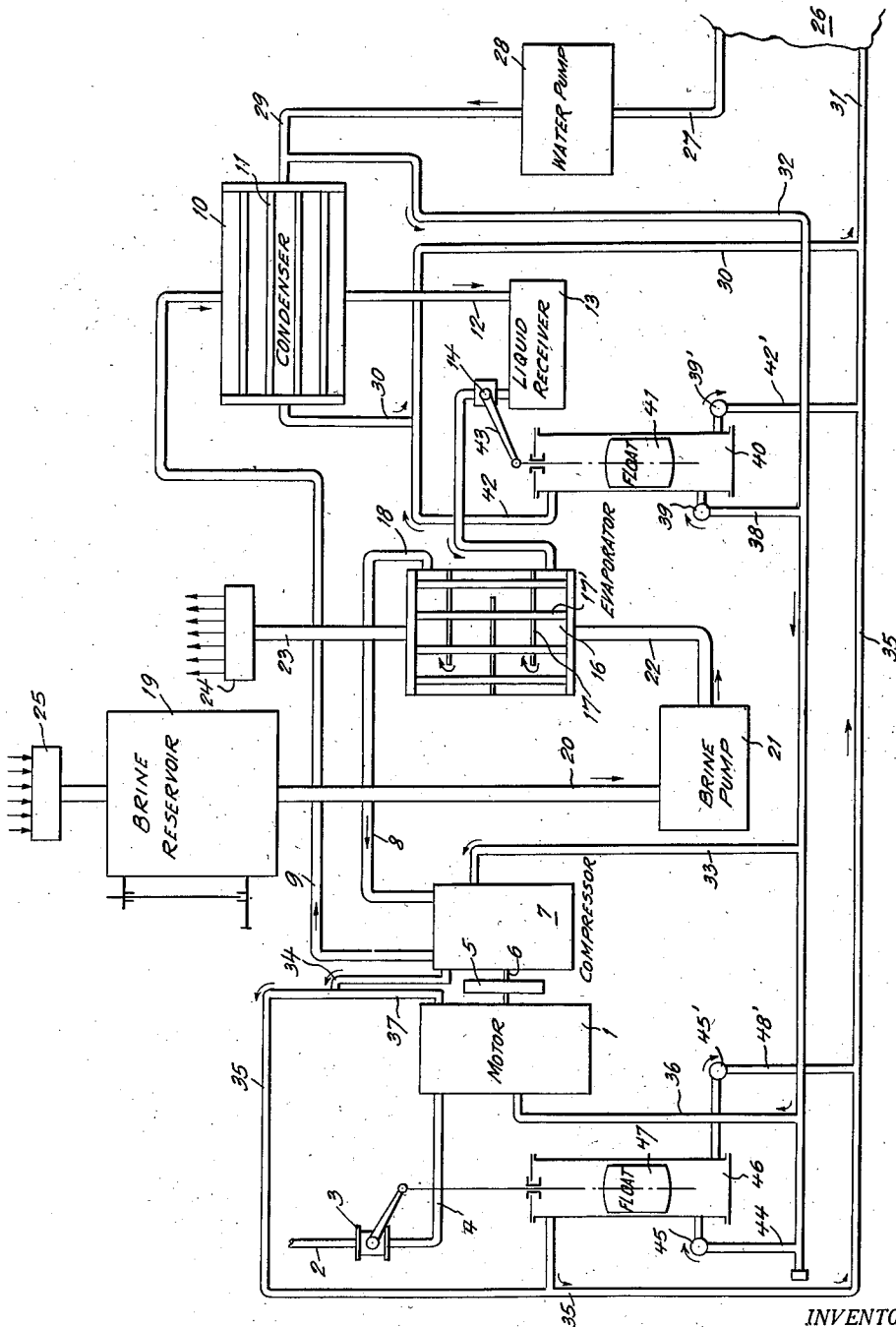


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SAFETY DEVICE FOR REFRIGERATION  
MACHINES AND THE LIKE  
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SAFETY DEVICE FOR REFRIGERATION  
MACHINES AND THE LIKE

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The present invention is directed to motor operated systems and more particularly to a structure adapted to act as a safety device in case of failure of certain elements of the system to operate properly. It is applicable to many types of such machines, including diesel, gas or gasoline engines, automobiles, trucks, compressors, pumps, refrigeration systems, and all cases where a flow of water or other liquid is essential for continued operation.

Refrigeration systems, for example, consist of a compressor for the refrigerating liquid, a condenser for liquefying the same and an evaporator for gasifying it, whereby heat is absorbed and a refrigerating effect obtained. Through the condenser there is generally circulated a cooling liquid such as water and if such circulation should fail, danger immediately arises. Such failure may be due to a defective water pump, leaks in pipes, drying up of a source of cooling water, plugging of pipes, cracking of jackets or various other minor accidents.

In such case great danger arises by reason of the fact that refrigerating gas continues to heat up and often builds up a sufficient pressure to cause rupture of the apparatus, some times with explosive violence. This causes great damage to the system and also puts the system out of commission whereby spoilage of food or other detrimental effects result.

Aboard ship such refrigeration systems are of prime importance for preserving food for long journeys and for various other uses. If failure occurs on a ship, a cargo may be completely ruined, not only by the failure of refrigeration but also by the release of the refrigerant. Also aboard ship there are a large number of persons who necessarily work in close quarters and a disruption of the refrigerating system would cause injury to a number of persons and particularly where the rupture was of explosive violence.

It has previously been proposed to provide some safety devices, such as thermometers or the like, which would indicate at a remote point an undue rise in temperature of a part of the system.

However, such a device is defective in that it requires an individual to watch the same and the human element is too uncertain for reliance thereon. In some instances it has been proposed to utilize a thermostat arrangement operated electrically to give an alarm or other indication, either visible or audible, of a failure in the system. Such devices operate fairly well but they are not sufficiently reliable for the purpose. Open contacts in such an alarm arrangement may be-

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come corroded as by sea air or may become dirty or there may be a short circuit, a blown-out fuse, or an open switch, or various other contingencies which will result in failure of the alarm device to operate. In any of these cases, the result of the operation is merely an alarm and before action can be taken thereon, serious damage may occur.

The present invention is intended and adapted to overcome the difficulties and disadvantages inherent in the prior art, it being among the objects of the present invention to provide a simple arrangement which constitutes a part of the refrigeration system and which is adapted to automatically operate to cut off the refrigeration system when danger occurs.

It is also among the objects of the present invention to provide a device which operates upon the failure or diminution of the water supply to cut off the flow of refrigeration gas and/or the operation of the compressor.

It is still further among the objects of the present invention to provide a device which operates on the principle of a float which in its movements is adapted to operate a cut-off such as a valve, switch or other element so as to prevent disruption of or damage to the refrigeration system.

In the operation of the present invention, there is provided the usual refrigerating system having in general the various elements set forth above and operating to cycle the refrigerant there-through. There is also provided a means for conducting refrigeration from the system to the desired points to be cooled. This may be accomplished in any of the usual ways, as for example by the use of brine which flows over the evaporator, is cooled and then distributed throughout the area to be cooled and then returned in a cyclic manner. There is also provided a motive means for operating the compressor which may be a steam engine, diesel motor or gasoline engine type, or even an electric motor. All these elements are well known in the art.

In practicing the present invention, there is added to the ordinary refrigerating system a chamber having a float therein of any suitable type. The chamber is connected to the cooling liquid, which circulates through various of the elements of the system. The float is also connected to a valve or other cut-off means such as the valve at the outlet of the liquid refrigerant receiver between the same and the evaporator. The cooling liquid connections to the float cham-

ber may be made in various ways, as for example it may be a by-pass in parallel with the cooling liquid for the condenser or it may be supplied by a portion of the water flowing out of the condenser. In any case, when the system is operating normally, the float chamber is filled with water which passes through the same to the outlet. The float itself is at its upper position and its connection with the valve or the like is such that the flow of liquid refrigerant to the evaporator is unimpeded. If, and when there is a failure of cooling liquid supply either in whole or in part, due to various possible causes, the water flowing through the float chamber diminishes or ceases, causing the float to drop to its low position. Because of the mechanical connection with the aforesaid valve, the downward movement of the float closes the valve and cuts off the supply of refrigerant.

This float may also be connected to the source of motive power to cut the power off from the compressor at the same time, and thus cause the entire system to stop operating. Similarly the various pumps in the system may be cut off if desired. Instead of such operation resulting from the movement of a single float, one or more additional floats and float chambers may be introduced into the system at various points.

In the accompanying drawing constituting a part hereof and in which like reference characters indicate like parts, the single figure is a diagrammatic view of a refrigeration system having embodied therein devices made in accordance with the present invention.

Motor 1 of any suitable type is supplied with a source of power such as steam, motor fuel, electricity or the like, through duct 2 having a valve, switch or the like 3 in the line and the connection 4 therefrom to the motor. The operation of the motor turns the flywheel 5 on a shaft 6 which operates compressor 7.

The refrigerant in vapor state enters the compressor through pipe 8, is compressed and flows therefrom through pipe 9 into condenser 10 having cooling tubes 11 therein. Liquefaction of refrigerant takes place and the liquid flows through pipe 12 into liquid receiver 13. A valve 14 is placed in liquid outlet 15, which enters evaporator 16 and passes around baffles 17. The evaporator is provided with pipes 17' through which brine flows. In the evaporation, the refrigerant absorbs heat from the brine, is gasified and passes out through pipe 18 and into pipe 8. Brine is contained in a reservoir 19 and flows through pipe 20 to brine pump 21, passing over pipe 22 through tubes 17', pipe 23 and into distributor 24. The cold brine is distributed to various areas to be cooled and then returns to header 25 and back to reservoir 19.

Cooling liquid such as sea water or river water 26 is drawn through pipe 27 by water pump 28 and is forced through pipe 29 into and through tubes 11 of condenser 10. The exit water passes through pipe 30 into pipe 31 to waste.

An additional pipe 32 for cooling water is connected with pipe 33 which communicates with a jacket or casing on compressor 7 to cool the same and then passes out through pipe 34 into pipe 35 and into exit pipe 31.

Also connected to pipe 32 is a pipe 36 which leads cooling liquid into a casing or jacket around motor 1 to cool the same, the liquid then passing out through pipe 37 and into pipe 35.

Still another pipe connection 38 from pipe 32 having a valve 39 therein enters the bottom of float chamber 40 containing float 41 and an

exit pipe 42 from the top of chamber 40 leads into out-flow pipe 30. A pipe 42' leads from the bottom of chamber 40 to exit pipe 31 and is controlled by valve 39'. Float 41 has a link or arm 43 connected to valve 14.

An additional pipe 44 leading from pipe 32 and controlled by valve 45 enters the bottom of chamber 46, containing float 47, and flows out of the chamber through pipe 48 in the top thereof and into pipe 35. An additional pipe 48' from the bottom of chamber 40 and controlled by valve 45' communicates with pipe 35.

The operation of the machine is as follows. Water pump 28 circulates water through condenser 10, compressor 7 and motor 1 while refrigerant circulates through condenser 10, receiver 13, evaporator 16 and compressor 20. The circulation of brine by pump 21 goes through evaporator 16, distributor 4 and reservoir 19. In addition, there is circulation of water through chambers 40 and 46 as described above.

If there should be a failure in the system, as for example a stoppage of pump 28, the flow of water through pipe 29 ceases or diminishes whereby the liquid in chamber 40 flows out through pipe 42', causing float 41 to drop, the result of which is that arm 43 closes valve 14, stopping the flow of refrigerating liquid. At the same time, and similarly, the cooling liquid in chamber 46 flows out through pipe 48', causing float 47 to drop and arm 49 thereon closes valve 3. This shuts off the fuel from the motor and stops the compressor. Thus at a stage in the operation before any damage can result from the stoppage of flow of cooling water, the entire machine is shut down. After it is repaired the water is caused to circulate with valve 39 open to fill chamber 41 and valve 45 open to fill chamber 46 and the machine may again be started in its normal operational cycle.

Although the invention has been described setting forth a single specific embodiment thereof, many variations in the details of construction may be made within the principles herein set forth. An entirely different type of refrigerating system may be substituted for the one illustrated in the drawing. The connections between the floats and the valves may be different from those shown. The flow of water through the float chambers, as for example chamber 40, need not be from pipe 38 through chamber 40 and out through pipe 42 but the outlet may be pipe 42'. The flow of water through said chambers may originate at other points in the system than illustrated and described.

More than two float chambers may be utilized or in some cases a single float chamber may be connected to two or more of the elements of the refrigeration system to obtain the type of functioning described herein. The float chambers may be used to open and close switches where, for example, an electric motor is used as a source of power. The character of the connections between the float and the valve or other device to be operated thereby may be quite different from those shown as many mechanical arrangements to accomplish the purpose are known to those skilled in the art. The refrigerant may be ammonia or any other chemical compound suitable for the purpose. It is not essential that the refrigeration be transmitted in the system by means of brine, but the other well-known means of obtaining refrigeration from a liquid refrigerant by evaporation may be utilized. Various other elements may be introduced into the sys-

tem in addition to those shown, as for example, check valves at suitable points and various other devices.

These and other changes in the details of the invention may be made within the spirit thereof and the invention is therefore to be broadly construed and not to be limited except by the character of the claims appended hereto.

I claim:

1. In a refrigeration system having a compressor for refrigerant, a motor attached to said compressor, a jacket for cooling liquid on said compressor, means for cutting off the source of power from said motor, a condenser for refrigerant connected to said compressor, a receiver for liquid refrigerant connected to said condenser, and an evaporator connected to said receiver and a valve in said connection, said compressor, condenser, receiver and evaporator constituting a closed system, a single source of cooling liquid for said condenser and compressor and means for circulating the same around said condenser and compressor to remove heat therefrom and an exit pipe for said liquid, the improvement which comprises a pair of chambers, each chamber having a float therein, a connection from said source of cooling liquid to each of said chambers and a connection from each of said chambers to the exit pipe for said cooling liquid, said floats being buoyed up while said liquid

flows through said chambers, a mechanical connection from one of said floats to said cut-off of said motor, a mechanical connection from said other float to said valve, whereby on failure of said source of cooling liquid said floats drop cutting off said power and closing said valve.

2. A system according to claim 1, in which there is included a by-pass connection from said source of cooling liquid to each of said chambers and pipes from each chamber connected to said exit pipe.

3. A system according to claim 1, in which separate pipes from said source of cooling liquid are connected to said compressor and condenser, respectively.

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