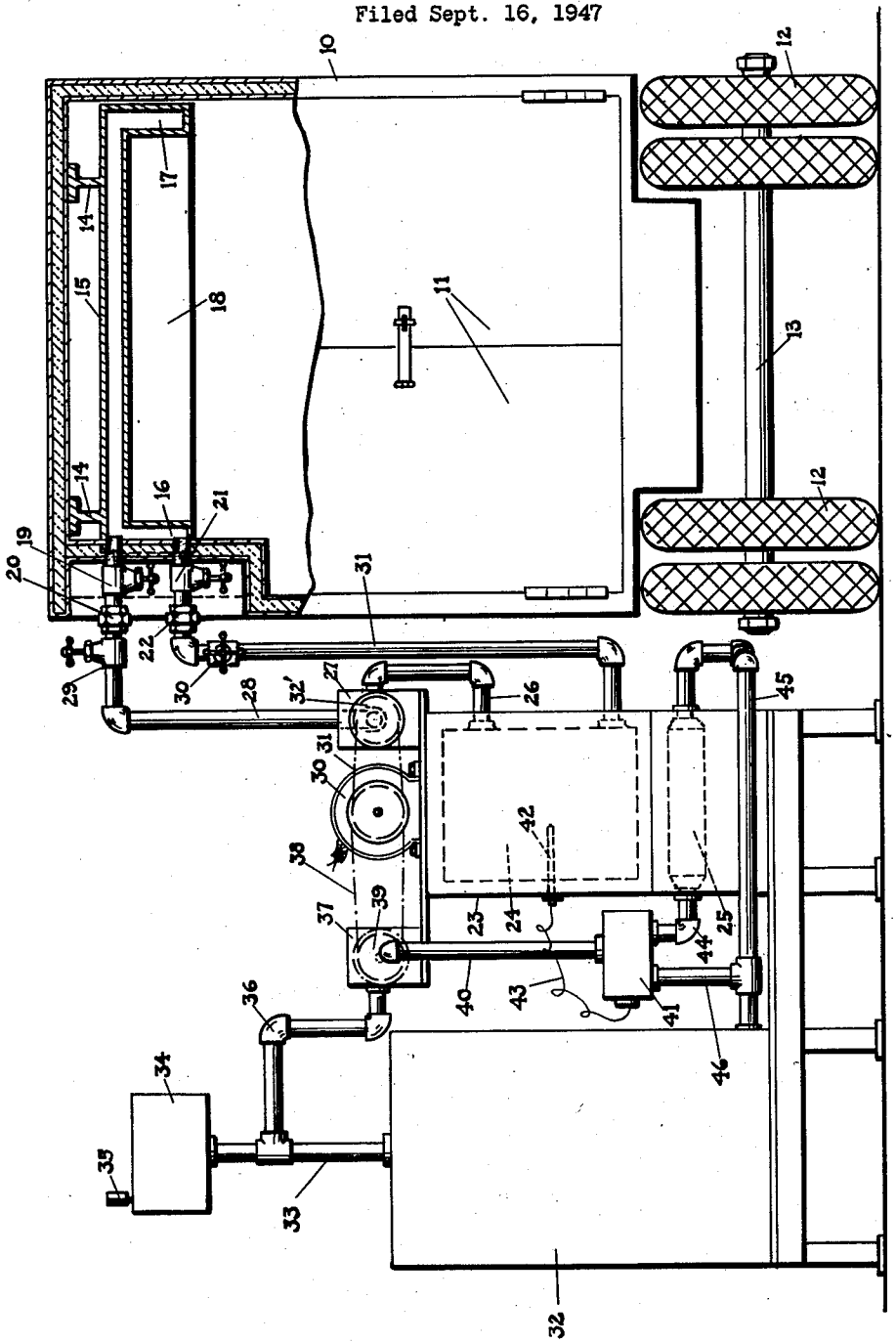
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COOLING SYSTEM

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COOLING SYSTEM

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This invention relates to systems for cooling enclosures and more particularly to such systems using a particular class of chemical compounds as the heat transfer medium.

Heretofore various systems and devices have been employed for cooling enclosures and more particularly for cooling the interior of storage containers, vehicles, refrigerator cars and the like to hold interior temperatures low enough to preserve the contents thereof during shipping. In many instances cooling is obtained by bunkering the container with ice which is an expensive and inefficient method and one requiring frequent stops for re-icing. In other cases each vehicle or container is supplied with a separate and individually powered refrigerating unit. Such units are expensive to install and expensive to operate.

I have found that by the use of a particular class of chemical compounds, the tetra-aryl ortho silicates, as the heat transfer medium a simple, inexpensive and most efficient system for cooling such enclosures can be devised. The tetra-aryl ortho silicates are described in the Johnston Patent #2,335,012, dated November 23, 1943, and are fluid at approximately —70° F. and boil in the neighborhood of 725° F. Within this wide temperature range these silicates are a most efficient heat transfer medium and may be used in the lightest and most simple structures without danger from high pressures.

It is accordingly an object of the present invention to provide a novel system for cooling the interior of enclosures and particularly transportable containers using a particular class of chemical compound as the heat transfer medium.

Another object is to provide such a system using tetra-aryl ortho silicate as the heat transfer medium.

Another object is to provide such a system which is of simple construction, light, cheap and easy to manufacture and efficient in operation.

Other and further objects of the present invention will appear from the following description.

An embodiment of my invention is shown in the accompanying drawing and is described hereinafter to illustrate the same. This should in no way be construed as defining or limiting my invention and reference should be had to the appended claims for this purpose.

The embodiment to be described shows the system for cooling the medium as nonportable and the enclosure to be cooled as a refrigerator for a trailer-truck. It is to be expressly understood that it is within the scope of my invention to construct the cooling system as portable and to apply the same to any type of enclosure or container, portable or stationary.

In the drawing 10 is any suitable enclosure or container to be refrigerated and is provided with

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loading doors 11 which are shown broken away adjacent their tops to show a part of the interior of the container in section. As here shown, container 10 is the trailer of a trailer-truck combination and is supported for transportation upon rear wheels 12 and axle 13. Arranged within container 10 and supported from its top by brackets 14 is a coolant reservoir 15 here shown as approximately the same shape as the top of the container and provided with hollow downwardly depending side elements 16 and 17, and hollow end elements, one of which is shown at 18. The refrigerating medium or coolant, tetra-aryl ortho silicate, is admitted to reservoir 15 through manually operable valve 19 and coupling 20 and is removed from reservoir 15 through manually operable valve 21 and coupling 22, it being understood that any suitable automatic valve or coupling may be used in the place of those illustrated.

Suitably arranged with respect to container 10, and in this case positioned so that the trailer-truck can be placed along side, is any suitable absorption type refrigerating unit 23 including a conventional evaporator provided with a separate reservoir 24 for tetra-aryl ortho silicate cooled by the absorption type refrigeration unit 23, said unit 23 being provided with a conventional generator 25 where the refrigerant is vaporized for circulation in the unit 23 for ultimate use in the evaporator. Cooled tetra-aryl ortho silicate is taken from reservoir 24 by pipe 26 and circulating pump 27 and is delivered to coupling 20 and reservoir 15 through pipe 28 and manually operable valve 29. Pump 27 is driven by a suitable motor 30, driving belt 31, and pulley 32'. Tetra-aryl ortho silicate is returned from reservoir 15 through coupling 22, manually operable valve 30 and pipe 31 to reservoir 24.

Positioned near refrigerating unit 23 is a boiler 32 suitable for heating tetra-aryl ortho silicate. Boiler 32 may be fired by coal, oil, gas or other suitable fuel or may be heated electrically. Heated tetra-aryl ortho silicate is taken from boiler 32 through pipe 33, an expansion tank 34 being provided to take care of any expansion or contraction of the tetra-aryl ortho silicate during heating and cooling. The circulating system for the heated tetra-aryl ortho silicate is preferably a closed system and for safety purposes should be provided with any suitable pressure and vacuum relief valve 35 preset to open only under abnormal conditions of pressure and vacuum. Pipe 33 connects with pipe 36 leading to one side of a circulating pump 37 driven by motor 30 through belt 38 and pulley 39. Pump 37 discharges into pipe 40 which connects with a thermostatically controlled valve 41. Valve 41 is actuated in the conventional way by a bulb 42 subject to the temperatures of the cooled tetra-aryl ortho silicate in reservoir 24 and communicating

therewith by tube 43. Pipe 44 leads from valve 41 to generator 25 and pipe 45 connects the return side of generator 25 to the return side of boiler 32. A by-pass pipe 46 connects from valve 41 to return pipe 45.

With the embodiment of my invention set up as described, when it is desired to cool a container or to replenish the supply of coolant in a container, boiler 32 is fired and motor 30 started. Heated tetra-aryl ortho silicate will be circulated through generator 25 by pump 37 and refrigerating unit 23 will be energized and the tetra-aryl ortho silicate in reservoir 24 cooled. It is within the scope of this invention to maintain a supply of cooled tetra-aryl ortho silicate in reservoir 24 at all times by periodic or more or less continuous energization of unit 23 to meet any demands. Container 10 is then suitably positioned and couplings 20 and 22 are completed. Valves 29 and 19, 30 and 21 are then opened and pump 27 operated to circulate cooled tetra-aryl ortho silicate from reservoir 24 through reservoir 15 and back to reservoir 24 thus cooling the interior of container 10. When the interior of container 10 reaches the desired temperature valves 29, 19, 30 and 21 are closed, couplings 20 and 22 are broken, and container 10 may be removed and another connected in for cooling. If the interior of container 10 can be kept at the desired temperature after cooling for a desired period of time without keeping reservoir 15 full of cooled tetra-aryl ortho silicate to act as a source of cold the same may be wholly or partially drained back to reservoir 24 at the option of the user before coupling 22 is broken.

Valve 41 is thermostatically controlled to prevent the tetra-aryl ortho silicate in reservoir 24 from being cooled below any desired temperature for which valve 41 is preset. When the temperature in reservoir 24 falls below that for which valve 41 is preset bulb 42 will actuate valve 41 and pipe 44 and generator 25 will be closed to the supply of heated tetra-aryl ortho silicate which will be returned through by-pass 46 to boiler 32 thus de-energizing refrigerating unit 23 and allowing the temperature in reservoir 24 to rise. When the temperature in reservoir 24 rises to that for which valve 41 is preset bulb 42 will actuate valve 41 to shut off by-pass 46 and permit flow of heated tetra-aryl ortho silicate through generator 25 and energization of refrigerating unit 23.

The several valves, pumps, piping circuits, reservoirs and couplings as well as the boiler and refrigerating unit may all be constructed of the lightest weight materials since such a system has no pressure problems and the pumps need only circulate the tetra-aryl ortho silicate without substantial pressures being applied.

It will now be apparent that by the present invention I have provided a novel system for cooling the interior of enclosures or transportable containers using a particular class of chemical compound, tetra-aryl ortho silicate, as the heat transfer medium, which is of simple and inexpensive construction, lightweight, easy to manufacture, and efficient in operation.

Changes to or modifications of the embodiment of my invention herein described may now be suggested to those skiled in the art without departing from my inventive concept and reference should be had to the appended claims to determine the scope of this invention.

What is claimed is:

1. In a system of the type described including a container to be cooled by an organic ortho silicate, a reservoir in the container, means for heating an organic ortho silicate, absorption type refrigerating means including an evaporator and a generator where the refrigerant is vaporized for ultimate use in the evaporator, a second reservoir containing an organic ortho silicate to be cooled by the evaporator, a closed piping system connecting said heating means to one side of said generator to heat the same and vaporize the refrigerant and connecting the other side of said generator to the return side of said heating means, and a closed piping system connecting the second of said reservoirs to the first of said reservoirs.

2. A system as described in claim 1 in which circulating means are provided in the first named of said closed piping systems to circulate heated organic ortho silicate therethrough and circulating means are provided in the second named of said closed piping systems to circulate cooled organic ortho silicate therethrough.

3. A system as described in claim 1 in which expansion and contraction compensating means for the organic ortho silicate and a vacuum and pressure relief means are provided in the first named of said closed piping systems.

4. A system as described in claim 1 including a thermostatically controlled valve in said first named closed piping system responsive to the temperatures in the second of said reservoirs and a by-pass leading from said thermostatically controlled valve to the return side of said heating means.

5. In a system of the type described including a container to be cooled by an organic ortho silicate, a reservoir in the container, means for heating an organic ortho silicate, absorption type refrigerating means including an evaporator and a generator where the refrigerant is vaporized for ultimate use in the evaporator, a second reservoir containing an organic ortho silicate to be cooled by said evaporator, a piping system connecting said heating means to one side of said generator to heat the same and vaporize the refrigerant and connecting the other side of said generator to the return side of said heating means, and a piping system connecting the second of said reservoirs to the first of said reservoirs.

6. A system as described in claim 5 in which circulating means are provided in the first named of said piping systems to circulate heated organic ortho silicate therethrough and circulating means are provided in the second of said piping systems to circulate cooled organic ortho silicate therethrough.

7. A system as described in claim 5 including a thermostatically controlled valve in said first named piping system responsive to the temperatures in the second of said reservoirs and a by-pass leading from said thermostatically controlled valve to the return side of said heating means.

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