June 27, 1950 C. C. COONS 2,513,148

INTERMITTENT ABSORPTION REFRIGERATION

Filed Aug. 22, 1946 2 Sheets-Sheet 1

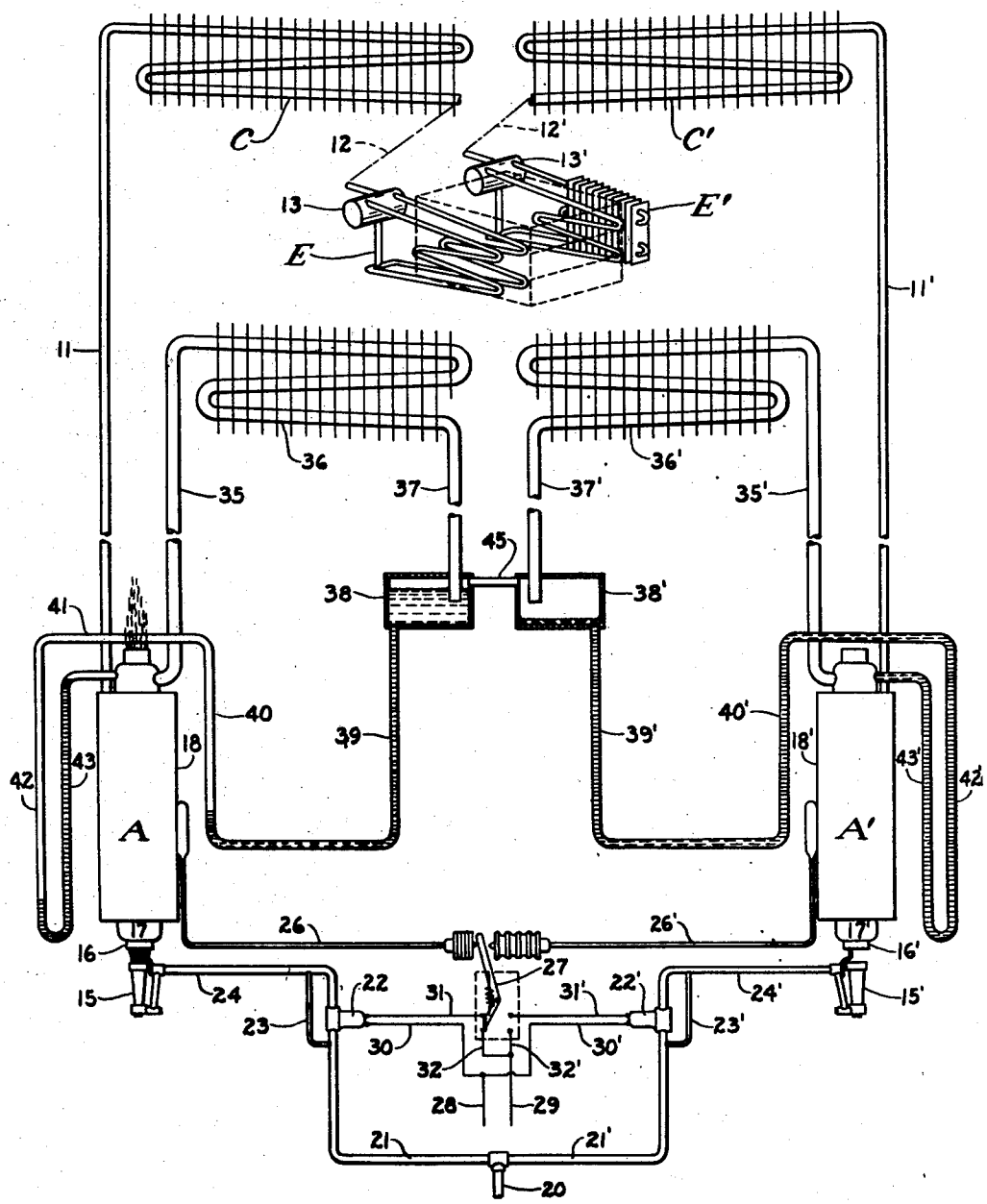


Fig. 1

INVENTOR.
Curtis C. Coons
BY Harry S. Demarse

June 27, 1950 C. C. COONS 2,513,148

INTERMITTENT ABSORPTION REFRIGERATION

Filed Aug. 22, 1946 2 Sheets-Sheet 2

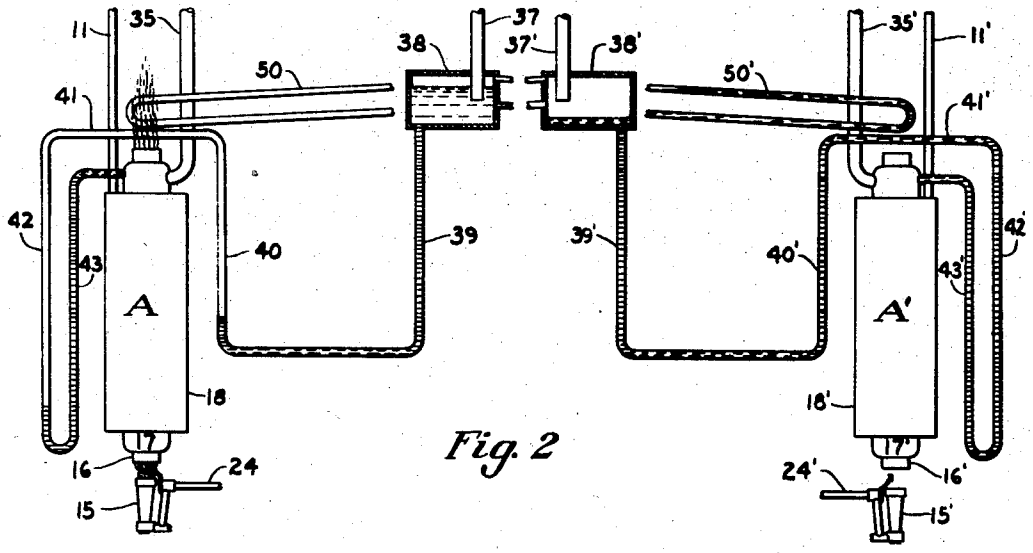


Fig. 2

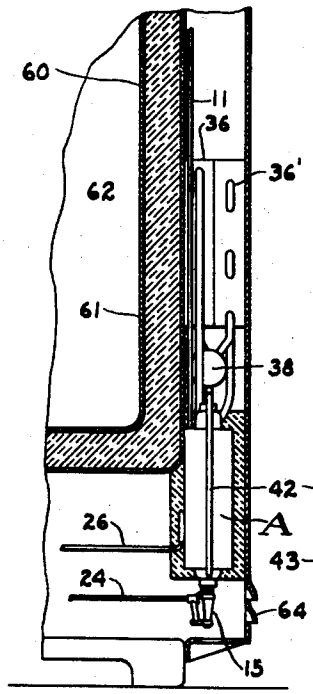


Fig. 3

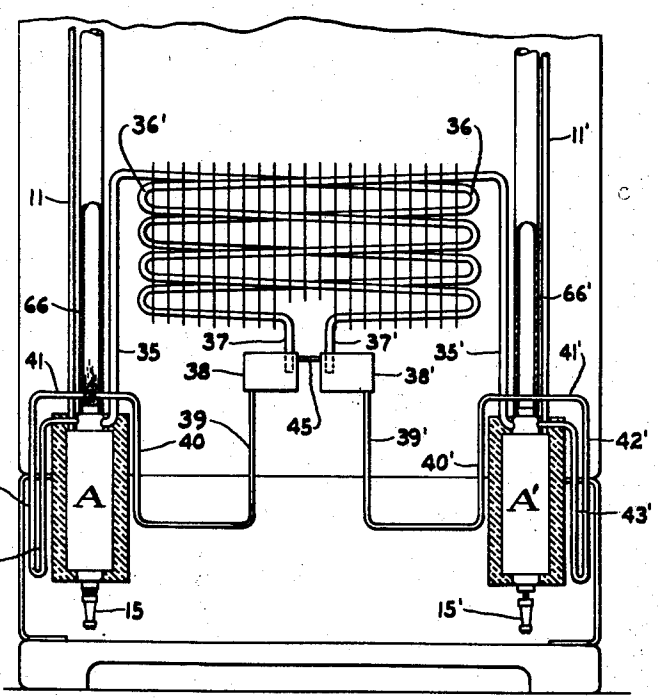


Fig. 4

INVENTOR.
Curtis C. Coons
BY Harry S. Denmee

Patented June 27, 1950 2,513,148

UNITED STATES PATENT OFFICE

2,513,148

INTERMITTENT ABSORPTION REFRIGERATION

Curtis C. Coons, North Canton, Ohio, assignor to The Hoover Company, North Canton, Ohio, a corporation of Ohio

Application August 22, 1946, Serial No. 692,267

18 Claims. (Cl. 62—5)

1

The present invention relates to the art of refrigeration and more particularly to a secondary cooling and control system for cooling and regulating the cooling of an element which is alternately subjected to heating and cooling cycles of operation.

Specifically the present invention proposes a cooling system for a device alternately subject to periods of heating and cooling operation characterized by the provision of a means having no moving parts automatically operable to interrupt the circulation of the cooling medium when the aforesaid device is heated and to restore circulation of the cooling medium quickly at the termination of a heating cycle.

In a specific sense the present invention is particularly applicable to a secondary cooling system for the generator-absorbers of a dual unit intermittent refrigerating device. In accordance with the invention the cooling system is provided with a vapor lock arrangement which is heated when heat is applied to the generator-absorber so as to interrupt the circulation of the cooling medium. Cooling medium flow is then interrupted simply by means of an entrapped body of vapor. The vapor lock is eliminated by the application of heat to the associated generator-absorber whereby an excess pressure is applied to certain portions of the first-mentioned cooling system which operates to destroy the vapor lock and restore the circulation of the cooling medium.

Other objects and advantages of the invention will become more apparent as the description proceeds when taken in connection with the accompanying drawings in which:

Figure 1 is a diagrammatic representation of a dual intermittent absorption refrigerating system embodying the present invention;

Figure 2 is a diagrammatic fragmentary view showing a modified form of the invention of Figure 1;

Figure 3 is a fragmentary vertical sectional view of a refrigerator cabinet showing the arrangement of certain parts of the present invention with respect to the cabinet; and

Figure 4 is a rear partial elevational view of the arrangement of Figure 3.

Referring now to Figure 1 of the drawing, it will be seen that the apparatus comprises two identical intermittent absorption refrigerating systems. Since the two systems are identical, the apparatus on the left-hand side of Figure 1 will be given reference characters, and the corresponding parts in the right-hand system of Figure 1 will be given corresponding reference characters distinguished by a prime.

2

The left-hand system of Figure 1 comprises a generator-absorber A connected by a conduit 11 to a tubular air-cooled condenser C which discharges condensed vapor through conduit 12 into the reservoir 13 of an evaporator E.

This apparatus is provided with a gas burner 15 which is arranged to discharge products of combustion into the central heating flue 16 of the generator-absorber A. When heat is applied from the burner 15, refrigerant vapor is evolved from the absorber contained in the generator-absorber A, which vapor flows through conduit 11, is liquefied in condenser C, and discharges through conduit 12 into the reservoir 13 of the evaporator E.

At the termination of a generating period, the control mechanism, to be described hereinafter, de-energizes the gas burner 15 and a cooling mechanism, also to be described hereinafter, cools the generator-absorber A. As a result of this action the pressure within the absorbent containing portion of generator-absorber A drops to a low value and causes evolution of vapor from the liquid contained in evaporator E and at a low refrigerating temperature. The vapor so produced flows from reservoir 13, through conduit 12, condenser C, and conduit 11 into the generator-absorber A wherein it is reabsorbed and the heat of absorption is rejected to an ultimate cooling medium by the action of the aforesaid cooling system.

The generator-absorber A comprises, in addition to the heating flue 16, a sealed tubular jacket 17 surrounding tube 16 for the reception of a cooling medium. The cooling jacket 17 is in turn surrounded by an absorbent containing construction indicated generally in the drawings at 18. The specific construction of the generator-absorber as such forms no part of the present invention. The system will be charged with a suitable refrigerant such as ammonia and a dry or liquid absorbent for the refrigerant such as strontium chloride or water.

Fuel for the fuel burners 15 and 15' is conducted from gas supply conduit 20 through conduits 21 and 21', respectively, to the burners 15 and 15', respectively. Conduit 21 is provided with a solenoid control valve 22 around which is connected a small by-pass conduit 23. The fuel passing through valve 22 and by-pass conduit 23 is conducted by conduit 24 to the burner structure. The burner per se forms no part of the present invention but is preferably of the type

embodying an automatic pilot or minimum ignition flame arrangement and a flame failure safety cut-off.

A thermostat 26 is associated with the generator-absorber A and is arranged to operate a snap acting electrical switch mechanism 27. In the position shown, the electrical switch mechanism is energizing the solenoid valve 22 through the following circuit: line wires 28 and 29, conductor 30, conductor 31, the left-hand contact of switch 27, and conductor 32.

As the generator-absorber A reaches the end of its heating period, the temperature thereof begins to rise due to the reduced evolution of refrigerant vapor therefrom. When this temperature reaches a predetermined point, the thermostat element 26 will expand and actuate the switch 27 to its opposite position de-energizing solenoid valve 22 and energizing solenoid valve 22'.

In the positions of the thermostatic elements 26 and 26' shown, the burner 15 has just been energized for a short period of time. As a result, the thermostat 26 is collapsed because the burner has not had time to heat the generator-absorber A to any appreciable degree. On the other hand, the thermostatic element 26' is expanded because the temperature of the external casing of the generator-absorber A' has not yet been lowered appreciably. However, as the generator-absorber A approaches the end of its heating cycle, the generator-absorber A' will have been cooled to a comparatively low temperature and the thermostat 26' will be collapsed, thus expansion of the thermostat 26 will actuate the snap switch 27 without interference from the thermostat 26'. This alternate heating of the two generator-absorbers proceeds automatically as long as the system is energized.

The absorber-generator A has associated with its cooling jacket 17 a secondary cooling system comprising a vapor discharge conduit 35 for the jacket 17 which conducts vapor into the air-cooled condenser 36. The condensate formed in condenser 36 flows through a conduit 37 into a reservoir 38. From reservoir 38 a conduit 39 conveys cooling liquid to the inlet leg 40 of a vapor lock conduit comprising conduits 40, 41, and 42 arranged in the form of an inverted U with the bight conduit 41 passing over the upper or discharge end of the products of combustion flue 16 of the generator-absorber. The discharge leg 42 of the vapor lock construction forms a U-shaped trap conduit with the conduit 43 which opens into the upper end of cooling jacket 17. This system will be charged with a suitable coolant such as methyl chloride.

The reservoirs 38 and 38' have the upper portions thereof connected by a conduit 45 for a purpose to be hereinafter described.

During cooling operation of the generator-absorbers, the conduit system connecting the reservoir to the generator-absorber cooling jacket is substantially filled with liquid in the manner shown for the generator-absorber A'. However, at switchover, when the burner 15 is actuated to full flame operation, the heat applied to conduit 41 vaporizes some of the liquid therein contained almost as soon as the flame reaches full volume on the burner itself. The vapor formed in conduit 41 fills the conduit 41 and extends into the conduits 40 and 42 to establish a condition of vapor lock which prevents any further flow of liquid from reservoir 38 into the cooling jacket 17.

Since liquid flow into jacket 17 is no longer possible, the liquid contained in the jacket is rapidly vaporized and passes through conduit 35 to condenser 36 wherein it is condensed and is discharged in liquid form through conduit 37 into the reservoir 38. Thus a short time after switchover to heating cycle operation substantially all the liquid in the system is contained in reservoir 38 except for the small amount present in conduits 39, 40, 42, and 43.

As the heating cycle continues, there will be some evaporation of liquid in conduits 40 and 42 due to heat conducted along the length of that conduit until a condition of balance is reached which is roughly indicated by the liquid level as shown in the conduits 40 and 42. Such a condition is achieved when the conduits 40 and 42 are at the condensation temperature of the cooling medium at the surface level of liquid therein. It will be understood, however, that this showing of liquid levels in conduits 40 and 42 represents a possible condition; the liquid levels may be higher than shown or slightly lower, depending upon varying ambient conditions, rate of heat application, and design factors.

The conditions indicated in Figure 1 of the drawing will obtain until the thermostat 26 is actuated to de-energize burner 15 and to provide for full flame operation of burner 15'. As soon as the burner 15 is extinguished, the conduit systems 40, 41, and 42 will begin to be cooled by the surrounding air and by air flowing through the flue 16. However, air flow through flue 16 discharges heated air against conduit 41, though the temperature of such air is materially below the temperature of the products of combustion which impinge upon that conduit during the heating cycle of operation.

If the foregoing condition is allowed to proceed undisturbed, a considerable period of time, possibly twenty minutes, may be required to condense the vapor in conduits 40, 41, and 42 completely to destroy the vapor lock and to permit circulation of cooling fluid from the reservoir 38 into the jacket 17.

The aforementioned delay is an undesirable feature and it is one of the principal objects of the present invention to abolish or destroy the vapor lock within a very short period of time.

It will be noted from Figure 1 that the conduit 37 extends into the reservoir 38 for a considerable distance and that its lower end is appreciably below the surface level of stored liquid in reservoir 38.

Very shortly after the thermostat 26 operates to de-energize burner 15 and energize burner 15', the vapor lock in conduits 40', 41', and 42' will be created. In addition to this, there will be a rapid vaporization of cooling liquid which substantially fills the jacket 17'. The rapid vaporization of the large quantity of liquid contained in jacket 17' produces an immediate and substantial increase in pressure in the entire cooling system associated with absorber-generator A'. This increase in pressure is applied to the upper portion of the reservoir 38 through the conduit 45. Due to the fact that the lower end of conduit 37 is submerged in the liquid in reservoir 38, the increase in pressure applied from the cooling system of the generator-absorber cannot directly be applied to condenser 36 but liquid is forced to rise within conduit 37 from reservoir 38. The rising column of liquid in conduit 37 creates a slight increase in pressure in the condenser 36. However, that con-

denser and its contents have long since reached a condition of stable equilibrium; that is, the condenser has cooled to substantially air temperature, hence any slight increase in pressure therewithin will merely cause some condensation of the small amount of vapor required to fill the condenser. Stated somewhat differently, the effect of the rising column in the conduit 37 is not to increase pressure in the system comprising the condenser 36, conduit 35, and cooling jacket 37 but to condense a small amount of vapor. However, the increase in pressure within the cooling system caused by the application of vapor pressure to the upper part of the reservoir is applied directly and immediately to the vapor lock by reason of the liquid contained in conduit 39 and the lower portion of conduit 40. Such an increase in pressure applied in an unbalanced manner produces a number of effects which will be described hereinafter.

As long as the vapor lock exists in conduits 40, 41, and 42, a condition of stable equilibrium is maintained. That is, the distance between the free surface level of liquid in conduit 40 and the free surface level of liquid in reservoir 38 is equal to the distance between the free surface levels of the liquid in conduits 42 and 43. Any condition tending to upset this equilibrium will tend to eliminate the vapor lock and to permit free flow of coolant from the reservoir to the generator-absorber cooling jacket.

At switchover, when the increase in pressure in the previously active cooling system is applied through conduit 45 to the vapor space of reservoir 38, a column of liquid is forced upwardly into the conduit 37 leading to the condenser. For reasons heretofore explained, the column of liquid rising in conduit 37 applies an excess pressure to one side only of the vapor lock, thus destroying the previously existing condition of stable equilibrium. This increase in pressure has a number of secondary effects:

(1) A mere increase in pressure will tend to cause condensation of the vapor formed in the vapor lock in the cooler portions of conduits 40, 41, and 42.

(2) The increase in pressure on the condenser side of the lock tends to displace liquid in the conduit systems 38 to 43, inclusive, in the direction of the cooling jacket 17.

(3) As liquid rises in conduit 40 it will reach portions of that conduit at an elevated temperature and will cool them by vaporization of a very small amount of liquid. This additional vapor tends further to force the liquid in the conduit systems 42 and 43 in the direction of the cooling jacket 17. This factor cools the previously highly heated portions of the vapor lock conduits 40, 41, and 42 and pushes the vapor into comparatively cold conduits which promotes condensation of the vapor in the lock.

(4) When the liquid columns are displaced sufficiently to force vapor around the bight portion of the U-tube 42—43, bubbles of vapor in conduit 43 lighten that column and tend to force the liquid therefrom into jacket 17, both by direct vapor lift action and by further unbalancing the forces acting on opposite sides of the conduit 41.

(5) Liquid flowing into jacket 17 from conduit 43 is immediately vaporized because that jacket is a a very elevated temperature. When a significant quantity of liquid has been forced from conduit 43 into jacket 17 and vaporized, a large increase in pressure is produced in the whole secondary system which will condense or collapse any vapor remaining in the conduits 40 to 42, inclusive, and thus eliminate the vapor lock.

Stated in somewhat shorter form, the effect of the increased pressure in reservoir 38 is to displace the liquid from the generator-absorber side of the vapor lock liquid seal to allow vapor to escape directly from the lock to the condenser and to condense the vapor forming the lock by direct application of high pressures.

The exact proportionate effect of the above-mentioned factors is not definitely known. It has, however, been established by actual test that the above-described system will eliminate the vapor lock and permit full circulation of the secondary cooling medium within one minute or less of switchover.

In Figure 2 there is shown a modified form of the invention. Since, structurally speaking, this form of the invention differs from that described in connection with Figure 1 only in certain details to be hereinafter specifically pointed out, the parts of the apparatus are given the same reference characters as those applied to identical parts described hereinabove in connection with Figure 1.

Though only the lower part of the apparatus has been shown in Figure 2, it is to be understood that the portions above the break shown in conduits 11, 35, 37, 37', 35', and 11' of Figure 1 are in every respect identical with the parts above the same conduits of Figure 2 which are not shown.

The form of the invention of Figure 2 specifically differs from Figure 1 only in the elimination of conduit 45 and the substitution therefor of U-shaped conduits 50 and 50'. The U-shaped conduit 50 opens into the reservoir 38'. This conduit is arranged to have a small downward slope with the bight of the U positioned directly over the outlet of the products of combustion flue 16 of the generator-absorber A. The conduit 50 is arranged with the legs of the U in vertically superposed position. The lower leg of U-shaped conduit 50 opens into reservoir 38' below the normal liquid level therein while the generator-absorber A' is operating on a heating period. The upper end of conduit 50 opens into the upper portion of reservoir 38' above the normal liquid level maintained therein during the generating period of the generator-absorber A'.

The conduit 50' is similarly associated with the reservoir 38. As shown in Figure 2, the conduit 50' is substantially filled with liquid, only the end portion of the upper leg thereof adjacent the point at which it joins the vapor space in the reservoir 38 being free of liquid.

The system of Figure 2 is provided with gas supply and control mechanisms identical with those illustrated and described in connection with Figure 1.

As the generator-absorber A reaches the end of its heating period, the control mechanism will de-energize burner 15 and energize burner 15'. The products of combustion then discharging through the flue 16' will immediately vaporize a substantial amount of the liquid in the U-shaped conduit 50', which vapor will discharge through the upper leg of said conduit into the upper vapor space in the reservoir 38. The vapor so generated will, by reason of the fact that conduit 37 extends appreciably into the liquid contained in reservoir 38 and is therefore provided with a liquid seal with respect to the vapor space in reservoir 38, increase the pressure in the vapor space in reser-

voir 38. Increased pressure in the vapor space in reservoir 38 will displace liquid upwardly in the conduit 37 in the same manner as in Figure 1. Similarly, the actions which follow as a consequence of the increased pressure applied to the vapor space of reservoir 38 in the Figure 1 form of the invention follow in the same manner in the Figure 2 form of the invention.

Shortly after the vapor lock is eliminated the liquid level in reservoir 38 will drop below the lower leg of conduit 50' and no more liquid will be supplied thereto. The liquid remaining in conduit 50' is then quickly vaporized and the conduit is dry until the next cooling period of generator-absorber A is initiated.

In the Figure 2 form of the invention, the pressure in each secondary cooling system is independent of the associated secondary cooling system and the excess pressure applied to a localized portion of the cooling system at switchover is generated and retained within a localized portion of such system.

The Figure 2 form of the invention is particularly applicable to a single intermittent absorption refrigerating system. For example, considering only the left-hand intermittent system and its associated cooling mechanism of Figure 2, the conduit 50', instead of being heated by the heater for the generator-absorber A', may be heated by an auxiliary burner which the control energizes when it de-energizes burner 15. The operation of the system under these conditions will be identical with that heretofore described except with respect to the manner in which heat is applied to the conduit 50'. Under the conditions preposed immediately above, the control 26 of the generator-absorber A would have a positive lost motion connection with the actuating element of the switch 27 in order to provide positive control over the main burner and burner for heating conduit 50'. Under these conditions the burner corresponding to 15', for example, would merely be arranged to heat the bight portion of the U-shaped conduit 50'.

The arrangement of portions of the invention with respect to the cabinet are illustrated in Figures 3 and 4. These figures specifically illustrate the form of the invention of Figure 1, it being understood that the form of the invention of Figure 2 will be arranged in a substantially identical manner with respect to the cabinet. Only the lower rear corner of the cabinet construction is shown, as the main condensers and evaporator and associated parts of the system will be arranged with respect to the cabinet substantially in the manner shown in United States Letters Patent 2,386,438 issued October 9, 1945, to Curtis C. Coons for Refrigeration.

The absorber-generators A and A' are located adjacent the lower rear corners of the cabinet construction 60, substantially below the insulated wall 61 of the refrigerating compartment 62. The generator-absorbers are also in the lower portion of a rear cooling chamber 63 which extends upwardly along a vertical side wall of the cabinet construction. This compartment is arranged to receive air from the space directly beneath the refrigerating chamber 62 and also through louvers 64 adjacent the bottom portion thereof. The condensers 36 and 36' are positioned in the chamber 63 above and between the generator-absorbers A and A' wherefore these elements receive cooling air unheated by a previous contact with heat rejecting elements and also unheated by the insulated generator-absorber assembly. Products of combustion disposal flues 66 and 66' are provided for the generator-absorbers A and A', respectively. The products of combustion flues convey the waste products of combustion to the upper portion of the chamber 63 and discharge the same through the upper end of said chamber. The conduits 41 and 41' pass through the lower ends of the flues 66 and 66' adjacent the discharge end of the generator-absorber combustion heating flues 16 and 16'.

In Figures 3 and 4 the conduits 37 and 37' have been shown as very short. This was done to facilitate illustration. It is preferred that the vertical distance from the conduit 41 to the lower end of the condenser 36 shall at least be equal to the vertical distance between the point at which conduit 43 connects to jacket 17 and the point at which conduit 43 connects to conduit 42. This vertical head is not essential as no harm is done if liquid does back into the condenser tubes at switchover. However, by providing room for a column of liquid of the aforesaid height which has its upper end extending upwardly into conduit 37, the apparatus is then always capable of building up a liquid head of sufficient height to overcome the maximum liquid back pressure head which can be created by the column in conduit 43 without wetting the condenser tubes.

The conduits connecting the cooling jackets 17 and 17' to the reservoirs 38 and 38' are always exposed to the coolest available cooling air except for the small portion of the vapor lock which passes through the products of combustion flue 66. This aids in preventing too great a vapor lock in the conduits 42 and 40 and also facilitates rapid collapse of the vapor lock upon switchover.

The foregoing invention provides a means by which a vaporization-condensation type cooling system for a periodically or intermittently cooled element may be interrupted as desired by creation of a vapor lock which will be eliminated in a short period of time when either generator-absorber is switched over from generating to absorbing operation without the action of moving parts within either primary or secondary cooling systems. The sole control required is that provided for energizing and de-energizing the heating means for the generator absorbers which has no direct connection with the cooling system. Thus the application of heat to the system simultaneously creates a flow blocking vapor pocket in one part of the system and creates forces which quickly eliminate another flow blocking vapor pocket.

While the invention has been illustrated and described in detail it is not to be limited thereto but various changes may be made in the construction, design and arrangement of parts without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. In combination with an element subject to alternate periods of heating and cooling; a cooling system having a heat absorbing portion in heat exchange relation with said element, a portion arranged to form a vapor lock when subjected to heat and to be heated simultaneously with the application of heat to said element, and means for applying an excess pressure to a portion of said vapor lock when the application of heat to said element is discontinued.

2. A cooling system for an element which is alternately heated and cooled comprising a condensing means, a reservoir, means for conducting liquid from said condensing means to said

reservoir including a conduit extending into said reservoir a distance sufficient to seal said conduit when a major portion of the liquid in the system is in said reservoir, a part in heat exchange with said element, means connecting said reservoir to said part including means forming a vapor trap having liquid sealing traps between said part and said reservoir, and a liquid vaporizing means connected to apply vapor pressure to said reservoir above the liquid lever therein.

3. In combination a refrigerating system including a generator-absorber, a cooling system for said generator-absorber including a heat absorbing part in heat exchange relation with said generator-absorber, a heat rejecting part, and a coolant reservoir connected in circuit, said connecting means including a part arranged to conduct coolant from said reservoir to said heat absorbing part having a vapor trapping part connected to said reservoir and said heat absorbing part by liquid sealing traps, coolant vaporizing means connected to supply vapor to said reservoir above the surface level of liquid therein and in liquid sealed relationship to said heat rejecting part, and means constructed and arranged to heat said generator-absorber and said coolant vaporizing means alternately.

4. In combination a refrigerating system including a generator-absorber, a cooling system for said generator-absorber including a heat absorbing part in heat exchange relation with said generator-absorber, a heat rejecting part, and means connecting said parts in circuit including means for conducting liquid from said heat rejecting part to said heat absorbing part having a first vapor trapping part connected to said heat rejecting part through a liquid seal, a second vapor trapping part connected to said first vapor trapping part and said heat absorbing part through liquid seals, coolant vaporizing means connected to discharge vapor into said first vapor trapping part, and heating means arranged to heat said generator-absorber and said second vapor trapping part simultaneously and to heat said first vaporizing part alternately with respect to said generator-absorber and said second vapor trapping part.

5. Refrigerating apparatus comprising a pair of intermittent absorption refrigerating systems each including a generator-absorber, means for heating said generator-absorbers and control means for alternately activating said heating means; a cooling system for each of said generator-absorbers each comprising a part in heat exchange with one of said generator-absorbers, a heat rejecting part connected to receive vapor from said heat exchange part, a reservoir, a conduit from said heat rejecting part extending into the interior of said reservoir, conduit means extending from said reservoir to said heat exchange part including a vapor trapping liquid flow preventing means arranged to be heated concurrently with said one generator-absorber, a coolant charge in said cooling system sufficient to seal off the end portion of said conduit extending into the reservoir when liquid accumulates in the reservoir under the action of said flow preventing means; and conduit means connecting the upper portions of said reservoirs.

6. Refrigerating apparatus comprising a pair of intermittent absorption refrigerating systems each including a generator-absorber, means for heating said generator-absorbers and control means for alternately activating said heating means; a cooling system for each of said generator-absorbers each comprising a part in heat exchange with one of said generator-absorbers, a heat rejecting part connected to receive vapor from said heat exchange part, a reservoir, a conduit from said heat rejecting part extending into the interior of said reservoir, conduit means extending from said reservoir to said heat exchange part including a vapor trapping liquid flow preventing means arranged to be heated concurrently with said one generator-absorber, a coolant charge in said cooling system sufficient to seal off the end portion of said conduit extending into the reservoir when liquid accumulates in the reservoir under the action of said flow preventing means, and second conduit means associated with said reservoir arranged to receive liquid therefrom and to be heated concurrently with the other of said generator-absorbers.

7. In a refrigerating apparatus having en element subject to alternate periods of heating and cooling, a vaporization-condensation cooling system having a vaporizing part in heat absorbing relationship with said element, a condenser connected to receive vapor from said vaporizing part, a liquid receiver, conduit means for conducting liquid from said condenser to said receiver including an end portion extending into said receiver to have its open end sealed when the liquid level in said receiver rises above a predetermined level, means for conducting liquid from said reservoir to said vaporizing part including a vapor entrapping liquid flow preventing part arranged to be heated concurrently with said element, and heat operated means arranged to be heated alternately with said element for applying a pressure to one portion of said flow preventing part in excess of the pressure on other portions of said flow preventing part to displace vapor in said flow preventing part in the direction of said vaporizing part.

8. Refrigerating apparatus comprising a pair of intermittent absorption refrigerating systems each including a generator-absorber, a cooling system for each of said generator-absorbers, each of said cooling systems including a heat absorbing part in heat exchange relation with a generator-absorber, a heat rejecting part arranged to receive vapor from said heat absorbing part, a liquid receiving part, conduit means for conducting liquid from said heat rejecting part to said liquid receiving part, second conduit means for conducting liquid from said liquid receiving part to said heat absorbing part including a section constructed to block flow of liquid from said liquid receiving part when said section is vapor filled, means constructed and arranged to heat said section and the generator-absorber in heat exchange relation with said heat absorbing part concurrently; control means for energizing said heating means alternately, and means constructed and arranged to be activated by the application of heat to each generator-absorber to apply a pressure to the cooling system of the other generator-absorber to displace liquid in the liquid receiving part of the cooling system of the generator-absorber which has just completed a heating cycle into the conduit leading to said heat rejecting part.

9. Refrigerating apparatus comprising a pair of intermittent absorption refrigerating systems each including a generator-absorber, a cooling system for each of said generator-absorbers, each of said cooling systems including a heat absorbing part in heat exchange relation with a generator-absorber, a heat rejecting part arranged to re-

ceive vapor from said heat absorbing part, a liquid receiving part, conduit means for conducting liquid from said heat rejecting part to said liquid receiving part, second conduit means for conducting liquid from said liquid receiving part to said heat absorbing part including a section constructed to block flow of liquid from said liquid receiving part when said section is vapor filled, said liquid receiving means and said conduit from said heat rejecting part being so constructed and arranged that the end of said conduit is submerged in liquid when said section is filled with vapor, means constructed and arranged to heat said section and the generator-absorber in heat exchange relation with said heat absorbing part concurrently; control means for energizing said heating means alternately, and means constructed and arranged to be activated by the application of heat to each generator-absorber to apply a pressure to the liquid receiving means of the cooling system of the other generator-absorber above the liquid level in said receiving means to displace liquid from said receiving means upwardly in the conduit leading to the heat rejecting part and to apply a pressure to said section in excess of the pressure in said heat absorbing part.

10. Absorption refrigerating apparatus comprising a pair of intermittent refrigerating apparatuses each having a part to be heated and cooled and means for heating said part, control means for energizing said heating means alternately; a cooling system including elements in heat exchange with each of said parts, said cooling system including means to flow coolant to said elements, said flow means having structure arranged to be heated simultaneously with the application of heat to each of said apparatuses operable when heated to prevent flow of coolant to said part of the apparatus being heated, and structure operable upon application of heat to each of said apparatuses for eliminating the ability of said flow preventing structure to prevent the flow of coolant to the said part of the previously heated apparatus.

11. In combination a heat operated intermittent absorption refrigerating system including a part to be cooled when the system is producing refrigeration, and means for intermittently heating said system; a cooling system arranged to flow a coolant into heat exchange relation with said part to be cooled including an inverted U-shaped conduit arranged to be heated simultaneously with the application of heat to the refrigerating system, liquid sealed traps connected to each leg of said inverted U-shaped conduit whereby to form a sealed-off flow preventing body of vapor in said inverted U-shaped conduit when the same is heated, and heat operated means arranged to be heated alternately with the application of heat to said refrigerating system for applying a force to one side of said body of vapor to displace the same through one of said liquid sealing traps.

12. In a refrigerating apparatus of the intermittent absorption type embodying a part to be cooled and means for applying heat to the refrigerating apparatus; a cooling system comprising a heat absorbing part in heat exchange relation with said part to be cooled, a heat rejecting part, means for conveying coolant from said heat rejecting part to said heat absorbing part including a liquid sealed vapor pocket and a part arranged to be heated simultaneously with the application of heat to said refrigerating apparatus to form a trapped flow preventing body of vapor, and means arranged to be heated alternately with the application of heat to said refrigerating apparatus for creating an excess pressure in said liquid sealed vapor pocket.

13. Refrigerating apparatus comprising a pair of heat operated intermittent absorption refrigerating systems each including a part to be cooled and a heat absorbing element in heat exchange therewith, heating means, means for governing the operation of said heating means to heat said systems alternately; heat rejecting means, means for conveying heated cooling medium from said heat absorbing elements to said heat rejecting means, separate means for conveying cooling medium from said heat rejecting means to each of said heat absorbing elements, each of said conveying means including a structure operative when heated to form a cooling medium flow blocking trapped body of cooling medium vapor, each of said structures being arranged to be heated simultaneously with the refrigerating system including the heat absorbing element to which the structure conveys cooling medium; and means operative when heat is applied to either of said refrigerating systems to introduce vapor of cooling medium into the means for conveying cooling medium in heat exchange with the other refrigerating system between the heat rejecting means and the vapor trapping structure in said conveying means and in liquid sealed relation to each of them.

14. In combination with a refrigerating system having a part to be cooled periodically in the operation of the system, a cooling system comprising a heat rejecting part, a heat absorbing part in heat exchange with said part to be cooled, means for conveying cooling medium from said heat rejecting part to said cooling part including structure arranged to form an entrapped flow blocking body of vapor when heated and a liquid sealed vapor pocket, means arranged when heated to create a pressure in said vapor pocket, and means arranged to heat said structure and said last-mentioned means alternately.

15. In combination with a refrigerating system having a part to be cooled periodically in the operation of the system, a cooling system comprising a heat rejecting part, a heat absorbing part in heat exchange with said part to be cooled, means for conveying cooling medium from said heat rejecting part to said cooling part including structure arranged to form an entrapped flow blocking body of vapor when heated, said conveying means being constructed and arranged to form equal pressure creating liquid column pressure heads on each side of said entrapped body of vapor when said structure is heated, means arranged when heated to create an additional pressure creating liquid column on one side of said entrapped body of vapor to destroy the previous equality of liquid column pressure heads on opposite sides thereof, and means arranged to heat said structure and said last-mentioned means alternately.

16. In combination with a refrigerating system having a part to be cooled periodically in the operation of the system, a cooling system comprising a heat rejecting part, a heat absorbing part in heat exchange with said part to be cooled, means for conveying cooling medium from said heat rejecting part to said cooling part including structure arranged to form an entrapped flow blocking body of vapor when heated, means arranged when heated to force liquid into heat exchange

with the portion of said conveying means containing vapor when heated to promote condensation of said entrapped vapor, and means arranged to heat said structure and said last-mentioned means alternately.

17. In combination with an element subject to alternate periods of heating and cooling; a cooling system having a heat absorbing portion in heat exchange relation with said element, means for conveying cooling medium to said heat absorbing portion including structure operative when heated to prevent flow of cooling medium to said heat absorbing portion, heat operated means operative when heated to cool said structure, and means for simultaneously applying heat to said element and said structure and for heating said heat operated means alternately with said element.

18. Refrigerating apparatus comprising a pair of intermittent absorption refrigerating systems each including a generator-absorber; a cooling system for each of said generator-absorbers, each of said cooling systems comprising a part in heat exchange relation with a separate one of said generator-absorbers, means for conveying cooling medium to said part including structure operative when heated to prevent flow of cooling medium through said conveying means and means operative when heated to cool said structure; heating means, means for activating said heating means to heat said generator-absorbers alternately and simultaneously to heat the flow preventing structure of the cooling system of the generator-absorber being heated and the heat operated means of the other cooling system.

CURTIS C. COONS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,627,808	Schurtz	May 10, 1927
1,854,778	Boving	Apr. 19, 1932
2,021,994	Hainsworth	Nov. 26, 1935
2,340,886	Kleen	Feb. 8, 1944

FOREIGN PATENTS

Number	Country	Date
117,029	Australia	June 10, 1943