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⑤④ **Method and apparatus for satisfying heating and cooling demands.**

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Description

This invention relates generally to a method and apparatus for simultaneously satisfying heating and cooling demands.

Refrigeration apparatus or machines are frequently employed to cool a fluid such as water which is circulated through various rooms or enclosures of a building to cool these areas. Often, the refrigerant of such machines rejects a relatively large amount of heat at the condenser of the machine. This rejected heat is commonly dissipated to the atmosphere, either directly or via a cooling fluid that circulates between the condenser and a cooling tower. Over a period of time, the rejected heat represents a substantial loss of energy, and much attention has been recently directed to reclaiming or recovering this heat to satisfy a heating load or demand.

One general approach to reclaiming this heat is to employ a booster compressor to draw and further compress refrigerant from the condenser of the refrigeration machine. This further compressed vapor is then passed through a separate, heat reclaiming condenser. A heat transfer fluid is circulated through the heat reclaiming condenser in heat transfer relation with the refrigerant passing therethrough. Heat is transferred from the refrigerant to the heat transfer fluid, heating the fluid and condensing the refrigerant. The heated heat transfer fluid may then be used to satisfy a present heating load or the fluid may be stored for later use, and the condensed refrigerant is returned to the cooling circuit for further use therein.

With refrigeration machines having both a cooling circuit and heating circuit as described above, it is desirable to control the heating and cooling circuits to meet varying heating and cooling loads, and it is preferred to control the heating and cooling circuits independent of each other so that variations in one circuit do not affect the other circuit's ability to handle loads placed thereon. However, difficulties arise when the heating and cooling circuits are independently controlled. For example, if the refrigeration machine is called on to simultaneously handle a low cooling load and a high heating load, then the refrigerant flow rate through the cooling circuit is comparatively small and a relatively small amount of vapor is discharged from the compressor of the cooling circuit. At the same time, the refrigerant flow rate through the heating circuit is relatively large and a relatively large portion of the refrigerant discharged from the compressor of the cooling circuit is drawn into the booster compressor and passed through the heating circuit. In fact, under extreme conditions, the refrigerant flow rate through the booster compressor may temporarily exceed the rate at which refrigerant is discharged from the compressor of the cooling circuit. When this occurs, the mass of refrigerant vapor in the condenser of the cooling circuit decreases, decreasing the

pressure therein. This, in turn, decreases the pressure at the inlet of the booster compressor. If this pressure falls to a very low level, the temperature of the vapor discharged from the booster compressor may become undesirably high, or the booster compressor may enter what is known as surge conditions wherein there are periodic complete flow reversals in the compressor, destroying the efficiency of the compressor and endangering the integrity of the elements thereof.

The problem of pressure loss is considered in US—A—3 665 724. In this United States patent a multi-stage compressor is disclosed feeding the heating load. The high pressure side of a cooling circuit is connected to an intermediate point on the multi-stage compressor and if a loss of pressure is detected in this high pressure side a series of valves are actuated which connects the high pressure side of the cooling circuit further back in the multi-stage compressor to maintain the pressure at the output of the multi-stage compressor and hence the flow of refrigerant through the heating circuit. In accordance with the present invention, however, there is provided apparatus for satisfying heating and cooling demands comprising a cooling circuit for satisfying the cooling demand and including a mechanical refrigeration unit having a high pressure side and a low pressure side; and a heating circuit for satisfying the heating demand and including a booster compressor for compressing refrigerant vapor, a booster inlet line for transmitting refrigerant vapor from the high pressure side of the refrigeration unit to the booster compressor for further compression therein, a heat reclaiming condenser for passing refrigerant vapor from the booster compressor in heat transfer relation with a heat transfer fluid to heat the fluid and condense the refrigerant vapor, return means for returning condensed refrigerant from the heat reclaiming condenser to the refrigeration unit and control means for varying the vapor flow rate through the booster compressor; characterized in that the control means is designed to reduce the vapor flow rate through the booster compressor when the pressure in the high pressure side of the refrigeration unit falls below a first predetermined value. The invention also includes a method of controlling a booster type refrigeration machine employing these principles.

This invention will now be described by way of example, with reference to the accompanying drawing, which is a schematic representation of a vapor compression refrigeration machine incorporating teachings of the present invention.

Referring to the drawing, there is disclosed a schematic illustration of refrigeration machine 10 employing teachings of the present invention. Machine 10 includes, generally, cooling circuit 12 and heating circuit 14. Cooling circuit 12, in turn, includes primary compressor

means such as first stage 16 of two stage compressor 18, primary condenser 20, primary expansion means 22, and evaporator 24. Heating circuit 14 includes booster compressor means such as second stage 26 of compressor 18, heat reclaiming condenser 30, and auxiliary expansion means 32. Inlet guide vanes 34 are provided to control the vapor flow through first stage 16 of compressor 18 and, thus, through cooling circuit 12, while valve 36 is utilized to regulate the vapor flow through second stage 26 of compressor 18 and, hence, through heating circuit 14. Pressure sensor means 38, preferably including two pressure switches 40 and 42, is in vapor communication with primary condenser 20 to control valve 36 in a manner more fully discussed below. Motor or drive means (not shown) is employed in a manner which will be apparent to those skilled in the art to simultaneously drive first and second stages 16 and 26 of compressor 18.

In operation, first stage 16 of compressor 18 discharges hot, compressed refrigerant vapor into primary condenser 20 via line 44. Refrigerant passes through primary condenser 20, rejects heat to an external heat exchange medium such as water circulating through heat exchange coil 46 located therein, and condenses. The condensed refrigerant flows through primary expansion means 22, reducing the temperature and pressure of the refrigerant. The expanded refrigerant enters and passes through evaporators 24 and absorbs heat from an external heat transfer medium such as water passing through heat exchange coil 50 which is positioned within the evaporator. The heat transfer medium is thus cooled and the refrigerant is evaporated. The cooled heat transfer medium may then be used to satisfy a cooling load, and the evaporated refrigerant is drawn from evaporator 24 into line 52 leading back to first stage 16 of compressor 18.

As described above, first stage 16 of compressor 18 and primary expansion means 22 separate cooling circuit 12 into high pressure side 54 and low pressure side 56, and booster inlet line 58 is provided for transmitting refrigerant vapor from the high pressure side of the cooling circuit to second stage 26 of compressor 18. In the embodiment depicted in the drawing, inlet line 58 is connected to primary condenser 20 and transmits a portion of the refrigerant vapors passing therethrough to second stage 26 of compressor 18. Alternatively, line 58 could be connected to discharge line 44. Second stage 26 of compressor 18 further compresses the vapor transmitted thereto, further raising the temperature and pressure of the vapor. This further compressed vapor is discharged into line 60, leading to heat reclaiming condenser 30. The refrigerant vapor enters and passes through heat reclaiming condenser 30 in heat transfer relation with a heat transfer fluid such as water passing through heat exchange

coil 62 disposed within the heat reclaiming condenser. Heat is transferred from the refrigerant vapor to the fluid passing through coil 62, heating the fluid and condensing the refrigerant. The heated heat transfer fluid may then be employed to satisfy a heating load. Refrigerant condensed in heat reclaiming condenser 30 passes therefrom back to cooling circuit 12 via return means including auxiliary expansion means such as orifice 32 and refrigerant lines 64 and 66. More particularly, condensed refrigerant from heat reclaiming condenser 30 flows through orifice 32 via line 64, reducing the pressure and temperature of the refrigerant. Refrigerant line 66 transmits refrigerant from orifice 32 back to cooling circuit 12, specifically primary expansion means 22 thereof, for further use in the cooling circuit.

Guide vanes 34 may be controlled in response to any one or more of a number of factors indicative of changes in the load on cooling circuit 12 to vary the capacity thereof. For example, guide vanes 34 may be controlled in response to the temperature of the fluid leaving heat exchanger 50 of evaporator 24. As the cooling load increases or decreases, guide vanes 34 move between minimum and maximum vapor flow positions to increase or decrease, respectively, the vapor flow rate through first stage 16 of compressor 18 and, thus, cooling circuit 12. Similarly, valve 36 may be controlled in response to any one or more factors indicating changes in the load on heating circuit 14 to vary the capacity thereof. For example, valve 36 may be controlled in response to the temperature of the fluid discharged from heat exchanger 62 of heat reclaiming condenser 30. As the heating load increases or decreases, positioning means 68 moves valve 36 between minimum and maximum vapor flow positions to increase or decrease, respectively, the vapor flow rate through second stage 26 of compressor 18 and, hence, through heating circuit 14. Positioning means 68 may be of any suitable type, for example an electric, hydraulic or pneumatic device. Preferably, however, positioning means 68 includes a reversible electric motor that is selectively connected to a source of electrical energy to move valve 36.

As discussed previously, when refrigeration machines of the general type described above are called on to simultaneously handle a low cooling load and a high heating load, the pressure at the inlet of the heating circuit, or booster compressor may become very low. When this occurs, the temperature of the vapor discharged from the booster compressor may become excessively high or the booster compressor may enter surge conditions. In view of this, machine 10 includes control means for reducing the vapor flow rate through second stage 26 of compressor 18 when the pressure in the high pressure side 54 of cooling circuit 12 falls below a first predetermined value or set point. More specifically, the above-mentioned

reducing means includes pressure sensor 38 and positioning means 68. Positioning means 68 is connected to sensor 38 and, as mentioned above, to valve 36. Positioning means 68 and sensor 38 cooperate for moving valve 36 toward its minimum flow position to decrease the vapor flow rate through second stage 26 of compressor 18 when the pressure of vapor in primary condenser 20 falls below the first predetermined value. Preferably, positioning means 68 continues to move valve 36 toward its minimum flow position if the pressure in primary condenser 20 remains below the first predetermined value, further reducing the vapor flow rate through heating circuit 14.

With the above arrangement, the rate at which vapor is drawn from primary condenser 20 by heating circuit 14 is reduced until that vapor flow rate matches or becomes less than the rate at which vapor enters the primary condenser via primary compressor 16. This tends to maintain the mass of refrigerant vapor in primary condenser 20 at or above a stable value. In this manner, the pressure in primary condenser 20 may be maintained at or above a level sufficient to prevent second stage 26 of compressor 18 from entering surge conditions or from discharging vapor at an excessively high temperature. Should the pressure in primary condenser 20 rise back above the first predetermined level, sensor 38 ceases to cause positioning means 68 to move valve 36 toward its minimum flow position. However, as will be apparent to those skilled in the art, valve 36 may still be moved toward its minimum flow position for other reasons such as a decrease in the load on heating circuit 14.

In addition to the foregoing, preferably sensor 38 also senses when the pressure in primary condenser 20 falls below a second predetermined level or set point, greater than the above-discussed first predetermined level. When this event is sensed, positioning means 68 is prevented from moving valve 36 toward its maximum flow position. This tends to prevent the rate at which vapor is drawn from primary condenser 20 by heating circuit 14 from increasing due to, for example, an increase in the load on heating circuit 14. This, in turn, tends to prevent the pressure in the primary condenser from further decreasing. In case the pressure in primary condenser 20 rises back above the second predetermined level, sensor 38 no longer prevents positioning means 68 from moving valve 36 toward its maximum flow position; and the valve may be so moved, for example because of an increase in the heating load on circuit 14. In contrast, should the pressure in primary condenser 20 continue to fall, for example, because of a further reduction in the cooling load on cooling circuit 12, and the pressure in the primary condenser falls below the first predetermined level, positioning means 68, as explained in detail above, is activated for moving valve 36 to decrease the vapor flow rate

through second stage 26 of compressor 18.

As will be apparent to one skilled in the art, pressure sensor 38 may be of any suitable type such as an electric, hydraulic, or pneumatic device. Since positioning means 68 preferably includes a reversible electric motor, pressure sensor 38 preferably includes first and second pressure switches 40 and 42. Switch 40 senses when the pressure in primary condenser 20 falls below the second set point to disconnect the electric motor from the source of electrical energy to disable the motor from opening valve 36, while switch 42 senses when the pressure in primary condenser 20 falls below the first set point to connect the electric motor to the electrical energy source for closing valve 36. As shown in the drawing, switches 40 and 42 are disposed in chamber 70 which is in vapor communication with primary condenser 20 via tap-off line 72.

Refrigeration machine 10 incorporating teachings of the present invention may be effectively employed to prevent the booster compressor from entering surge conditions or from discharging vapor at undesirably high temperatures when the machine is called upon to simultaneously satisfy a low cooling load and a high heating load. Moreover, as may be understood from a review of the above discussion, these beneficial results may be achieved in a very reliable and inexpensive manner.

Claims

1. Apparatus (10) for satisfying heating and cooling demands comprising a cooling circuit for satisfying the cooling demand and including a mechanical refrigeration unit (12) having a high pressure side (54) and a low pressure side (56); and a heating circuit (14) for satisfying the heating demand and including a booster compressor (26) for compressing refrigerant vapor, a booster inlet line (58) for transmitting refrigerant vapor from the high pressure side (54) of the refrigeration unit (12) to the booster compressor (26) for further compression therein, a heat reclaiming condenser (30) for passing refrigerant vapor from the booster compressor (26) in heat transfer relation with a heat transfer fluid to heat the fluid and condense the refrigerant vapor, return means (64, 66) for returning condensed refrigerant from the heat reclaiming condenser (30) to the refrigeration unit (12) and control means (36, 38, 68) for varying the vapor flow rate through the booster compressor (26); characterized in that the control means (36, 38, 68) is designed to reduce the vapor flow rate through the booster compressor (26) when the pressure in the high pressure side of the refrigeration unit (12) falls below a first predetermined value.

2. The apparatus (10) as defined by claim 1 further characterized in that the control means (36, 38, 68) includes a valve (36) for regulating the flow of vapor through the booster com-

pressor (26); a sensor (38) for sensing the pressure of vapor in the high pressure side (54) of the refrigeration unit (12); and positioning means (68) connected to the valve (36) and the sensor (38) for regulating the valve (36) to decrease the vapor flow rate through the booster compressor (26) when the pressure in the high pressure side (54) of the refrigeration units (12) falls below the first predetermined value.

3. The apparatus (10) as defined by claim 2 further characterized in that the positioning means (68) is designed to prevent the valve (36) from increasing the vapor flow rate through the booster compressor (26) when the pressure in the high pressure side (54) of the refrigeration unit (12) falls below a second predetermined value greater than the first predetermined value.

4. The apparatus (10) as defined by claim 3 further characterized in that the pressure sensor (38) includes a first pressure switch (40) for operating the positioning means (68) to move the valve (36) to decrease the vapor flow rate through the booster compressor (26) when the pressure in the high pressure side (54) of the refrigeration units (12) falls below the first predetermined value; and a second pressure switch (42) for preventing the positioning means (68) from opening the valve (36) when the pressure in the high pressure side (54) of the refrigeration unit (12) falls below the second predetermined value.

5. The apparatus (10) as defined by claim 2 or 4 further characterized in that the booster inlet line (58) is connected to a condenser (24) of the refrigeration unit (12) for receiving refrigerant vapor therefrom.

6. A method of controlling booster type refrigeration machine (10) used to simultaneously satisfy a cooling load and a heating load, the method comprising the steps of compressing refrigerant vapor and discharging the compressed refrigerant to a high pressure side (54) of a refrigeration circuit (12); condensing a portion of the compressed refrigerant; passing a portion of refrigerant vapor from the high pressure side (54) of the refrigeration circuit (12) through a heating circuit (14); compressing refrigerant vapor passing through the heating circuit (14); passing said refrigerant vapor in heat transfer relation with a heat transfer fluid to heat the fluid and condense the refrigerant vapor; and returning the condensed refrigerant to the refrigerant circuit, characterized by the step of reducing the quantity of refrigerant further compressed in the heating circuit when the pressure of refrigerant in the high pressure side (54) of the refrigeration circuit (12) falls below a first predetermined value.

7. The method as defined by claim 6 characterized in that the reducing step includes the step of sensing the pressure in the high pressure side (54) of the refrigeration circuit (12); and decreasing the flow of refrigerant through the heating circuit (14) when the sensed pres-

sure falls below the first predetermined value.

8. The method as defined by claim 7 further characterized by the step of stabilizing the quantity of refrigerant further compressed when the pressure in the high pressure side (54) of the refrigeration circuit (12) falls below a second predetermined value greater than the first predetermined value.

9. The method as defined by claim 8 characterized in that the stabilizing step includes the steps of sensing the pressure in the high pressure side (54) of the refrigeration circuit (12); and stabilizing the flow of refrigerant through the heating circuit (12) when the sensed pressure falls below the second predetermined value.

Revendications

1. Un appareil (10) pour satisfaire des besoins de chauffage et de refroidissement comportant un circuit de refroidissement pour satisfaire les besoins de refroidissement et comprenant un ensemble de réfrigération mécanique (12) ayant un côté haute pression (54) et un côté basse pression (56), et un circuit de chauffage (14) pour satisfaire les besoins de chauffage et comprenant un surcompresseur (26) pour comprimer de la vapeur de fluide frigorigène, une conduite d'entrée (58) du surcompresseur pour transporter de la vapeur de fluide frigorigène depuis le côté haute pression (54) de l'ensemble de réfrigération (12) jusqu'au surcompresseur (26) afin qu'elle y soit davantage comprimée, un condenseur (30) de récupération de chaleur pour faire circuler la vapeur de fluide frigorigène provenant du surcompresseur (26) dans une relation d'échange de chaleur avec un fluide d'échange de chaleur afin de chauffer ce fluide et condenser la vapeur de fluide frigorigène, des moyens de retour (64, 66) pour retourner le fluide frigorigène condensé du condenseur (30) de récupération de chaleur à l'ensemble de réfrigération (12) et des moyens de commande (36, 38, 68) pour faire varier le débit de vapeur qui s'écoule à travers le surcompresseur (26); caractérisé en ce que les moyens de commande (36, 38, 68) sont conçus pour réduire le débit de vapeur s'écoulant à travers le surcompresseur (26) lorsque la pression régnant dans le côté haute pression de l'ensemble de réfrigération (12) tombe au-dessous d'une première valeur prédéterminée.

2. L'appareil (10) tel que défini par la revendication 1, caractérisé, en outre, en ce que les moyens de commande (36, 38, 68) comprennent une vanne (36) pour régler le débit de vapeur qui s'écoule à travers le surcompresseur (26); un détecteur (38) pour détecter la pression de vapeur qui règne dans le côté haute pression (54) de l'ensemble de réfrigération (12); et des moyens de positionnement (68) reliés à la vanne (36) et au détecteur (38) pour régler la vanne (36) afin de diminuer le débit de vapeur s'écoulant à travers le surcompresseur

(26) lorsque la pression régnant dans le côté haute pression (54) de l'ensemble de réfrigération (12) tombe au-dessous de la première valeur prédéterminée.

3. L'appareil (10) tel que défini par la revendication 2, caractérisé, en outre, en ce que les moyens de positionnement (68) sont conçus pour empêcher la vanne (36) d'accroître le débit de vapeur s'écoulant à travers le surcompresseur (26) lorsque la pression régnant dans le côté haute pression (54) de l'ensemble de réfrigération (12) tombe au-dessous d'une seconde valeur prédéterminée supérieure à la première valeur prédéterminée.

4. L'appareil (10) tel que défini par la revendication 3, caractérisé, en outre, en ce que le détecteur de pression (38) comprend un premier manostat (40) pour actionner les moyens de positionnement (68) afin de déplacer la vanne (36) de manière à diminuer le débit de vapeur s'écoulant à travers le surcompresseur (26) lorsque la pression régnant du côté haute pression (54) de l'ensemble de réfrigération (12) tombe au-dessous de la première valeur prédéterminée; et un second manostat (42) pour empêcher les moyens de positionnement (68) d'ouvrir la vanne (36) lorsque la pression régnant du côté haute pression (54) de l'ensemble de réfrigération (12) tombe au-dessous de la seconde valeur prédéterminée.

5. L'appareil (10) tel que défini par la revendication 2 ou 4, caractérisé, en outre, en ce que la conduite d'entrée (58) du surcompresseur est raccordée à un condenseur (24) de l'ensemble de réfrigération (12) pour en recevoir de la vapeur de fluide frigorigène.

6. Un procédé pour commander une machine de réfrigération (10) du type à surcompresseur utilisée pour satisfaire simultanément une charge de refroidissement et une charge de chauffage, le procédé comprenant les étapes qui consistent à comprimer de la vapeur de fluide frigorigène et à refroidir le fluide frigorigène dans un côté haute pression (54) d'un circuit de réfrigération (12); à condenser une partie du fluide frigorigène comprimé; à envoyer une partie de la vapeur de fluide frigorigène provenant de la partie haute pression (54) du circuit de réfrigération (12) dans un circuit de chauffage (14); à comprimer la vapeur de fluide frigorigène circulant dans le circuit de chauffage (14); à faire circuler ladite vapeur de fluide frigorigène dans une relation d'échange de chaleur avec un fluide d'échange de chaleur pour chauffer ce fluide et condenser la vapeur de fluide frigorigène; et à retourner le fluide frigorigène condensé au circuit de réfrigération, caractérisé par l'étape qui consiste à réduire la quantité de fluide frigorigène qui est à nouveau comprimée dans le circuit de chauffage lorsque la pression de fluide frigorigène régnant dans le côté haute pression (54) du circuit de réfrigération (12) tombe au-dessous d'une première valeur prédéterminée.

7. Le procédé tel que défini par la revendication 6, caractérisé en ce que l'étape de réduction comporte l'étape qui consiste à détecter la pression qui règne dans le côté haute pression (54) du circuit de réfrigération (12); et à diminuer le débit de fluide frigorigène qui s'écoule dans le circuit de chauffage (14) lorsque la pression détectée tombe au-dessous de la première valeur prédéterminée.

8. Le procédé tel que défini par la revendication 7, caractérisé par l'étape qui consiste à stabiliser la quantité de fluide frigorigène qui est à nouveau comprimée lorsque la pression qui règne dans le côté haute pression (54) du circuit de réfrigération (12) tombe au-dessous d'une seconde valeur prédéterminée supérieure à la première valeur prédéterminée.

9. Le procédé tel que défini par la revendication 8, caractérisé en ce que l'étape de stabilisation comporte les étapes qui consistent à détecter la pression qui règne dans le côté haute pression (54) du circuit de réfrigération (12); et à stabiliser le débit de fluide frigorigène qui s'écoule dans le circuit de chauffage (12) lorsque la pression détectée tombe au-dessous de la seconde valeur prédéterminée.

Patentansprüche

1. Vorrichtung (10) zum Befriedigen eines Wärme- und Kältebedarfs mit einem zum Befriedigen des Kältebedarfs dienenden Kühlsystem, das eine mechanische Kältemaschine (12) mit einer Hochdruckseite (54) und einer Niederdruckseite (56) besitzt, und einem zum Befriedigen des Wärmebedarfs dienenden Heizsystem (14) mit einem Zusatzverdichter (26) zum Verdichten von Kältemitteldampf, einer Zusatzverdichterzuleitung (58) zum Zuführen von Kältemitteldampf von der Hochdruckseite (54) der Kältemaschine (12) zu dem Zusatzverdichter (26) zur weiteren Verdichtung darin, einem Wärmerückgewinnungskondensator (30) zum Führen von von dem Zusatzverdichter (26) kommendem Kältemitteldampf in Wärmeübertragungsbeziehung mit einem Wärmeübertragungsmedium, so daß dieses erwärmt und der Kältemitteldampf kondensiert wird, einer Rückführeinrichtung (64, 66) zum Zurückführen von kondensiertem Kältemittel von dem Wärmerückgewinnungskondensator (30) zu der Kältemaschine (12) und einer Steuereinrichtung (36, 38, 68) zum Verändern des Dampfstroms durch den Zusatzverdichter (26), dadurch gekennzeichnet, daß die Steuereinrichtung (36, 38, 68) so ausgebildet ist, daß sie den Dampfstrom durch den Zusatzverdichter (26) herabsetzt, wenn der Druck in der Hochdruckseite der Kältemaschine (12) unter einen ersten vorherbestimmten Wert sinkt.

2. Vorrichtung (10) nach Anspruch 1, dadurch gekennzeichnet, daß die Steuereinrichtung (36, 38, 68) ein Ventil (36) zum Regulieren des Dampfstroms durch den Zusatzverdichter (26), einen Sensor (38) zum Messen des

Dampfdruckes in der Hochdruckseite (54) der Kältemaschine (12) und ein mit dem Ventil (36) und dem Sensor (38) verbundenes Stellglied (68) aufweist, das dazu dient, das Ventil (36) im Sinne einer Verminderung des Dampfstroms durch den Zusatzverdichter (26) zu verstellen, wenn der Druck in der Hochdruckseite (54) der Kältemaschine (12) unter den ersten vorherbestimmten Wert fällt.

3. Vorrichtung (10) nach Anspruch 2, dadurch gekennzeichnet, daß das Stellglied (68) so ausgebildet ist, daß es verhindert, daß das Ventil (36) den Dampfstrom durch den Zusatzverdichter (26) erhöht, wenn der Druck in der Hochdruckseite (54) der Kältemaschine (12) unter einen zweiten vorherbestimmten Wert fällt, der höher ist als der erste vorherbestimmte Wert.

4. Vorrichtung (10) nach Anspruch 3, dadurch gekennzeichnet, daß der Drucksensor (38) einen ersten Druckschalter (40) besitzt, der dazu dient, das Stellglied (68) derart zu betätigen, daß er das Ventil (36) im Sinne einer Verminderung des Dampfstroms durch den Zusatzverdichter (26) bewegt, wenn der Druck in der Hochdruckseite (54) der Kältemaschine (12) unter den ersten vorherbestimmten Wert fällt, und einen zweiten Druckschalter (42), der dazu dient, ein Öffnen des Ventils (36) durch das Stellglied (68) zu verhindern, wenn der Druck in der Hochdruckseite (54) der Kältemaschine (12) unter den zweiten vorherbestimmten Wert fällt.

5. Vorrichtung (10) nach Anspruch 2 oder 4, dadurch gekennzeichnet, daß die Zusatzverdichterzuleitung (58) mit einem Kondensator (24) der Kältemaschine (12) zum Empfang von Kältemitteldampf von dem Kondensator verbunden ist.

6. Verfahren zur Steuerung einer Verdichter-Kältemaschine (10) zum gleichzeitigen Befriedigen eines Kälteverbrauchers und eines

Wärmeverbrauchers, in dem Kältemitteldampf verdichtet und der verdichtete Kältemitteldampf der Hochdruckseite (54) eines Kühlsystems (12) zugeführt wird, ein Teil des verdichteten Kältemittels kondensiert wird, ein Teil des Kältemitteldampfes von der Hochdruckseite (54) des Kältesystems (12) durch ein Heizsystem (14) geführt wird, der Kältemitteldampf in einer Wärmeübertragungsbeziehung mit einem Wärmeübertragungsmedium geführt wird, um dieses zu erwärmen und den Kältemitteldampf zu kondensieren, und der kondensierte Kältemitteldampf zu dem Kühlsystem zurückgeführt wird, dadurch gekennzeichnet, daß die Menge des in dem Heizsystem weiterverdichteten Kältemittels vermindert wird, wenn der Druck des Kältemittels in der Hochdruckseite (54) des Kühlsystems (12) unter einen ersten vorherbestimmten Wert fällt.

7. Verfahren nach Anspruch 6, dadurch gekennzeichnet, daß zum Vermindern der Kältemittelmenge der Druck in der Hochdruckseite (54) des Kühlsystems (12) gemessen und der Strom des durch das Heizsystem (14) tretenden Kältemittels vermindert wird, wenn der gemessene Druck unter den ersten vorherbestimmten Wert fällt.

8. Verfahren nach Anspruch 7, dadurch gekennzeichnet, daß die Menge des weiterverdichteten Kältemittels konstantgehalten wird, wenn der Druck in der Hochdruckseite (54) des Kühlsystems (12) unter einen zweiten vorherbestimmten Wert fällt, der höher ist als der erste vorherbestimmte Wert.

9. Verfahren nach Anspruch 8, dadurch gekennzeichnet, daß zum Konstanthalten der Druck in der Hochdruckseite (54) des Kühlsystems (12) gemessen und der Strom des Kältemittels durch das Heizsystem (12) konstantgehalten wird, wenn der gemessene Druck unter den zweiten vorherbestimmten Wert fällt.

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