

1

2,693,091

HEAT EXCHANGE UNIT OF AN ABSORPTION REFRIGERATING APPARATUS

Boris Masing, Adliswil, Switzerland

Application February 27, 1951, Serial No. 212,863

Claims priority, application Switzerland March 2, 1950

4 Claims. (Cl. 62—119.5)

This invention relates to absorption refrigerators of the continuous cycle type having an inert gas circuit in which the gas circulates under the influence of gas columns of different density. It is known that the refrigerating capacity of absorption refrigerators of this type is decreased by thermal losses of the gas, these losses being directly proportional to the rate of circulation of the inert gas. A low temperature of the evaporator necessitates a relatively large flow of inert gas, whereas at higher temperatures of the evaporator a smaller flow of inert gas is necessary. In consequence, it is desirable to regulate the flow of circulatory gas in such a manner that it corresponds to the desired temperature of the evaporator, so that only so much gas circulates as is necessary to carry away the evaporated refrigerating medium. If such a regulation can be achieved, the amount of refrigerating medium available will be utilized entirely, whilst at the same time the loss of refrigerating capacity from avoidable heat losses is prevented.

The object of the present invention is to provide an absorption refrigerator, in which the flow of inert gas through the evaporator is regulated automatically in proportion to the flow of refrigerating medium. It is impracticable for this purpose to use mechanical valves in the gas circulation system, as such valves would be adversely affected in their function by corrosion in a short time. The maximum possible gas circulation is limited by the dimensions of the pipes. It is desirable, therefore, to limit the flow of circulating gas to a minimum by the use of liquid seals acting as valves. Liquid seals have been used in the inert gas circuit of absorption refrigerators, but in these known constructions the unavoidable throttling or temporary deflection of the poor gas is so slight that a regulation such as is contemplated in the present invention, is ruled out. The term "poor gas" is used to indicate gas which contains only a small proportion of the refrigerant such as ammonia.

The invention therefore comprises absorption refrigerating apparatus of the kind wherein one or more liquid seals are interposed in the inert gas circuit for the purpose of controlling the circulation of inert gas, the circuit including a gas heat exchanger having an inner pipe leading from the absorber to the evaporator, in which apparatus a liquid seal is interposed between the inner and outer pipes of the gas heat exchanger by providing a dam in the outer pipe, while the inner pipe has an aperture communicating with the outer pipe through a casing, which is arranged on the inner pipe, the casing having an opening situated below the level of the dam and extending substantially parallel with the axis of the gas heat exchanger.

The invention is illustrated, by way of example, in the accompanying drawings of which:

Fig. 1 shows an absorption refrigerator in diagrammatic arrangement,

Fig. 2 is a section through the heat exchanger,

Fig. 3 is a perspective view of a detail of the heat exchange and

Fig. 4 is a section along the line IV—IV of Fig. 2.

In Fig. 1 a boiler 1 is connected with a condenser 3 through a rectifier 2. A pipe 4 leads from the condenser 3 to an evaporator 5 which is connected with a gas heat exchanger 6. The gas heat exchanger 6 is connected with the absorber vessel 13 through a pipe 11 and also through an absorber 12. A pipe 17 conveys absorption medium from the boiler 1 through a liquid

2

heat exchanger 15 to a pipe 14 which leads into an absorber 12. A thermo-syphon pump coil 16, with a rising pipe 18, is provided on the boiler 1. The method of working of such systems is generally known, so that a description is unnecessary.

In Figs. 2 to 4 the special construction of a liquid valve device controlling the gas circulation is shown in detail. The poor gas passing through the gas heat exchanger 6 in the pipe 8 from the absorber normally flows through this pipe 8 to the evaporator where it is charged by evaporating refrigerating medium supplied from the pipe 4. The enriched gas then flows through the heat exchanger 6 and the pipe 11 to the absorber vessel 13 and absorber 12.

An aperture 9 is formed in the pipe 8 inside the gas heat exchanger 6, and this aperture opens into a sheet metal casing 7 which is arranged on the pipe 8. This sheet metal casing 7 extends nearly to the wall of the gas heat exchanger 6 at the bottom where it has an opening 10 which is substantially parallel with the axis of the gas heat exchanger. The pipe 11 is inserted into the gas heat exchanger 6 with its end above the bottom to provide a dam for any liquid situated in the gas heat exchanger. The dam level 11a is chosen so that the opening 10 will be completely closed when liquid rises to the level 11a. The gas heat exchanger is preferably built in obliquely in the apparatus at a slight angle to the horizontal, so that a continuous closing or opening of the opening 10 takes place when the level of the impounded liquid rises or falls.

It is also important for the rapid regulation of the circulation of inert gas and thus for the avoidance of heat losses, that the aperture 9 corresponds to about the cross-section of the pipe 8, while the cross-section of the opening 10 is many times this cross-section. The regulation is ensured in shortest time by the large cross-sections of the opening 10, which permits the passage of a substantial flow of gas through it.

The method of working of the device according to the invention is shortly as follows:

When the liquid seal which closes the opening 10 is absent, a proportion of the poor gas leaves through the aperture 9 and the opening 10 and flows directly back to the absorber 12. The reduced flow of poor gas through the evaporator results in some of the refrigerating medium flowing unevaporated from the evaporator into the pipe 6 of the exchanger until the level of the liquid is again raised and the opening 10 again closed.

Poor gas flowing through the inner pipe 8 to the evaporator 5 is in free communication through the aperture 9 with the level of any liquid refrigerant within the opening 10 in the casing 7, but the poor gas does not flow directly over the liquid surface in contact with it.

It is found with the device shown that only so much poor gas circulates through the evaporator as is necessary for the evaporation of the inflowing refrigerating medium at a given evaporator temperature.

I claim:

1. A substantially horizontal gas heat exchanger in combination with an evaporator and an absorber vessel, the exchanger having a first inner pipe, a second pipe interconnecting the vessel and the exchanger, the end of the second pipe in the exchanger being upwardly directed from the bottom thereof, a casing disposed on the inner pipe and in spaced relationship with the bottom of the exchanger, the casing having an opening in juxtaposition with the bottom of the exchanger and below the level of the protruding end of the second mentioned pipe in the exchanger, and the first inner pipe having an aperture coacting with the opening in the casing.

2. A gas heat exchanger according to claim 1 in which the aperture in the inner pipe corresponds substantially to the cross-section of the inner pipe.

3. A gas heat exchanger according to claim 1 in which the opening in the casing is greater in area than the cross-section of the inner pipe.

4. A gas heat exchanger according to claim 1 in which the opening in the casing is longitudinally inclined to the wall of the heat exchanger.

(References on following page)

2,693,091

3

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date	
2,242,281	Algren -----	May 20, 1941	5
2,242,282	Bergholm -----	May 20, 1941	
2,306,199	Ullstrand -----	Dec. 22, 1942	
2,484,669	Backstrom -----	Oct. 11, 1949	

Number
878,968

4

FOREIGN PATENTS

Country	Date
France -----	Feb. 10, 1943