can be seen in the attached figures, the modular assembly of compact devices for de-icing installations object of the present invention patent comprises a series of compact devices arranged on standard pallets (15) (1200 mm x 1000 mm), which can be combined among the different types of units of type (A), (B), (C) or (D).

**[0013]** Device type (A) has a hydraulic pump (1) prepared for progressive static start or a start by means of a variable frequency drive, a power unit (2), the power of which will depend on the power of the pump, which allows signal starting, a sealed-type protection and control panel (3) with a minimum degree of protection IP. 557, a closed liquid tank (4) provided with several openings in the upper part, with their corresponding covers and caps, and with one or two lower outlets with a disposable blind flange and gasket allowing the coupling of counter flanges with different diameters, a drum (5) the installation of which will depend on the type of start used because it must be installed in order to be able to compensate for the increases / reductions of pressure in the network and always maintain same loaded, a collector (6) for the installation of at least one motor-operated control valve (7) to control opening and closing, which will be connected to the de-icing sprinklers.

**[0014]** All the elements necessary for automating the different devices can be installed in the protection and control panel (3); in the event that a variable frequency drive is installed in said panel, the drum (5) will not be installed.

**[0015]** Device type (B) comprises a closed liquid tank (8) provided with several openings in the upper part, with their corresponding covers and caps, and with one or two lower outlets with a disposable blind flange and gasket which allow the coupling of counter flanges with different diameters, an HDPE (high-density polyethylene) fuel tank (9); it must be equipped with an outer enclosure operating like a 100% capacity retention pond, a collector for the installation of HDPE (high-density polyethylene PE100) automatic valves (10) which are very resistant to chemical agents and other media having a very different composition such as diluted alkali, acid and aqueous saline solutions, the minimum number of valves is from one to eight sequentially operating one by one, each of these valves will be connected to two frost control sprinklers and at least one opening and closing control valve (11).

**[0016]** Device type (C) comprises a large-capacity IBC container (12) manufactured in HDPE (high-density polyethylene) and has a filling opening as well as a discharge valve and a welded steel rod protection cage protected with an anti-corrosive coating.

**[0017]** Device type (D) comprises a closed liquid tank (13) manufactured in HDPE (high-density polyethylene) and is provided with several openings in the upper part, with their corresponding covers and caps, and with one or two lower outlets with a disposable blind flange and gasket which allow the coupling of counter flanges with different diameters, the fuel tank (14) manufactured in HDPE (high-density polyethylene), and it is equipped with an outer enclosure operating like a 100% capacity retention pond.

**[0018]** Example 6 described would involve the combination of devices type (A) + type (D) + type (C) for those circumstances in which it is necessary to increase the fuel and de-icing agent capacity.

**[0019]** Having sufficiently described the nature of the present invention as well as a manner of carrying it out to practice, all that must be added is that said invention can be subjected to certain variations in shape and materials, provided said alterations do not substantially change the features claimed below.

## Claims

1. A modular assembly of compact devices for de-icing installations, said assembly being of the type comprising a series of compact devices **characterized by** being arranged on standard pallets (15) (1200 mm x 1000 mm), and being able to be combined among the different types of units of type (A), (B), (C) or (D); wherein device type (A) has a hydraulic pump (1) prepared for the progressive static start or a start by means of a variable frequency drive, a power unit (2) the power of which will depend on the power of the pump, which allows signal starting, a sealed-type protection and control panel (3) with a minimum degree of protection IP.557, a closed liquid tank (4) provided with several openings in the upper part, with their corresponding covers and caps, and with one or two lower outlets with a disposable blind flange and gasket allowing the coupling of counter flanges with different diameters, a drum (5) the installation of which will depend on the type of start used because it must be installed in order to be able to compensate for the increases / reductions of pres-

sure in the network and always maintain same loaded, a collector (6) for the installation of at least one motor-operated control valve (7) to control opening and closing, which will be connected to the de-icing sprinklers.

2. The modular assembly of compact devices for deicing installations according to claim 1, **characterized in that** all the elements necessary for automating the different devices can be installed in the protection and control panel (3); the drum (5) will not be installed in the event that a variable frequency drive is installed in said panel.

3. The modular assembly of compact devices for deicing installations according to claim 1, **characterized in that** device type (B) comprises a closed liquid tank (8) provided with several openings in the upper part, with their corresponding covers and caps, and with one or two lower outlets with a disposable blind flange and gasket which allow the coupling of counter flanges with different diameters, an HDPE (high-density polyethylene) fuel tank (9); it must be equipped with an outer enclosure operating like a 100% capacity retention pond, a collector for the installation of HDPE (high-density polyethylene PE100) automatic valves (10) which are very resistant to chemical agents and other media having a very different composition such as diluted alkali, acid and aqueous saline solutions, the minimum number of valves is from one to eight sequentially operating one by one, each of these valves will be connected to two frost control sprinklers and at least one opening and closing control valve (11).

4. The modular assembly of compact devices for deicing installations according to claim 1, **characterized in that** device type (C) comprises a large-capacity IBC container (12) manufactured in HDPE (high-density polyethylene) and has a filling opening as well as a discharge valve and a welded steel rod protection cage protected with an anti-corrosive coating.

5. The modular assembly of compact devices for deicing installations according to claim 1, **characterized in that** device type (D) comprises a closed liquid tank (13) manufactured in HDPE (high-density polyethylene) and is provided with several openings in the upper part, with their corresponding covers and caps, and with one or two lower outlets with a disposable blind flange and gasket which allow the coupling of counter flanges with different diameters, the fuel tank (14) manufactured in HDPE (high-density polyethylene), and it is equipped with an outer enclosure operating like a 100% capacity retention pond.

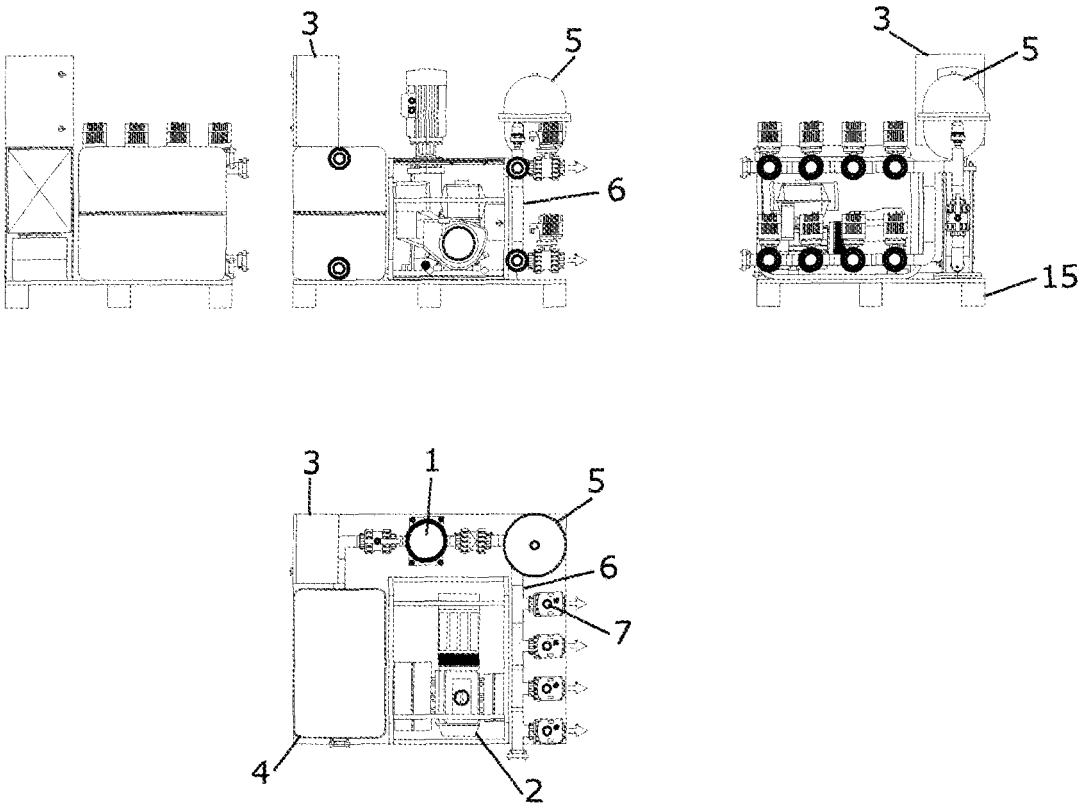


FIG.1

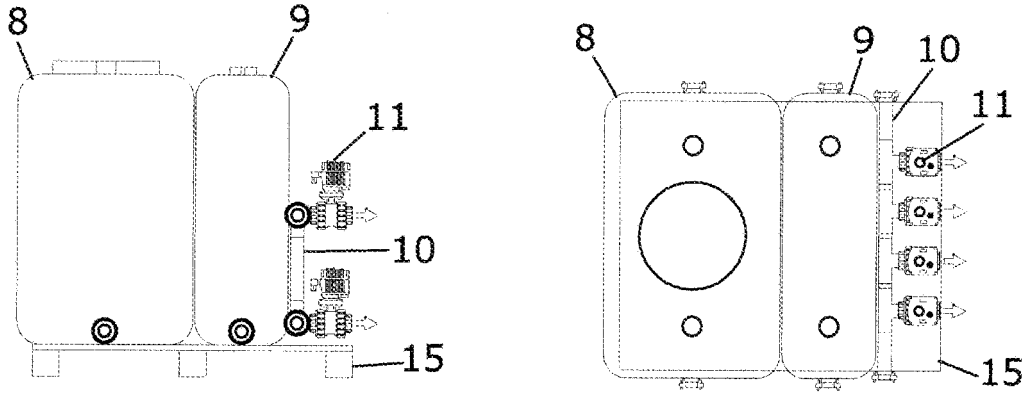


FIG.2

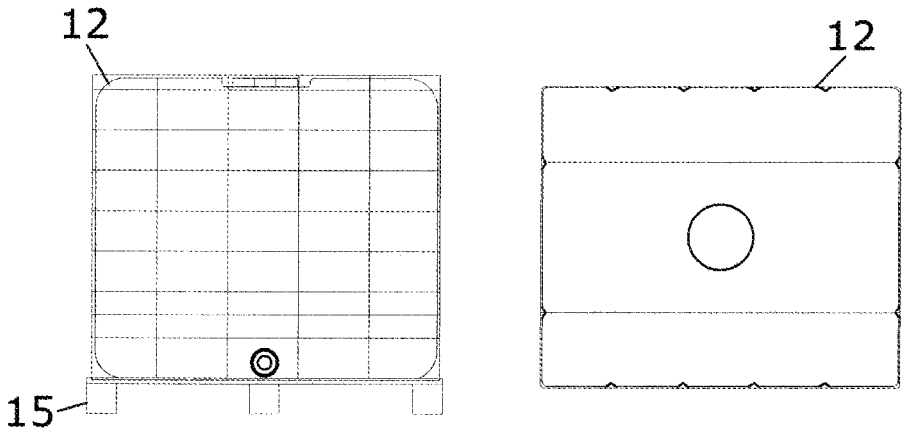


FIG.3

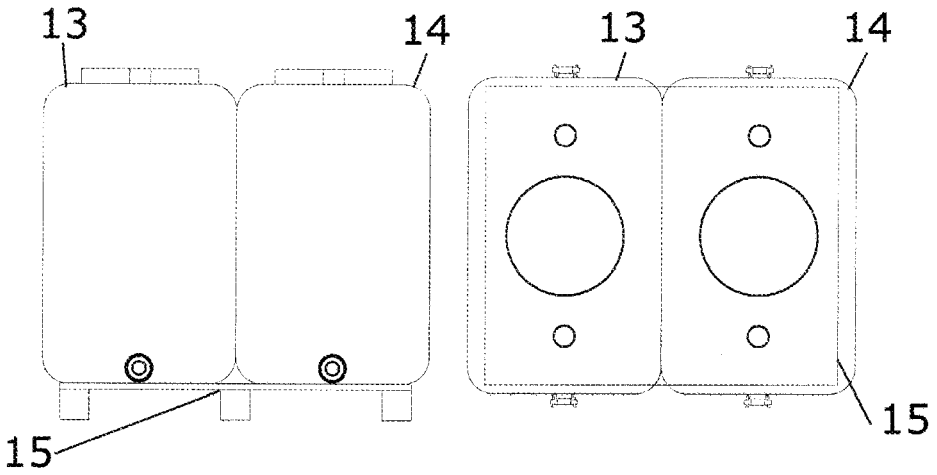


FIG.4

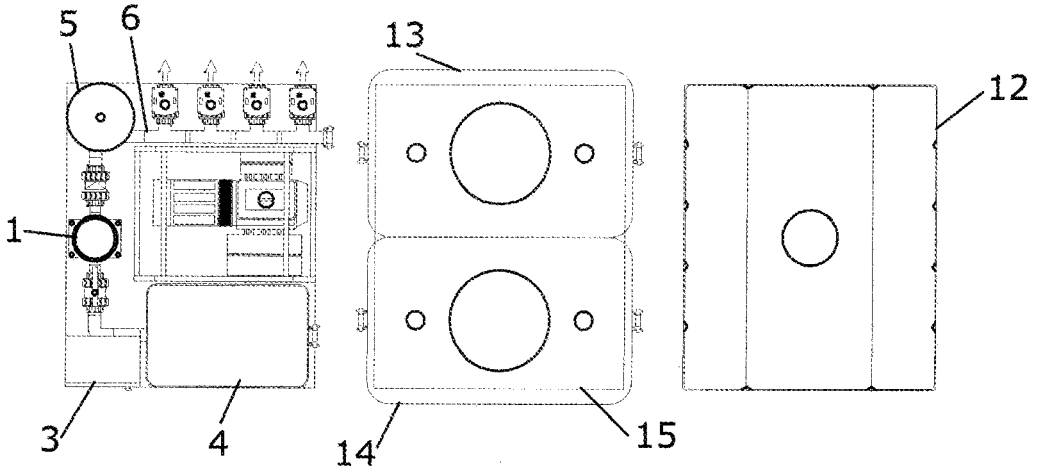


FIG.5