

明 細 書

冷 凍 装 置

〔 技術分野 〕

本発明は、例えば、複数種類の温度環境を必要とするスーパーマーケット等に設けられる冷凍装置に関する。

〔 背景技術 〕

従来より、例えば、特開昭 6 2 - 9 4 7 8 5 号公報に示されているように、スーパーマーケット等に設けられる冷蔵ショーケースが知られている。この種のショーケースは、圧縮機と凝縮器と膨張弁と蒸発器とが冷媒配管によって接続されて成る冷凍装置を備えている。更に、上記ショーケースは、食品の陳列空間の他、該陳列空間との間で空気を循環させるための空気通路が形成されている。そして、上記蒸発器がこの空気通路に配置されている。

上記冷凍装置を駆動すると、圧縮機から吐出した冷媒が凝縮器で凝縮した後、膨張弁で減圧する。続いて、上記冷媒は、蒸発器において空気通路を流れる空気との間で熱交換を行って蒸発し、該空気を冷却する。この冷却された空気は、空気通路から陳列空間に供給されて食品を所定の低温度に保つ。この冷凍装置により、食品の鮮度が維持される。

また、上述したスーパーマーケットは、店内や従業員事務所の空気調和を行う空調装置も設けられている。この空調装置は、戸外に設置された室外ユニットと、店内の天井等に設置された室内ユニットとが冷媒配管等により接続されて構成されている。そして、これらの室外ユニットと室内ユニットとの間で熱搬送し、店内や従業員事務所の冷房等を行っている。この空調装置により、店内や従業員事務所が適切な空調状態に維持される。

－解決課題－

上述したように、従来は、ショーケース等のように食品を陳列する領域と、店内や従業員事務所等の人が存在する領域とはそれぞれ異なった冷凍装置と空調装置とを設けていた。そして、該冷凍装置と空調装置とによって各領域の要求に応じた環境を実現していた。つまり、上記冷凍装置と空調装置とは、それぞれ互いに独立したものであった。

このため、従来は、それぞれの冷凍装置と空調装置とに個別の熱源を設ける必要があった。つまり、ショーケース用の冷凍装置にあつては凝縮器等を設ける必要があり、店内用の空調装置にあつては室外ユニットを設ける必要があった。この結果、スーパーマーケット全体としての冷凍空調システムが煩雑となっていた。

また、上記各熱源を構成する機器の設置スペースも個別に必要となっていた。この結果、冷凍空調システムの設置に要する空間が大きくなってしまったといった不具合もあった。

本発明は、これらの点に鑑みてなされたものであつて、1つの装置でもってスーパーマーケット等のような複数種類の温度環境の要求に応え得るようにすると同時に、全体構成の簡素化を図り、これによって設置スペースの縮小を図ることを目的とする。

〔 発明の開示 〕

上記の目的を達成するために、本発明は、1台の熱源側ユニットに対し、該熱源側ユニットとの間で2元冷凍サイクルを構成する第1タイプの利用側ユニットと、熱源側ユニットとの間で一元冷凍サイクルを構成する第2タイプの利用側ユニットとを接続し、各利用側ユニットによって異なる温度環境を設定できるようにした。

－解決手段－

具体的に、第1の解決手段は、先ず、圧縮機(61)及び熱源側熱交換器(62)を有する熱源側ユニット(60)と、該熱源側ユニット(60)に液配管(72)及びガス配管(71)によって接続され、且つ互いに並列に接続された複数の利用側ユニット(11,

21,31,41,51) とを備えている。

更に、該各利用側ユニット (11,21,31,41,51) は、異なる冷凍サイクルを形成する少なくとも第1タイプの利用側ユニットと第2タイプの利用側ユニットの何れかで構成されている。

加えて、上記第1タイプの利用側ユニット (11,21,31) は、熱源側ユニット (60) から供給される熱源側の冷媒と利用側の冷媒とを熱交換させる冷媒熱交換器 (13,23,33) と、該冷媒熱交換器 (13,23,33) から供給される利用側の冷媒と空気とを熱交換させて該空気を所定温度に調和する第1利用側熱交換器 (16,26,36) とを有する閉回路の利用側冷媒回路 (12,22,32) を備えている。そして、上記第1タイプの利用側ユニット (11,21,31) が、熱源側ユニット (60) との間で多元冷凍サイクルを構成している。

一方、上記第2タイプの利用側ユニット (41,51) は、熱源側ユニット (60) から供給される冷媒と空気とを直接に熱交換させて該空気を所定温度に調和する第2利用側熱交換器 (46,56) を備えている。そして、上記第2タイプの利用側ユニット (41,51) が、熱源側ユニット (60) との間で一元冷凍サイクルを構成している。

尚、上記第1タイプの利用側ユニット (11,21,31) における冷媒熱交換器 (13,23,33) は、いわゆるカスケード型熱交換器と称される場合もある。

この第1の解決手段では、第1タイプの利用側ユニット (11,21,31) が熱源側ユニット (60) との間で多元冷凍サイクルの運転動作を行う。したがって、例えば、利用側熱交換器 (16,26,36) が吸熱運転を行う場合、比較的低温度の冷熱を得ることができる。

一方、第2タイプの利用側ユニット (41,51) が熱源側ユニット (60) との間で一元冷凍サイクルの運転動作を行う。したがって、例えば、利用側熱交換器 (46,56) が吸熱運転を行う場合、得られる冷熱の温度が上記第1タイプのものに比べて高くなる。

この結果、上記各利用側ユニット (11,21,31,41,51) が設置される環境の要求に応じた冷熱が得られる。

また、第2の解決手段は、上記第1の解決手段において、各利用側ユニット（11, 21, 31, 41, 51）の吹出し空気温度又は吸込み空気温度が所定の目標温度になるように熱源側ユニット（60）及び各利用側ユニット（11, 21, 31, 41, 51）を制御する制御手段（81）が設けられている。更に、上記何れかの利用側ユニット（11）の吹出し空気温度又は吸込み空気温度が目標温度に達しない能力不足の利用側ユニット（11）が生じると、該利用側ユニット（11）の能力が大きくなるように、他の利用側ユニット（51）の目標温度を変更するための変更信号を上記制御手段（81）に出力する設定変更手段（82）が設けられている。

この第2の解決手段では、特に安定した冷凍能力が要求される利用側ユニット（11）が存在する場合、この利用側ユニット（11）の能力を維持するように、他の利用側ユニット（51）の能力を低下させる。つまり、冷凍能力を安定させる利用側ユニット（11）を優先した運転が行われる。

また、第3の解決手段は、上記第2の解決手段において、設定変更手段（82）は、第1タイプの利用側ユニット（11, 21, 31）の吹出し空気温度又は吸込み空気温度が目標温度に達しない能力不足の利用側ユニット（11）が生じると、第2タイプの利用側ユニット（41, 51）の目標温度を変更するための変更信号を出力する構成としている。

また、第4の解決手段は、上記第3の解決手段において、利用側ユニット（11, 21, 31, 41, 51）の吹出し空気温度又は吸込み空気温度を検知する温度検知手段（Th-r）が設けられている。そして、各利用側ユニット（11, 21, 31, 41, 51）の利用側熱交換器（16, 26, 36, 46, 56）は、冷媒が蒸発する蒸発器で構成される。更に、設定変更手段（82）は、上記温度検知手段（Th-r）の出力を受け、第1タイプの利用側ユニット（11）の吹出し空気温度が目標温度よりも所定温度以上高いとき、第2タイプの利用側ユニット（51）の目標温度を高くするための変更信号を出力するように構成されている。

この第3の解決手段及び第4の解決手段では、第1タイプの利用側ユニット（11, 21, 31）の能力を、第2タイプの利用側ユニット（41, 51）よりも優先的に確保する。

つまり、第1タイプの利用側ユニット(11,21,31)での比較的低温の冷熱を安定的に得られる運転が行われる。

また、第5の解決手段は、上記第1の解決手段において、第1タイプの利用側ユニット(11,21)が、スーパーマーケットにおける食品陳列用のショーケース(10,20)に設けられている。一方、第2タイプの利用側ユニット(51)は、スーパーマーケットの店内の空気調和を行うように室内に設けられている。

この第5の解決手段では、スーパーマーケットのショーケース(10,20)と室内とで要求される複数種類の温度環境を1つの装置でもって実現する。

－発明の効果－

したがって、第1の解決手段によれば、1台の熱源側ユニット(60)に対し、該熱源側ユニット(60)の間で二元冷凍サイクルを構成する第1タイプの利用側ユニット(11,21,31)と、上記熱源側ユニット(60)との間で一元冷凍サイクルを構成する第2タイプの利用側ユニット(41,51)とを接続するようにしたために、各利用側ユニット(11,21,31,41,51)によって異なる温度環境を確実に得ることができる。

これにより、1台の熱源側ユニット(60)を有する装置によって、温度レベルの大きく異なる多種類の温度環境を実現することができる。特に、従来のスーパーマーケット等のように、温度環境毎に個別の冷凍装置や空調装置を設けることが必要なくなる。この結果、簡素で且つ設置スペースを大幅に削減できる装置を実現しながら、各種の要求に応じた温度環境を得ることができる。

また、第2の解決手段によれば、能力不足の利用側ユニット(11)が生じると、この利用側ユニット(11)の能力を大きくするように、他の利用側ユニット(51)の目標温度を変更するようにしたために、特に安定した冷凍能力が要求される利用側ユニット(11)が存在する場合、この利用側ユニット(11)の能力を維持することができる。つまり、特定の利用側ユニット(11)の能力を優先的に維持させるので、装置全体として大きな能力を要求することなしに特定の利用側ユニット(11)において必

要な能力を得ることができる。

また、第3の解決手段及び第4の解決手段によれば、第1タイプの利用側ユニット(11,21,31)の冷凍能力を、第2タイプの利用側ユニット(41,51)の冷凍能力よりも優先して制御するようにしたために、特に大きな冷凍能力を発揮する第1タイプの利用側ユニット(11,21,31)の能力を優先的に維持させることができる。つまり、高い冷凍能力を発揮できる第1タイプの利用側ユニット(11,21,31)は、特に安定した冷凍能力が要求される利用側ユニットとして利用される場合が多いと考えられる。この場合、上記第1タイプの利用側ユニット(11,21,31)を優先的に制御することにより、この安定した能力要求に応えられなくなってしまうことを確実に回避することができる。

また、第5の解決手段によれば、第1タイプの利用側ユニット(11,21)をスーパーマーケットにおける食品陳列用のショーケース(10,20)に設け、第2タイプの利用側ユニット(51)を店内の空気調和を行うように室内に設けるようにしたために、スーパーマーケットで要求される複数種類の温度環境を1つの装置でもって実現することができる。更に、上記第1タイプの利用側ユニット(11,21)を優先制御するので、ショーケース(10,20)の内部を常に安定した低温度に維持することができる。この結果、食品の鮮度を長期に亘って確保することができるので、装置の実用性の向上を図ることができる。

[図面の簡単な説明]

図1は、本発明の実施形態に係る冷凍空調システムの配管系統図である。

図2は、ショーケースを優先制御する動作手順を示すフローチャート図である。

[発明を実施するための最良の形態]

次に、本発明の実施形態を図面に基づいて詳細に説明する。

本実施形態は、本発明に係る冷凍装置をスーパーマーケットの冷凍空調システムに適用したものである。

そこで、先ず、上記スーパーマーケットにおける店内売場や従業員事務所などの各領域に要求される温度環境を説明する。

このスーパーマーケットの店内売場には、冷凍食品を陳列する冷凍ショーケース (10)、冷蔵食品を陳列する冷蔵ショーケース (20) が設置されている。そして、例えば、冷凍ショーケース (10) では -20°C のケース内温度環境が要求され、冷蔵ショーケース (20) では 0°C のケース内温度環境が要求される。

また、このスーパーマーケットには、一般にバックヤードと呼ばれる部屋であって且つ各種の食品を保管しておく保管庫 (30) の他、従業員が食品のバック詰め等の作業を行う食品加工室 (40) 及び、店内や従業員事務所等のように人が存在する一般空調室 (50) が存在する。これら各部屋 (30~50) には、それぞれ異なる温度環境が要求される。具体的に、例えば、保管庫 (30) では -2°C の温度環境が要求され、食品加工室 (40) では 15°C の温度環境が要求され、一般空調室 (50) では 25°C の温度環境が要求される。

次に、本実施形態に係る冷凍空調システムについて説明する。

この冷凍空調システムは、熱源側ユニットとしての1台の室外ユニット (60) と、利用側ユニットである3台の冷凍ユニット (11,21,31) 及び2台の空調ユニット (41,51) とを備えている。そして、該各冷凍ユニット (11,21,31) 及び各空調ユニット (41,51) は、上記冷凍ショーケース (10) と冷蔵ショーケース (20) と保管庫 (30) と食品加工室 (40) と一般空調室 (50) にそれぞれ設けられている。

先ず、上記室外ユニット (60) について説明する。

この室外ユニット (60) は、スーパーマーケットの戸外に設置され、圧縮機 (61) 及び熱源側熱交換器である室外熱交換器 (62) を備えている。該室外熱交換器 (62) は、圧縮機 (61) の冷媒吐出側に接続され、且つ室外ファン (F-o) が近接して配置されている。

上記圧縮機 (61) の吸入側は、ガス側連絡管 (71) によって各冷凍ユニット (11,21,31) 及び各空調ユニット (41,51) に接続され、また、上記室外熱交換器 (62) の液側は、液側連絡管 (72) によって各冷凍ユニット (11,21,31) 及び各空調ユニット

(41,51) に接続されている。つまり、上記ガス側連絡管 (71) 及び液側連絡管 (72) は、途中で複数に分岐され、この分岐端部が各冷凍ユニット (11,21,31) 及び各空調ユニット (41,51) のガス側及び液側にそれぞれ接続されている。

次に、上記各冷凍ユニット (11,21,31) 及び各空調ユニット (41,51) について説明する。

該各冷凍ユニット (11,21,31) は、冷凍ショーケース (10)、冷蔵ショーケース (20) 及び保管庫 (30) に設置された第 1 タイプの利用側ユニットである。また、上記各空調ユニット (41,51) は、食品加工室 (40) 及び一般空調室 (50) に設置された第 2 タイプの利用側ユニットである。

上記冷凍ショーケース (10)、冷蔵ショーケース (20) 及び保管庫 (30) の冷凍ユニット (11,21,31) は、閉回路でなる利用側冷媒回路 (12,22,32) を備えている。該利用側冷媒回路 (12,22,32) は、上記室外ユニット (60) から液側連絡管 (72) を経て供給される冷媒と熱交換するように構成されている。

つまり、上記冷凍ユニット (11,21,31) は、室外ユニット (60) から液側連絡管 (72) を経て供給される冷媒と利用側冷媒回路 (12,22,32) との間で熱交換を行う冷媒熱交換器 (13,23,33) を備えている。尚、該冷媒熱交換器 (13,23,33) は、低温側の冷媒の凝縮熱を高温側の冷媒の蒸発熱で冷却するカスケード型熱交換器 (カスケード凝縮器) と称する場合もある。

上記利用側冷媒回路 (12,22,32) は、圧縮機 (14,24,34) と、冷媒熱交換器 (13,23,33) の利用側熱交換部としての凝縮部 (13a,23a,33a) と、膨張弁 (15,25,35) と、第 1 利用側熱交換器としての蒸発器 (16,26,36) とが冷媒配管 (17,27,37) によって順に接続されて構成されている。そして、該蒸発器 (16,26,36) には、ファン (F) が近接して配置されている。

上記室外ユニット (60) から延びる液側連絡管 (72) の分岐部には膨張弁 (18,28,38) が設けられている。該液側連絡管 (72) の分岐部における膨張弁 (18,28,38) の低圧側は、冷媒熱交換器 (13,23,33) の熱源側熱交換部としての蒸発部 (13b,23b,33b) に接続されている。

したがって、上記室外ユニット（60）と、冷凍ショーケース（10）、冷蔵ショーケース（20）及び保管庫（30）の各冷凍ユニット（11,21,31）との間では、熱源側回路（1次側回路）に対して複数の利用側回路（2次側回路）が接続された、いわゆるマルチ型の二元冷凍システムが構成されている。

すなわち、上記室外ユニット（60）の圧縮機（61）及び室外熱交換器（62）と、各冷凍ユニット（11,21,31）の膨張弁（18,28,38）及び冷媒熱交換器（13,23,33）の蒸発部（13b,23b,33b）によって1次側冷媒回路が構成されている。一方、上記各冷凍ユニット（11,21,31）の圧縮機（14,24,34）と、冷媒熱交換器（13,23,33）の凝縮部（13a,23a,33a）と、膨張弁（15,25,35）と、蒸発器（16,26,36）とによって2次側冷媒回路が構成されている。これら冷媒回路の間で熱搬送が行われる。

次に、上記食品加工室（40）及び一般空調室（50）の空調ユニット（41,51）について説明する。

該空調ユニット（41,51）は、第2利用側熱交換器としての室内熱交換器（46,56）を備えている。一方、上記室外ユニット（60）から延びる液側連絡管（72）の分岐部には膨張弁（45,55）が設けられている。該液側連絡管（72）の分岐部における膨張弁（45,55）の低圧側が室内熱交換器（46,56）に接続されている。

したがって、上記室外ユニット（60）と、食品加工室（40）及び一般空調室（50）の空調ユニット（41,51）との間では、室外ユニット（60）の圧縮機（61）及び室外熱交換器（62）と、食品加工室（40）及び一般空調室（50）の空調ユニット（41,51）の膨張弁（45,55）及び室内熱交換器（46,56）が順に接続されて成る一元冷凍サイクルが構成されている。

すなわち、上記室外ユニット（60）の圧縮機（61）から吐出して室外熱交換器（62）で凝縮した冷媒が、各空調ユニット（41,51）の膨張弁（45,55）で減圧し、室内熱交換器（46,56）で室内空気と熱交換を行って蒸発する。

上記冷凍空調システムには各種のセンサが設けられている。具体的に、上記各冷凍ユニット（11,21,31）及び各空調ユニット（41,51）には、吹出し空気温度又は吸込み空気温度を検知する温度検知手段としての温度センサ（Th-r）が設けられている。

尚、本実施形態における温度センサ (Th-r) は、実際には吹出し空気温度を検知している。

図示しないが、上記冷凍空調システムには、温度センサ (Th-r) の他、各圧縮機 (61,14,24,34) の吐出管温度、吐出圧力、吸入圧力等を検知するセンサも設けられている。

更に、上記冷凍空調システムにはコントローラ (80) が設けられている。該コントローラ (80) には、制御手段 (81) 及び設定変更手段 (82) が設けられている。

該制御手段 (81) は、上記各圧縮機 (61,14,24,34) の運転容量や膨張弁 (15,18,25,28,35,38,45,55) の開度等を制御し、各冷凍ユニット (11,21,31) 及び各空調ユニット (41,51) によって上述した温度環境が得られるようにしている。つまり、上記制御手段 (81) は、各冷凍ユニット (11,21,31) 及び各空調ユニット (41,51) の吹出し空気温度又は吸込み空気温度が所定の目標温度になるように上記各機器を制御する。

上記設定変更手段 (82) は、温度センサ (Th-r) の出力を受け、冷凍ショーケース (10) や冷蔵ショーケース (20) の冷凍ユニット (11,21) の吹出し空気温度又は吸込み空気温度が目標温度よりも所定温度以上高いとき、一般空調室 (50) の空調ユニット (51) の目標温度を現在の値よりも所定温度だけ高くするための変更信号を制御手段 (81) に出力するように構成されている。この一般空調室 (50) の空調ユニット (51) の目標温度を高くする所定温度は、例えば、5 degである。

次に、上記冷凍空調システムの運転動作について説明する。

運転を開始すると、室外ユニット (60) 及び各冷凍ユニット (11,21,31) の圧縮機 (61,14,24,34) が駆動する。この圧縮機 (61,14,24,34) の運転容量、各膨張弁 (15,18,25,28,35,38,45,55) の開度及び、ファン (F-o,F) の回転数等は、制御手段 (81) によって制御される。そして、上記各冷凍ユニット (11,21,31) 及び各空調ユニット (41,51) の吹出し空気温度又は吸込み空気温度が、所定の目標温度に達するように制御される。

つまり、上記冷凍ショーケース (10)、冷蔵ショーケース (20)、保管庫 (30) の冷

凍ユニット (11,21,31) は、室外ユニット (60) との間で二元冷凍サイクルに構成されているので、比較的低温度の冷熱が得られる。その際、各部の温度は上述した如くである。一方、上記食品加工室 (40)、一般空調室 (50) の空調ユニット (41,51) は、室外ユニット (60) との間で一元冷凍サイクルに構成されているので、上記冷凍ユニット (11,21,31) に比べて比較的温度の高い冷熱が得られる。その際、これら各部の温度も上述した如くである。

次に、本実施形態の特徴とする動作として、冷凍能力が不足した際の運転動作について図2のフローチャートに基づき説明する。

この冷凍能力が不足する状況としては、例えば、冷凍ショーケース (10) や冷蔵ショーケース (20) に新たな食品が陳列されて、一時的に冷凍ショーケース (10) や冷蔵ショーケース (20) の内部温度が上昇した場合がある。その他、冷凍能力が不足する状況としては、室外熱交換器 (62) の汚れ等によって室外機能力が低下した場合などが挙げられる。ここでは、冷凍ショーケース (10) の内部温度が上昇した場合の運転動作について説明する。

まず、ステップST1において、吹出し温度センサ (Th-r) が検出する冷凍ショーケース (10) への空気温度 (Tr) と、この冷凍ショーケース (10) の目標設定温度 (TsetA) とを比較する。この目標設定温度 (TsetA) は、例えば、 -20°C である。そして、上記吹出し空気温度 (Tr) が目標設定温度 (TsetA) よりも所定量 t 以上高い場合には、上記ステップST1の判定がYESとなり、ステップST2に移る。この所定量 t は、例えば、5 degである。

上記ステップST2において、一般空調室 (50) の目標設定温度 (TsetB) を所定量だけ高く設定する。例えば、この目標設定温度 (TsetB) を5 degだけ高くし、一般空調室 (50) の冷熱要求量を小さく設定する。

これにより、それまで一般空調室 (50) の室温がほぼ目標設定温度 (TsetB) に達していた場合には、実際の室内温度が目標設定温度 (TsetB) よりも低くなる。その後、上記ステップST2からステップST3に移り、一般空調室 (50) の空調ユニット (51) は空調運転を休止し、いわゆるサーモオフする。このサーモオフ動作は、例えば、膨

張弁 (55) を全閉にすることにより行われる。

このような状況では、この一般空調室 (50) の空調ユニット (51) は、室内温度が本来の目標温度よりも 5 deg以上高くなるまでは空調運転を再開しない。つまり、上記空調ユニット (51) は、室内温度が本来の目標温度よりも 5 deg以上高くなるまで、いわゆるサーモオンしない。

その後、ステップST 4に移り、上述した動作により、一般空調室 (50) の空調ユニット (51) への冷媒供給が必要なくなるので、冷凍ショーケース (10) の冷凍ユニット (11) に対し、所定時間の間、多量の冷媒を供給することが可能になる。つまり、上記空調ユニット (51) がサーモオンするまで、冷凍ユニット (11) の冷媒供給量が増大する。

この結果、この冷凍ショーケース (10) の冷凍ユニット (11) の能力が増大し、該冷凍ショーケース (10) の吹出し空気温度 (T_r) が目標設定温度 (T_{setA}) に迅速に近付くことになる。

続いて、ステップST 5において、上記冷凍ショーケース (10) の吹出し空気温度 (T_r) が目標設定温度 (T_{setA}) に達したか否かが判定される。該冷凍ショーケース (10) の吹出し空気温度 (T_r) が目標設定温度 (T_{setA}) に達すると、上記ステップST 5の判定がYESとなってステップST 6に移る。該ステップST 6において、一般空調室 (50) の目標設定温度 (T_{setB}) を元の値に戻す。つまり、この目標設定温度 (T_{setB}) を 5 degだけ低下させる。

これにより、一般空調室 (50) の冷熱要求量が大きくなり、この一般空調室 (50) の空気調和が良好に行われる。

尚、上記温度センサ (T_{h-r}) が吸込み空気温度を検知するようにした場合であっても上述と同様の制御動作が行われる。

以上のように、本実施形態によれば、1 台の室外ユニット (60) に対し、二元冷凍サイクルを構成する第 1 タイプの冷凍ユニット (11, 21, 31) と、一元冷凍サイクルを構成する第 2 タイプの空調ユニット (41, 51) とを設けるようにしたために、1 つの

冷凍空調システムによって温度レベルの大きく異なる多種類の温度環境を実現することができる。

特に、従来のスーパーマーケットのように、温度環境毎に個別の冷凍装置と空調装置とを設けることが必要なくなり、簡素で且つ設置スペースを大幅に削減した冷凍空調システムを実現することができる。これと同時に、各種の要求に応じた温度環境を得ることができる。

また、本実施形態では、冷凍空調システムの全体の冷凍能力が不足した場合であっても、一般空調室(50)の目標設定温度(T_{setB})を強制的に変更して冷凍ショーケース(10)などの温度環境を優先した運転制御を行うようにしているので、食品の鮮度を長期に亘って維持することができる。

また、上記冷凍ユニット(11,21,31)が室外ユニット(60)との間で二元冷凍サイクルを構成するので、低温側の冷媒回路である利用側冷媒回路(12,22,32)を変更するのみでもって希望の低温を得ることができる。この結果、上記冷凍空調システムのバリエーションが向上し、汎用性が向上する。

尚、本実施形態は、本発明をスーパーマーケットの冷凍空調システムに適用した場合について説明したが、本発明はこれに限らず、ビル用の冷凍システム等に適用することも可能である。

[産業上の利用可能性]

以上のように、本発明に係る冷凍装置は、温度環境が異なる領域を得る場合に有用である。特に、本発明に係る冷凍装置は、スーパーマーケットにおけるショーケースの冷凍と室内の空調とを行う場合に適している。

請求の範囲

1. 圧縮機 (61) 及び熱源側熱交換器 (62) を有する熱源側ユニット (60) と、

該熱源側ユニット (60) に液配管 (72) 及びガス配管 (71) によって接続され、
且つ互いに並列に接続された複数の利用側ユニット (11, 21, 31, 41, 51) とを備え、

該各利用側ユニット (11, 21, 31, 41, 51) は、異なる冷凍サイクルを形成する少なくとも第 1 タイプの利用側ユニットと第 2 タイプの利用側ユニットの何れかで構成され、

上記第 1 タイプの利用側ユニット (11, 21, 31) は、熱源側ユニット (60) から供給される熱源側の冷媒と利用側の冷媒とを熱交換させる冷媒熱交換器 (13, 23, 33) と、該冷媒熱交換器 (13, 23, 33) から供給される利用側の冷媒と空気とを熱交換させて該空気を所定温度に調和する第 1 利用側熱交換器 (16, 26, 36) とを有する閉回路の利用側冷媒回路 (12, 22, 32) を備え、上記第 1 タイプの利用側ユニット (11, 21, 31) が、熱源側ユニット (60) との間で多元冷凍サイクルを構成する一方、

上記第 2 タイプの利用側ユニット (41, 51) は、熱源側ユニット (60) から供給される冷媒と空気とを熱交換させて該空気を所定温度に調和する第 2 利用側熱交換器 (46, 56) を備え、上記第 2 タイプの利用側ユニット (41, 51) が、熱源側ユニット (60) との間で一元冷凍サイクルを構成している
ことを特徴とする冷凍装置。

2. 請求項 1 記載の冷凍装置において、

各利用側ユニット (11, 21, 31, 41, 51) の吹出し空気温度又は吸込み空気温度が所定の目標温度になるように熱源側ユニット (60) 及び各利用側ユニット (11, 21, 31, 41, 51) を制御する制御手段 (81) と、

上記何れかの利用側ユニット (11) の吹出し空気温度又は吸込み空気温度が目標温度に達しない能力不足の利用側ユニット (11) が生じると、該利用側ユニット (1) の能力が大きくなるように、他の利用側ユニット (51) の目標温度を変更するため





の変更信号を上記制御手段（81）に出力する設定変更手段（82）とを備えていることを特徴とする冷凍装置。

3. 請求項2記載の冷凍装置において、

設定変更手段（82）は、第1タイプの利用側ユニット（11,21,31）の吹出し空気温度又は吸込み空気温度が目標温度に達していない能力不足の利用側ユニット（11）が生じると、第2タイプの利用側ユニット（41,51）の目標温度を変更するための変更信号を出力することを特徴とする冷凍装置。

4. 請求項3記載の冷凍装置において、

利用側ユニット（11,21,31,41,51）の吹出し空気温度又は吸込み空気温度を検知する温度検知手段（Th-r）が設けられる一方、

各利用側ユニット（11,21,31,41,51）の利用側熱交換器（16,26,36,46,56）は、冷媒が蒸発する蒸発器で構成され、

設定変更手段（82）は、上記温度検知手段（Th-r）の出力を受け、第1タイプの利用側ユニット（11）の吹出し空気温度が目標温度よりも所定温度以上高いとき、第2タイプの利用側ユニット（51）の目標温度を高くするための変更信号を出力するように構成されていることを特徴とする冷凍装置。

5. 請求項1記載の冷凍装置において、

第1タイプの利用側ユニット（11,21）は、スーパーマーケットにおける食品陳列用のショーケース（10,20）に設けられる一方、

第2タイプの利用側ユニット（51）は、スーパーマーケットの店内の空気調和を行うように室内に設けられていることを特徴とする冷凍装置。

2/2

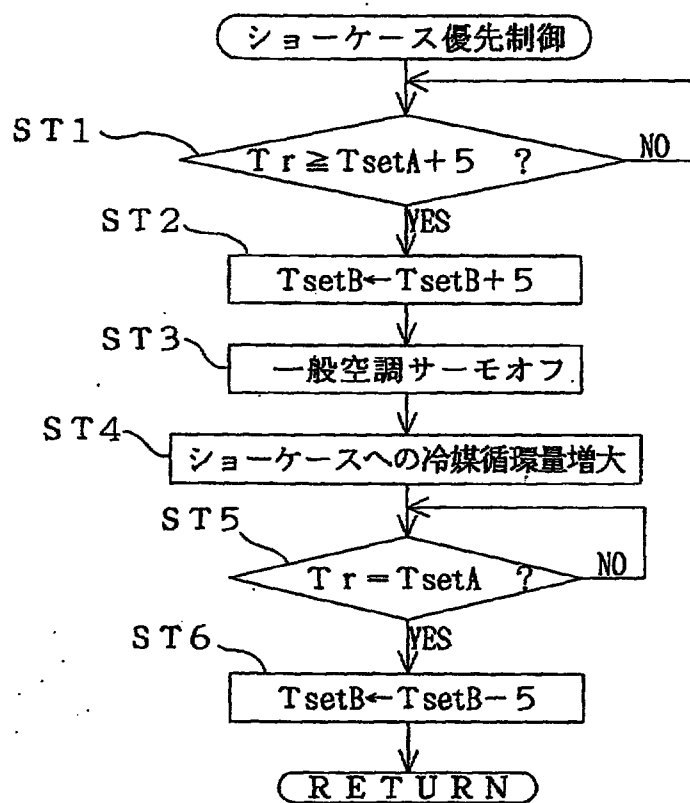


Fig. 2

DESCRIPTION

REFRIGERATING SYSTEM

5

TECHNICAL FIELD

The present invention relates to a refrigerating system applicable to a supermarket or the like requiring various types of temperature environments.

10

BACKGROUND ART

A chilling showcase applicable to a supermarket or the like has conventionally been known as disclosed in Japanese Laid-Open Publication No. 62-94785, for example. A showcase of such a type includes a refrigerating system in which a
15 compressor, a condenser, an expansion valve and an evaporator are connected via a refrigerant pipe. The showcase includes not only a display stand for foods but also an air passage for circulating the air into/from the display stand. The evaporator is installed in the air passage.

20

When the refrigerating system is driven, a refrigerant discharged from the compressor is condensed in the condenser and then the pressure of the refrigerant is reduced by the expansion valve. Subsequently, the refrigerant exchanges heat in the evaporator with the air flowing through the air passage
25 and is evaporated, thereby cooling the air. The cooled air is

supplied through the air passage to the display stand, thereby keeping the temperature of the foods at a predetermined low temperature. Such a refrigerating system can keep the foods fresh.

5 In addition, a supermarket is usually equipped with an air-conditioning system for conditioning the air in an in-store selling area and an employees' office. Such an air-conditioning system is constructed by connecting an outdoor unit placed outside of the store to an indoor unit placed on
10 the ceiling or the like inside the store via a refrigerant pipe and the like. Heat is transported between the outdoor unit and the indoor unit, thereby cooling the air inside the store and the employees' office. The air-conditioning system can keep a comfortable air condition inside the store and the
15 employees' office.

~~—Problems to be solved—~~

As described above, a refrigerating system and an air-conditioning system have conventionally been provided separately for an area, such as a showcase, where foods are displayed and for an area, such as an in-store selling area and
20 an employees' office, where persons are present, respectively. The refrigerating system and the air-conditioning system have provided appropriate environments required for the respective areas. That is to say, the refrigerating system and the air-

conditioning system have heretofore been totally independent of each other.

Thus, it has conventionally been necessary to provide discrete heat sources for a refrigerating system and an air-
5 conditioning system, respectively. More specifically, a condenser and the like need to be provided for a refrigerating system for a showcase and an outdoor unit needs to be provided for an air-conditioning system for conditioning the air inside a store. Accordingly, the freezer and air-conditioning sys-
10 tems required for a supermarket as a whole have been adversely complicated.

Moreover, spaces for housing various units constituting the respective heat sources have recently been required separately. Therefore, the spaces for disposing the freezer and
15 air-conditioning systems have disadvantageously increased these days.

In view of the above-described conventional problems, the present invention has been devised in order to provide a refrigerating system, which can simultaneously condition by
20 itself the air in various types of temperature environments in a supermarket or the like, can simplify the overall construction thereof and can reduce the required installation space.

DISCLOSURE OF INVENTION

In order to accomplish the above-described objective, according to the present invention, a single heat source unit is connected to a plurality of application units of a first type for forming a two-stage refrigerating cycle with the heat source unit and also connected to a plurality of application units of a second type for forming a one-stage refrigerating cycle with the heat source unit, and respectively different temperature environments are set by the application units of these two types.

-Solutions-

Specifically, the first solution provided by the present invention is a refrigerating system including: a heat source unit (60) including a compressor (61) and a heat-source heat exchanger (62); and a plurality of application units (11, 21, 31, 41, 51), which are connected to the heat source unit (60) via a liquid pipe (72) and a gas pipe (71) and are connected in parallel to each other.

The application units (11, 21, 31, 41, 51) are classified into at least two types of application units forming respectively different refrigerating cycles and including application units of the first type (11, 21, 31) and application units of the second type (41, 51).

Each of the application units (11, 21, 31) of the first type includes an application refrigerant circuit (12, 22, 32)

REPLACED SHEETS SG

☒	Description	: paged 04 to paged 11
☒	Claim(s)	: paged 26 to paged 29
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as a closed circuit including a refrigerant heat exchanger (13, 23, 33) and a first-application heat exchanger (16, 26, 36). Each of the refrigerant heat exchangers (13, 23, 33) exchanges heat between a heat-source refrigerant supplied from the heat source unit (60) and an application refrigerant. Each of the first-application heat exchangers (16, 26, 36) exchanges heat between the application refrigerant supplied from an associated one of the refrigerant heat exchangers (13, 23, 33) and the air, thereby conditioning the air at a predetermined temperature. A multi-stage refrigerating cycle is formed between each of the application units (11, 21, 31) of the first type and the heat source unit (60).

On the other hand, each of the application units (41, 51) of the second type includes a second-application heat exchanger (46, 56) for directly exchanging heat between the refrigerant supplied from the heat source unit (60) and the air, thereby conditioning the air at a predetermined temperature. A one-stage refrigerating cycle is formed between the application units (41, 51) of the second type and the heat source unit (60).

It is noted that each of the refrigerant heat exchangers (13, 23, 33) in the application units (11, 21, 31) of the first type is sometimes called "cascade heat exchanger".

According to the first solution, the application units (11, 21, 31) of the first type perform operations with the



heat source unit (60) in multi-stage refrigerating cycles. Thus, for example, if the application heat exchangers (16, 26, 36) perform heat absorption operation, cold heat at a relatively low temperature can be obtained.

5 On the other hand, the application units (41, 51) of the second type perform operations with the heat source unit (60) in one-stage refrigerating cycles. Thus, for example, if the application heat exchangers (46, 56) perform heat absorption operation, the temperature of the resulting cold heat becomes
10 higher than that of the cold heat obtained by the application units of the first type.

As a result, cold heat can be obtained so as to satisfy the requirements of respective environments in which the application units (11, 21, 31, 41, 51) are installed.

15 The second solution provided by the present invention is a refrigerating system including not only the components of the first solution, but also control means (81) for controlling the heat source unit (60) and the respective application units (11, 21, 31, 41, 51) such that a supply air temperature
20 or a suction air temperature of each of the application units (11, 21, 31, 41, 51) becomes a predetermined desired temperature. In addition, the refrigerating system further includes setting changing means (82) for outputting such a change signal to the control means (81) that if any of the application
25 units (e.g., 11) is so lacking in refrigerating power as to



have a supply air temperature or a suction air temperature not reaching the desired temperature thereof, the desired temperature of another application unit (e.g., 51) is changed so as to improve the power of the application unit (11).

5 In accordance with the second solution, if any of the application units (e.g., 11) is required to exhibit particularly stable refrigerating power, then the power of another application units (e.g., 51) is decreased so as to maintain the power of the application unit (11). In other words, op-
10 erations are performed in such a manner as to prioritize the application unit (11) that should exhibit stable refrigerating power.

 In the third solution provided by the present invention, the second solution is modified such that the setting chang-
15 ing means (82) outputs such a change signal that if any of the application units (11, 21 or 31) of the first type is so lacking in refrigerating power as to have a supply air temperature or a suction air temperature not reaching the desired temperature thereof, the desired temperature of any of
20 the application units (41 or 51) of the second type is changed.

 In the fourth solution provided by the present invention, the third solution is modified such that temperature sensor means (Th-r) for sensing the supply air temperatures
25 or the suction air temperatures of the application units (11,



21, 31, 41, 51) are further provided. Each of the application heat exchangers (16, 26, 36, 46, 56) of the application units (11, 21, 31, 41, 51) is constituted by an evaporator for evaporating a refrigerant. The setting changing means
5 (82) is constituted so as to receive outputs of the temperature sensor means (Th-r) and output a change signal for raising the desired temperature of any of the application units (41 or 51) of the second type if the supply air temperature of any of the application units (11, 21 or 31) of the first
10 type is higher than the desired temperature thereof by a predetermined difference or more.

In accordance with the third and the fourth solutions, the power of the application units (11, 21, 31) of the first type is prioritized over the application units (41, 51) of
15 the second type. That is to say, operations are performed so as to obtain cold heat at a relatively low temperature for the application units (11, 21, 31) of the first type.

In the fifth solution provided by the present invention, the first solution is adapted such that the application units
20 (11, 21) of the first type are provided for showcases (10, 20) for displaying foods in a supermarket, and that the application unit (51) of the second type is provided indoors for conditioning the air in the supermarket.

In accordance with the fifth solution, various types of
25 temperature environments required for the showcases (10, 20)



and for the selling area in the supermarket are realized by a single system.

-Effects of the invention-

In accordance with the first solution, the single heat
5 source unit (60) is connected to the application units (11,
21, 31) of the first type for forming a two-stage refrigerat-
ing cycle with the heat source unit (60) and to the applica-
tion units (41, 51) of the second type for forming a one-
stage refrigerating cycle with the heat source unit (60).
10 Thus, respectively different temperature environments can be
secured for the application units (11, 21, 31, 41, 51) of
these two types.

This makes it possible to provide many types of tempera-
ture environments having greatly different temperature levels
15 by using a system including only one heat source unit (60).
In particular, it is no longer necessary to provide a refriger-
ating system and an air-conditioning system separately for
the respective temperature environments, as has conventionally
done in a supermarket. As a result, temperature environ-
20 ments complying with various demands can be obtained while
providing a simplified system that can considerably reduce
the required installation area.

In accordance with the second solution, if there is any
application unit (e.g., 11) lacking in power, the desired
25 temperature of another application unit (e.g., 51) is changed



so as to recover the power of the application unit (11). Thus, if there is any application unit (11) required to exhibit particularly stable refrigerating power, the power of the application unit (11) can be maintained. That is to say, since the power maintenance of a particular application unit (11) is prioritized, required power can be obtained for the particular application unit (11) without increasing the required power of the entire system.

In accordance with the third and the fourth solutions, the control of the refrigerating power of the application units (11, 21, 31) of the first type is prioritized over the control of the refrigerating power of the application units (41, 51) of the second type. Thus, it is possible to prioritize the power maintenance of the application units (11, 21, 31) of the first type requiring particularly high refrigerating power. That is to say, it is considered that the application units (11, 21, 31) of the first type, which can exhibit superior refrigerating power, are often used as application units required for exhibiting particularly stable refrigerating power. In such a case, by prioritizing the control of the application units (11, 21, 31) of the first type, it is possible to prevent, with certainty, the power of the application units (11, 21, 31) from being too weakened to meet the constant refrigerating power requirements.

In accordance with the fifth solution, the application

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units (11, 21) of the first type are provided for showcases (10, 20) for displaying foods in a supermarket, and the application unit (51) of the second type is provided indoors for conditioning the air in the supermarket. Thus, various types of temperature environments required for a supermarket are realized by a single system. Furthermore, since the control of the application units (11, 21) of the first type is prioritized, the contents of the showcases (10, 20) can be kept at a constant, low temperature. As a result, since foods can be kept fresh for a long period of time, the practicality of the system can be improved.

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 is a piping diagram of a refrigerating/air-conditioning system in an embodiment of the present invention.

Figure 2 is a flow chart illustrating a procedure of the prioritized control over a showcase.

BEST MODE FOR CARRYING OUT THE INVENTION

Hereinafter, an embodiment of the present invention will be described in detail with reference to the accompanying drawings.

In this embodiment, the refrigerating system of the present invention is applied to a refrigerating/air-conditioning

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system for a supermarket.

Thus, various temperature environments required for respective areas such as a selling area and an employees' office in a supermarket will be described.

5 In the selling area of the supermarket, a freezing showcase (10) in which frozen foods are displayed and a chilling showcase (20) in which refrigerated foods are displayed are disposed. For example, an in-case temperature environment of -20°C is required for the freezing showcase (10) and an in-
10 case temperature environment of 0 °C is required for the chilling showcase (20).

 In the supermarket, there are a storehouse (30) or a so-called "backyard" for storing various kinds of foods therein, a food processing chamber (40) in which employees do various
15 work such as packing the foods, and a general air-conditioned room (50) such as the selling area and the employees' office where persons are present. Respectively different temperature environments are required for these rooms (30 to 50). Specifically, a temperature environment of -2°C is required
20 for the storehouse (30), a temperature environment of 15°C is required for the food processing chamber (40) and a temperature environment of 25°C is required for the general air-conditioned room (50).

 Next, the refrigerating/air-conditioning system of this
25 embodiment will be described.

The refrigerating/air-conditioning system includes: an outdoor unit (60) as a heat source unit; and three refrigerating units (11, 21, 31) and two air-conditioning units (41, 51) as application units. The refrigerating units (11, 21, 31) and the air-conditioning units (41, 51) are provided for the freezing showcase (10), the chilling showcase (20), the storehouse (30), the food processing chamber (40) and the general air-conditioned room (50), respectively.

First, the outdoor unit (60) will be described.

10 The outdoor unit (60) is installed outside of the supermarket and includes a compressor (61) and an outdoor heat exchanger (62) as a heat-source heat exchanger. The outdoor heat exchanger (62) is connected to a refrigerant outlet of the compressor (61) and an outdoor fan (F-o) is disposed in 15 the vicinity of the outdoor heat exchanger (62).

An inlet of the compressor (61) is connected to the respective refrigerating units (11, 21, 31) and the respective air-conditioning units (41, 51) via a gas connecting pipe (71). The outdoor heat exchanger (62) is connected on the 20 liquid side to the respective refrigerating units (11, 21, 31) and the respective air-conditioning units (41, 51) via a liquid connecting pipe (72). That is to say, each of the gas connecting pipe (71) and the liquid connecting pipe (72) is branched into a plurality of branched pipes, and the ends of 25 each pair of branched pipes are connected to the gas side and

the liquid side of the corresponding one of the refrigerating units (11, 21, 31) and the air-conditioning units (41, 51).

Next, the refrigerating units (11, 21, 31) and the air-conditioning units (41, 51) will be described.

5 The refrigerating units (11, 21, 31) are application units of the first type installed in the freezing showcase (10), the chilling showcase (20) and the storehouse (30), respectively. On the other hand, the air-conditioning units (41, 51) are application units of the second type installed
10 in the food processing chamber (40) and the general air-conditioned room (50), respectively.

Each of the refrigerating units (11, 21, 31) of the freezing showcase (10), the chilling showcase (20) and the storehouse (30) includes an application refrigerant circuit
15 (12, 22, 32) formed as a closed circuit. Each of the application refrigerant circuits (12, 22, 32) is constituted so as to exchange heat with the refrigerant supplied from the outdoor unit (60) via the liquid connecting pipe (72).

More specifically, each of the refrigerating units (11,
20 21, 31) includes a refrigerant heat exchanger (13, 23, 33) for exchanging heat in the application refrigerant circuit (12, 22, 32) with the refrigerant supplied from the outdoor unit (60) via the liquid connecting pipe (72). It is noted that such a refrigerant heat exchanger (13, 23, 33) is some-
25 times called "cascade heat exchanger" (or cascade condenser)

for cooling the condensation heat of a lower-temperature refrigerant with the evaporation heat of a higher-temperature refrigerant.

Each of the application refrigerant circuits (12, 22, 32) is constituted by connecting a compressor (14, 24, 34), a condensing section (13a, 23a, 33a), an expansion valve (15, 25, 35) and an evaporator (16, 26, 36) in this order via a refrigerant pipe (17, 27, 37). The condensing section (13a, 23a, 33a) functions as an application heat-exchanging section for each refrigerant heat exchanger (13, 23, 33). The evaporator (16, 26, 36) functions as a first-application heat exchanger. And a fan (F) is disposed in the vicinity of each evaporator (16, 26, 36).

An expansion valve (18, 28, 38) is provided for each branched pipe of the liquid connecting pipe (72) extending from the outdoor unit (60). Each expansion valve (18, 28, 38) provided for a corresponding branched pipe of the liquid connecting pipe (72) is connected on the lower-pressure side to an evaporating section (13b, 23b, 33b) functioning as a heat-source heat-exchanging section of a corresponding refrigerant heat exchanger (13, 23, 33).

Thus, a so-called "multiple" two-stage refrigerating system, in which a plurality of application circuits (secondary circuits) are connected to a single heat-source circuit (primary circuit), is formed between the outdoor unit (60)

and the respective refrigerating units (11, 21, 31) of the freezing showcase (10), the chilling showcase (20) and the storehouse (30).

That is to say, a primary refrigerant circuit includes:
5 the compressor (61) and the outdoor heat exchanger (62) of the outdoor unit (60); and the expansion valve (18, 28, 38) and the evaporating section (13b, 23b, 33b) of the refrigerant heat exchanger (13, 23, 33) of each refrigerating unit (11, 21, 31). On the other hand, a secondary refrigerant circuit includes: the compressor (14, 24, 34); the condensing
10 section (13a, 23a, 33a) of the refrigerant heat exchanger (13, 23, 33); the expansion valve (15, 25, 35); and the evaporator (16, 26, 36) of each refrigerating unit (11, 21, 31). Heat is transported between these refrigerant circuits.

15 Next, the air-conditioning units (41, 51) for the food processing chamber (40) and the general air-conditioned room (50) will be described.

Each of the air-conditioning units (41, 51) includes an indoor heat exchanger (46, 56) functioning as a second-
20 application heat exchanger. On the other hand, an expansion valve (45, 55) is provided for each branched pipe of the liquid connecting pipe (72) extending from the outdoor unit (60). Each expansion valve (45, 55) provided for a corresponding branched pipe of the liquid connecting pipe (72) is connected
25 on the lower-pressure side to a corresponding indoor heat ex-

changer (46, 56).

Thus, a one-stage refrigerating cycle is formed by connecting the compressor (61) and the outdoor heat exchanger (62) of the outdoor unit (60) to the expansion valve (45, 55) and the indoor heat exchanger (46, 56) of the air-conditioning units (41, 51) for the food processing chamber (40) and the general air-conditioned room (50) in this order between the outdoor unit (60) and the air-conditioning units (41, 51) for the food processing chamber (40) and the general air-conditioned room (50).

More specifically, a refrigerant discharged from the compressor (61) of the outdoor unit (60) is condensed in the outdoor heat exchanger (62). Next, the pressure of the condensed refrigerant is reduced by the expansion valve (45, 55) of each air-conditioning unit (41, 51). Then, the refrigerant exchanges heat in the indoor heat exchanger (46, 56) with the indoor air and is evaporated.

Various kinds of sensors are provided for the refrigerating/air-conditioning system. Specifically, a temperature sensor (Th-r) is provided as temperature sensing means for sensing a supply air temperature or a suction air temperature for each of the refrigerating units (11, 21, 31) and air-conditioning units (41, 51). It is noted that the temperature sensor (Th-r) of this embodiment actually senses a supply air temperature.

Although not shown in Figure 1, not only the temperature sensors (Th-r) but also sensors for sensing the outlet pipe temperature, the outlet pressure, the inlet pressure and the like of each compressor (61, 14, 24, 34) are provided for the
5 refrigerating/air-conditioning system.

A controller (80) is further provided for the refrigerating/air-conditioning system. The controller (80) includes a control section (control means)(81) and a setting changing section (setting changing means)(82).

10 The control section (81) controls the operating capacity of each compressor (61, 14, 24, 34), the opening degree of each expansion valve (15, 18, 25, 28, 35, 38, 45, 55) and the like, thereby realizing the above-described temperature environments for the respective refrigerating units (11, 21, 31)
15 and the respective air-conditioning units (41, 51). In other words, the control section (81) controls the respective units such that the supply air temperature or the suction air temperature of each of the refrigerating units (11, 21, 31) and air-conditioning units (41, 51) becomes a predetermined de-
20 sired temperature.

The setting changing section (82) is constituted so as to receive the outputs of the temperature sensors (Th-r) and to output a change signal to the control section (81) such that when the supply air temperature or the suction air tem-
25 perature of the refrigerating unit (11, 21) for the freezing

showcase (10) or the chilling showcase (20) is higher than the desired temperature thereof by a predetermined difference, the desired temperature of the air-conditioning unit (51) for the general air-conditioned room (50) becomes higher
5 than the current temperature thereof by the predetermined difference. The predetermined difference for raising the desired temperature of the air-conditioning unit (51) for the general air-conditioned room (50) is 5 degrees, for example.

Next, the operation of the refrigerating/air-
10 conditioning system will be described.

When the operation is started, the compressors (61, 14, 24, 34) of the outdoor unit (60) and the respective refrigerating units (11, 21, 31) are driven. The operating capacities of the compressors (61, 14, 24, 34), the opening degrees
15 of the expansion valves (15, 18, 25, 28, 35, 38, 45, 55) and the numbers of revolution of the fans (F-o, F) are controlled by the control section (81). The supply air temperatures and the suction air temperatures of the respective refrigerating units (11, 21, 31) and air-conditioning units (41, 51) are
20 also controlled so as to reach the respectively predetermined desired temperatures.

As described above, since a two-stage refrigerating cycle is formed between the refrigerating units (11, 21, 31) of the freezing showcase (10), the chilling showcase (20) and the
25 storehouse (30) and the outdoor unit (60), cold heat at a re-

latively low temperature is obtained. In such a state, the temperatures of the respective units are set at the above-described values. On the other hand, since a one-stage refrigerating cycle is formed between the air-conditioning units (41, 51) of the food processing chamber (40) and the general air-conditioned room (50) and the outdoor unit (60), cold heat at a relatively high temperature is obtained as compared with the refrigerating units (11, 21, 31). In such a state, the temperatures of the respective units are also set at the above-described values.

Next, an operation performed when any of the refrigerating units is lacking in refrigerating power will be described as a feature of this embodiment with reference to the flow chart illustrated in Figure 2.

A refrigerating unit is likely to be lacking in refrigerating power, for example, when the inner temperature of the freezing showcase (10) or the chilling showcase (20) is raised by the display of additional food products in the freezing showcase (10) or the chilling showcase (20) or when the outdoor air-conditioning power of the outdoor unit (60) is deteriorated by dirt attached to the outdoor heat exchanger (62) or the like. Hereinafter, an operation to be performed when the inner temperature of the freezing showcase (10) is raised will be described.

First, in Step ST1, the temperature (T_r) of the air sup-

plied to the freezing showcase (10), which is sensed by the supply air temperature sensor (T_{h-r}), is compared with the desired temperature setting (T_{setA}) of the freezing showcase (10). The desired temperature setting (T_{setA}) is -20°C , for example. If the supply air temperature (T_r) is higher than the desired temperature setting (T_{setA}) by a predetermined difference t or more, the query in Step ST1 is affirmed (YES branch) and the procedure advances to Step ST2. The predetermined difference t is 5 degrees, for example.

10 Next, in Step ST2, the desired temperature setting (T_{setB}) of the general air-conditioned room (50) is raised by the predetermined difference. In this case, the desired temperature setting (T_{setB}) is raised by 5 degrees and the heat quantity to be cooled for the general air-conditioned room
15 (50) is reduced.

 Thus, if the room temperature of the general air-conditioned room (50) has substantially reached the desired temperature setting (T_{setB}), then the actual room temperature becomes lower than the desired temperature setting (T_{setB}).
20 Next, the procedure advances from Step ST2 to Step ST3, in which the air-conditioning operation of the air-conditioning unit (51) of the general air-conditioned room (50) is suspended, thereby entering a so-called "thermo-off" state. The thermo-off state is entered by fully closing the expansion
25 valve (55).

In such a situation, the air-conditioning unit (51) of the general air-conditioned room (50) does not restart the air-conditioning operation until the room temperature becomes higher than the original desired temperature by more than 5
5 degrees. In other words, the air-conditioning unit (51) does not enter a so-called "thermo-on" state until the room temperature becomes higher than the original desired temperature by more than 5 degrees.

Thereafter, the procedure advances to Step ST4. As a re-
10 sult of the above-described operation, the supply of the refrigerant to the air-conditioning unit (51) of the general air-conditioned room (50) is not necessary until the "thermo-on" occurs. Thus, in this step, a large amount of refrigerant can be supplied to the refrigerating unit (11) of the freezing
15 showcase (10) for a predetermined period of time. In other words, the amount of the refrigerant supplied to the refrigerating unit (11) goes on increasing until the air-conditioning unit (51) enters the "thermo-on" state.

As a result, the power of the refrigerating unit (11) of
20 the freezing showcase (10) is increased and the supply air temperature (T_r) of the freezing showcase (10) becomes rapidly closer to the desired temperature setting (T_{setA}).

Subsequently, in Step ST5, it is determined whether or not the supply air temperature (T_r) of the freezing showcase
25 (10) has reached the desired temperature setting (T_{setA}). If

it is determined that the supply air temperature (T_r) of the freezing showcase (10) has reached the desired temperature setting (T_{setA}), the query in Step ST5 is affirmed (YES branch) and the procedure advances to Step ST6. In Step ST6,
5 the desired temperature setting (T_{setB}) of the general air-conditioned room (50) is reset at the original value. That is to say, the desired temperature setting (T_{setB}) is lowered by 5 degrees.

As a result, the heat quantity to be cooled for the general air-conditioned room (50) is increased and the air in the
10 general air-conditioned room (50) can be conditioned satisfactorily.

It is noted that if the temperature sensors (T_{h-r}) are supposed to sense the suction air temperature, the control operation is performed in the same manner as the above-described
15 case.

As described above, in this embodiment, refrigerating units (11, 21, 31) of the first type for forming a two-stage refrigerating cycle and air-conditioning units (41, 51) of the
20 second type for forming a one-stage refrigerating cycle are provided for a single outdoor unit (60). This makes it possible to provide many types of temperature environments having greatly different temperature levels by using a single refrigerating/air-conditioning system.

25 In particular, it is no longer necessary to provide re-

frigerating systems and air-conditioning systems separately for the respective temperature environments, as has conventionally done in a supermarket. As a result, temperature environments complying with various demands can be obtained
5 while providing a simplified system that can considerably reduce the required installation area.

Moreover, in this embodiment, even if the refrigerating power of the entire refrigerating/air-conditioning system is lacking, the desired temperature setting (T_{setB}) of the general air-conditioned room (50) is forcibly changed and the operation is controlled while prioritizing the temperature environment of the freezing showcase (10) or the like. Thus,
10 the foods can be kept fresh for a long period of time.

Furthermore, since a two-stage refrigerating cycle is formed between the refrigerating units (11, 21, 31) and the outdoor unit (60), a desired low temperature can be obtained only by changing the settings of the application refrigerant circuits (12, 22, 32) as the refrigerant circuits having lower temperatures. As a result, the refrigerating/air-conditioning
15 system can be used in a wider variety of applications and the universality of the refrigerating/air-conditioning system can be improved.

It is noted that, in this embodiment, the present invention has been described as being applied to a refrigerating/air-conditioning system for a supermarket. Alternatively,
25

the present invention is also applicable to a refrigerating system for a building.

INDUSTRIAL APPLICABILITY

5 As is apparent from the foregoing description, the refrigerating system of the present invention is effectively applicable to a situation requiring respectively different temperature environments. The refrigerating system of the present invention is applicable particularly suitably to refrigerating a showcase and conditioning the indoor air in a
10 supermarket.



CLAIMS

1. A refrigerating system comprising:

a heat-source unit (60) including a compressor (61) and a heat-source heat exchanger (62); and

a plurality of application units (11, 21, 31, 41, 51), which are connected to the heat-source unit (60) via a liquid pipe (72) and a gas pipe (71) and are connected in parallel to each other,

characterized in that the application units (11, 21, 31, 41, 51) are classified into at least two types of application units forming respectively different refrigerating cycles and including application units of a first type (11, 21, 31) and application units of a second type (41, 51),

and that each of the application units (11, 21, 31) of the first type includes an application refrigerant circuit (12, 22, 32) as a closed circuit including a refrigerant heat exchanger (13, 23, 33) and a first-application heat exchanger (16, 26, 36), a multi-stage refrigerating cycle being formed between each of the application units (11, 21, 31) of the first type and the heat source unit (60),

each of the refrigerant heat exchangers (13, 23, 33) exchanging heat between a heat-source refrigerant supplied from the heat source unit (60) and an application refrigerant,

each of the first-application heat exchangers (16, 26, 36) exchanging heat between the application refrigerant sup-





plied from an associated one of the refrigerant heat exchangers (13, 23, 33) and the air, thereby conditioning the air at a predetermined temperature,

and that each of the application units (41, 51) of the second type includes a second-application heat exchanger (46, 56) for exchanging heat between the refrigerant supplied from the heat source unit (60) and the air, thereby conditioning the air at a predetermined temperature, a one-stage refrigerating cycle being formed between the application units (41, 51) of the second type and the heat source unit (60).

2. The refrigerating system of Claim 1, further comprising:

control means (81) for controlling the heat source unit (60) and the respective application units (11, 21, 31, 41, 51) such that a supply air temperature or a suction air temperature of each of the application units (11, 21, 31, 41, 51) becomes a predetermined desired temperature; and

setting changing means (82) for outputting such a change signal to the control means (81) that if any of the application units (11, 21, 31, 41 or 51) is so lacking in refrigerating power as to have a supply air temperature or a suction air temperature not reaching the desired temperature, the desired temperature of another application unit (11, 21, 31, 41 or 51) is changed so as to recover the power of the application unit (11, 21 or 31).





3. The refrigerating system of Claim 2, characterized in that the setting changing means (82) outputs such a change signal that if any of the application units (11, 21 or 31) of the first type is so lacking in refrigerating power as to have a supply air temperature or a suction air temperature not reaching the desired temperature, the desired temperature of any of the application units (41 or 51) of the second type is changed.

4. The refrigerating system of Claim 3, further comprising temperature sensing means (Th-r) for sensing the supply air temperatures or the suction air temperatures of the application units (11, 21, 31, 41, 51),

characterized in that each of the application heat exchangers (16, 26, 36, 46, 56) of the application units (11, 21, 31, 41, 51) is constituted by an evaporator for evaporating a refrigerant,

and that the setting changing means (82) is constituted so as to receive outputs of the temperature sensing means (Th-r) and output a change signal for raising the desired temperature of any of the application units (41 or 51) of the second type if the supply air temperature of any of the application units (11, 21 or 31) of the first type is higher than the desired temperature thereof by a predetermined difference or more.

5. The refrigerating system of Claim 1, characterized in



that the application units (11, 21) of the first type are provided for showcases (10, 20) for displaying foods in a supermarket,

and that any of the application unit (41 or 51) of the second type is provided for conditioning the air in the supermarket.

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* C L M S *

ABSTRACT

In a refrigerating/air-conditioning system for a supermarket, a single outdoor unit (60) is connected to a plurality of application units (11, 21, 31, 41, 51), which are
5 connected in parallel to each other. The application units (11, 21, 31, 41, 51) are classified into application units (11, 21, 31) of a first type for forming a two-stage refrigerating cycle with the outdoor unit (60) and application
10 units (41, 51) of a second type for forming a one-stage refrigerating cycle with the outdoor unit (60). The application units (11, 21, 31) of the first type are applied to a freezing showcase (10), a chilling showcase (20) and a
storehouse (30), respectively. The application units (41, 51) of the second type are applied to a food processing
15 chamber (40) and a general air-conditioned room (50), respectively.

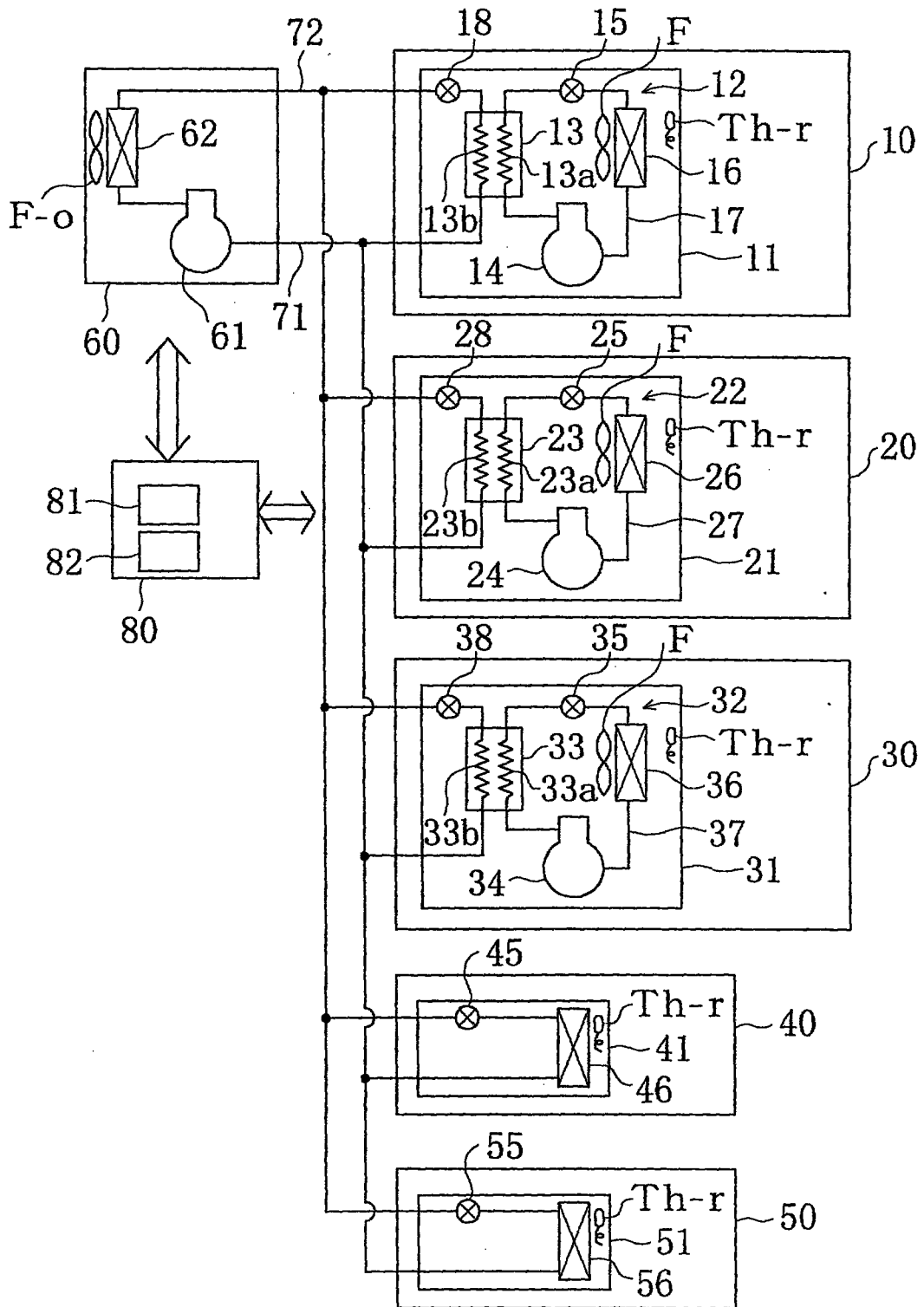


Fig. 1

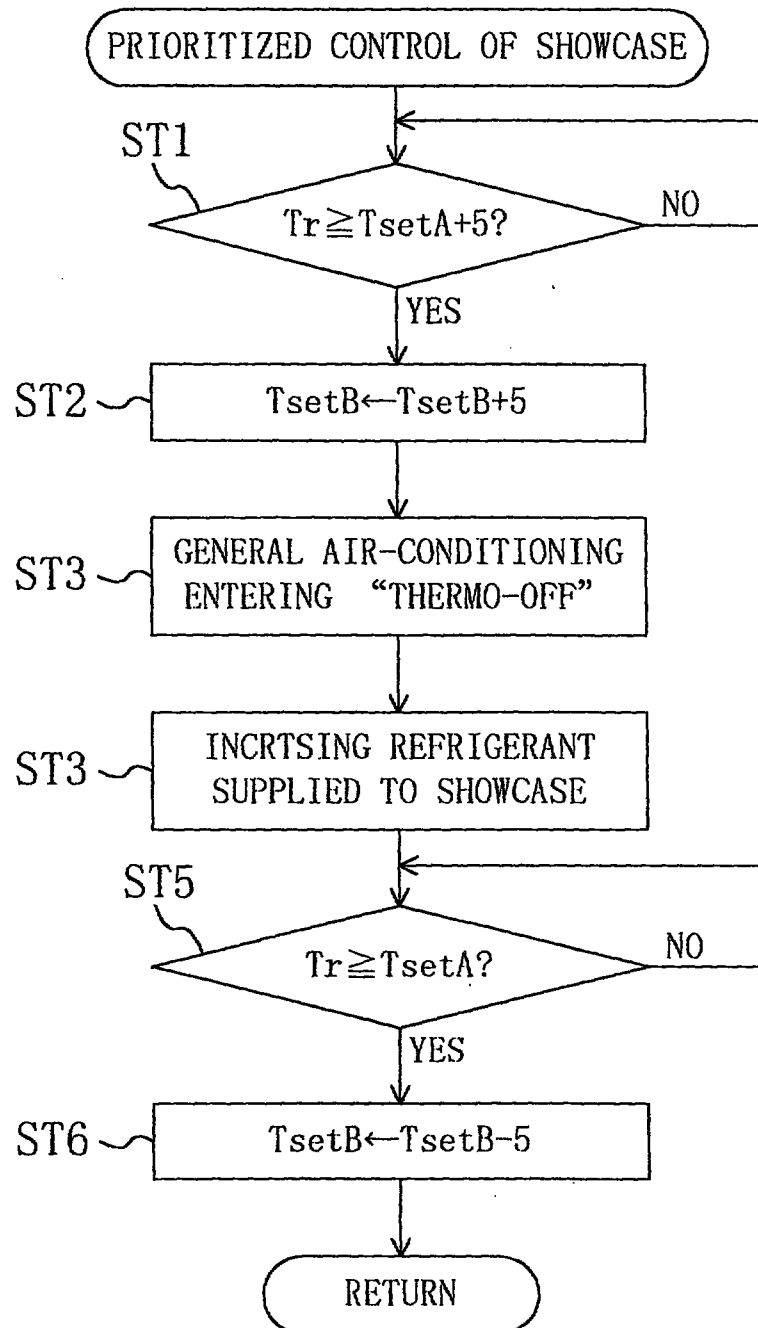


Fig. 2

REPLACEMENT SHEETS SG	
☒ Description	: paged 4 to paged 11
☒ Claim(s)	: paged 26 to paged 28
☐ Drawing(s)	: paged to paged
☐ Abstract	: paged to paged
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DISCLOSURE OF THE INVENTION

In accordance with the invention, there is provided a refrigerating system comprising:

a heat-source unit (60) including a compressor (61) and a heat-source heat
5 exchanger (62); and

a plurality of application units (11, 21, 31, 41, 51), which are connected to the heat-source unit (60) via a liquid pipe (72) and a gas pipe (71) and are connected in parallel to each other,

characterized in that the application units (11, 21, 31, 41, 51) are classified into at
10 least two types of application units forming respectively different refrigerating cycles and including application units of a first type (11, 21, 31) and application units of a second type (41, 51),

and that each of the application units (11, 21, 31) of the first type includes an application refrigerant circuit (12, 22, 32) as a closed circuit including a refrigerant heat
15 exchanger (13, 23, 33) and a first-application heat exchanger (16, 26, 36), a multi-stage refrigerating cycle being formed between each of the application units (11, 21, 31) of the first type and the heat source unit (60),

each of the refrigerant heat exchangers (13, 23, 33) exchanging heat between a heat-source refrigerant supplied from the heat source unit (60) and an application
20 refrigerant,

each of the first-application heat exchangers (16, 26, 36) exchanging heat between the application refrigerant supplied from an associated one of the refrigerant heat exchangers (13, 23, 33) and the air, thereby conditioning the air at a predetermined temperature,

25 that each of the application units (41, 51) of the second type includes a second-application heat exchanger (46, 56) for exchanging heat between the refrigerant supplied from the heat source unit (60) and the air, thereby conditioning the air at a predetermined temperature, a one-stage refrigerating cycle being formed between the application units (41, 51) of the second type and the heat source unit (60),

30 that each of the application units (11, 21) of the first type is provided in a showcase (10, 20) for displaying foods in a supermarket; and

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that any of the application units (41 or 51) of the second type is provided for conditioning the air in the supermarket.

In another aspect, there is provided a refrigerating system comprising:

a heat-source unit (60) including a compressor (61) and a heat-source heat
5 exchanger (62); and

a plurality of application units (11, 21, 31, 41, 51), which are connected to the heat-source unit (60) via a liquid pipe (72) and a gas pipe (71) and are connected in parallel to each other,

characterized in that the application units (11, 21, 31, 41, 51) are classified into at
10 least two types of application units forming respectively different refrigerating cycles and including application units of a first type (11, 21, 31) and application units of a second type (41, 51),

and that each of the application units (11, 21, 31) of the first type includes an application refrigerant circuit (12, 22, 32) as a closed circuit including a refrigerant heat
15 exchanger (13, 23, 33) and a first-application heat exchanger (16, 26, 36), a multi-stage refrigerating cycle being formed between each of the application units (11, 21, 31) of the first type and the heat source unit (60),

each of the refrigerant heat exchangers (13, 23, 33) exchanging heat between a heat-source refrigerant supplied from the heat source unit (60) and an application
20 refrigerant,

each of the first-application heat exchangers (16, 26, 36) exchanging heat between the application refrigerant supplied from an associated one of the refrigerant heat exchangers (13, 23, 33) and the air, thereby conditioning the air at a predetermined temperature,

25 and that each of the application units (41, 51) of the second type includes a second-application heat exchanger (46, 56) for exchanging heat between the refrigerant supplied from the heat source unit (60) and the air, thereby conditioning the air at a predetermined temperature, a one-stage refrigerating cycle being formed between the application units (41, 51) of the second type and the heat source unit (60), the system further comprising:

30 control means (81) for controlling the heat source unit (60) and the respective application units (11, 21, 31, 41, 51) such that a supply air temperature or a suction air

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temperature of each of the application units (11, 21, 31, 41, 51) becomes a predetermined desired temperature; and

setting changing means (82) for outputting such a change signal to the control means (81) that if any of the application units (11, 21, 31, 41 or 51) is so lacking in
5 refrigerating power as to have a supply air temperature or a suction air temperature not reaching the desired temperature, the desired temperature of another application unit (11, 21, 31, 41 or 51) is changed so as to recover the power of the application unit (11, 21 or 31).

Preferably, the system is characterized in that the setting changing means (82)
10 outputs such a change signal that if any of the application units (11, 21 or 31) of the first type is so lacking in refrigerating power as to have a supply air temperature or a suction air temperature not reaching the desired temperature, the desired temperature of any of the application units (41 or 51) of the second type is changed.

Preferably, the system further comprises temperature sensing means (Th-r) for
15 sensing the supply air temperatures or the suction air temperatures of the applications units (11, 21, 31, 41, 51),

characterized in that each of the application heat exchangers (16, 26, 36, 46, 56) of the application units (11, 21, 31, 41, 51) is constituted by an evaporator for evaporating a refrigerant,

20 and that the setting changing means (82) is constituted so as to receive outputs of the temperature sensing means (Th-r) and output a change signal for raising the desired temperature of any of the application units (41 or 51) of the second type if the supply air temperature of any of the application units (11, 21 or 31) of the first type is higher than the desired temperature thereof by a predetermined difference or more.

25 Preferably, the system is characterised in that each of the application units (11, 21) of the first type is provided in a showcase (10, 20) for displaying foods in a supermarket, and

any of the application units (41 or 51) of the second type is provided for conditioning the air in the supermarket.

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- Effects of the invention -

5 Since the single heat source unit (60) can be connected to the application units (11, 21, 31) of the first type for forming a two-stage refrigerating cycle with the heat source unit (60) and to the application units (41, 51) of the second type for forming a one-stage refrigerating cycle with the heat source unit (60),
10 respectively different temperature environments can be secured for the application units (11, 21, 31, 41, 51) of these two types.

 This makes it possible to provide many types of temperature environments having greatly different temperature levels
15 by using a system including only one heat source unit (60). In particular, it is no longer necessary to provide a refrigerating system and an air-conditioning system separately for the respective temperature environments, as has conventionally done in a supermarket. As a result, temperature environments
20 complying with various demands can be obtained while providing a simplified system that can considerably reduce the required installation area.

 If there is any application unit (e.g., 11) lacking in power, the desired temperature of another application unit (e.g., 51) is changed

so as to recover the power of the application unit (11). Thus, if there is any application unit (11) required to exhibit particularly stable refrigerating power, the power of the application unit (11) can be maintained. That is to say, since the power maintenance of a particular application unit (11) is prioritized, required power can be obtained for the particular application unit (11) without increasing the required power of the entire system.

10 The control of the refrigerating power of the application units (11, 21, 31) of the first type may also be prioritized over the control of the refrigerating power of the application units (41, 51) of the second type. Thus, it is possible to prioritize the power maintenance of the application units (11, 21, 31) of the first type requiring particularly high refrigerating power. That is to say, it is considered that the application units (11, 21, 31) of the first type, which can exhibit superior refrigerating power, are often used as application units required for exhibiting particularly stable refrigerating power. In such a case, by prioritizing the control of the application units (11, 21, 31) of the first type, it is possible to prevent, with certainty, the power of the application units (11, 21, 31) from being too weakened to meet the constant refrigerating power requirements.

25 The application units (11, 21) of the first type may also be provided for showcases

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(10, 20) for displaying foods in a supermarket, and the application unit (51) of the second type is provided indoors for conditioning the air in the supermarket. Thus, various types of temperature environments required for a supermarket are realized by a single system. Furthermore, since the control of the application units (11, 21) of the first type is prioritized, the contents of the showcases (10, 20) can be kept at a constant, low temperature. As a result, since foods can be kept fresh for a long period of time, the practicality of the system can be improved.

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 is a piping diagram of a refrigerating/air-conditioning system in an embodiment of the present invention.

Figure 2 is a flow chart illustrating a procedure of the prioritized control over a showcase.

BEST MODE FOR CARRYING OUT THE INVENTION

Hereinafter, an embodiment of the present invention will be described in detail with reference to the accompanying drawings.

In this embodiment, the refrigerating system of the present invention is applied to a refrigerating/air-conditioning

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CLAIMS

1. A refrigerating system comprising:
 - a heat-source unit (60) including a compressor (61) and a heat-source heat exchanger (62); and
 - 5 a plurality of application units (11, 21, 31, 41, 51), which are connected to the heat-source unit (60) via a liquid pipe (72) and a gas pipe (71) and are connected in parallel to each other,
 - characterized in that the application units (11, 21, 31, 41, 51) are classified into at least two types of application units forming respectively different refrigerating cycles and
 - 10 including application units of a first type (11, 21, 31) and application units of a second type (41, 51),
 - and that each of the application units (11, 21, 31) of the first type includes an application refrigerant circuit (12, 22, 32) as a closed circuit including a refrigerant heat exchanger (13, 23, 33) and a first-application heat exchanger (16, 26, 36), a multi-stage
 - 15 refrigerating cycle being formed between each of the application units (11, 21, 31) of the first type and the heat source unit (60),
 - each of the refrigerant heat exchangers (13, 23, 33) exchanging heat between a heat-source refrigerant supplied from the heat source unit (60) and an application refrigerant,
 - 20 each of the first-application heat exchangers (16, 26, 36) exchanging heat between the application refrigerant supplied from an associated one of the refrigerant heat exchangers (13, 23, 33) and the air, thereby conditioning the air at a predetermined temperature,
 - that each of the application units (41, 51) of the second type includes a second-
 - 25 application heat exchanger (46, 56) for exchanging heat between the refrigerant supplied from the heat source unit (60) and the air, thereby conditioning the air at a predetermined temperature, a one-stage refrigerating cycle being formed between the application units (41, 51) of the second type and the heat source unit (60),
 - that each of the application units (11, 21) of the first type is provided in a showcase
 - 30 (10, 20) for displaying foods in a supermarket; and



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that any of the application units (41 or 51) of the second type is provided for conditioning the air in the supermarket.

2. A refrigerating system comprising:

a heat-source unit (60) including a compressor (61) and a heat-source heat
5 exchanger (62); and

a plurality of application units (11, 21, 31, 41, 51), which are connected to the heat-source unit (60) via a liquid pipe (72) and a gas pipe (71) and are connected in parallel to each other,

characterized in that the application units (11, 21, 31, 41, 51) are classified into at
10 least two types of application units forming respectively different refrigerating cycles and including application units of a first type (11, 21, 31) and application units of a second type (41, 51),

and that each of the application units (11, 21, 31) of the first type includes an application refrigerant circuit (12, 22, 32) as a closed circuit including a refrigerant heat
15 exchanger (13, 23, 33) and a first-application heat exchanger (16, 26, 36), a multi-stage refrigerating cycle being formed between each of the application units (11, 21, 31) of the first type and the heat source unit (60),

each of the refrigerant heat exchangers (13, 23, 33) exchanging heat between a heat-source refrigerant supplied from the heat source unit (60) and an application
20 refrigerant,

each of the first-application heat exchangers (16, 26, 36) exchanging heat between the application refrigerant supplied from an associated one of the refrigerant heat exchangers (13, 23, 33) and the air, thereby conditioning the air at a predetermined temperature,

25 and that each of the application units (41, 51) of the second type includes a second-application heat exchanger (46, 56) for exchanging heat between the refrigerant supplied from the heat source unit (60) and the air, thereby conditioning the air at a predetermined temperature, a one-stage refrigerating cycle being formed between the application units (41, 51) of the second type and the heat source unit (60), the system further comprising:

30 control means (81) for controlling the heat source unit (60) and the respective application units (11, 21, 31, 41, 51) such that a supply air temperature or a suction air

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temperature of each of the application units (11, 21, 31, 41, 51) becomes a predetermined desired temperature; and

setting changing means (82) for outputting such a change signal to the control means (81) that if any of the application units (11, 21, 31, 41 or 51) is so lacking in refrigerating power as to have a supply air temperature or a suction air temperature not reaching the desired temperature, the desired temperature of another application unit (11, 21, 31, 41 or 51) is changed so as to recover the power of the application unit (11, 21 or 31).

3. The refrigerating system of Claim 2, characterized in that the setting changing means (82) outputs such a change signal that if any of the application units (11, 21 or 31) of the first type is so lacking in refrigerating power as to have a supply air temperature or a suction air temperature not reaching the desired temperature, the desired temperature of any of the application units (41 or 51) of the second type is changed.

4. The refrigerating system of Claim 3, further comprising temperature sensing means (Th-r) for sensing the supply air temperatures or the suction air temperatures of the applications units (11, 21, 31, 41, 51),

characterized in that each of the application heat exchangers (16, 26, 36, 46, 56) of the application units (11, 21, 31, 41, 51) is constituted by an evaporator for evaporating a refrigerant,

and that the setting changing means (82) is constituted so as to receive outputs of the temperature sensing means (Th-r) and output a change signal for raising the desired temperature of any of the application units (41 or 51) of the second type if the supply air temperature of any of the application units (11, 21 or 31) of the first type is higher than the desired temperature thereof by a predetermined difference or more.

5. The refrigerating system of any one of Claims 2 to 4 characterized in that each of the application units (11, 21) of the first type is provided in a showcase (10, 20) for displaying foods in a supermarket, and

any of the application units (41 or 51) of the second type is provided for conditioning the air in the supermarket.



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特許協力条約に基づいて公開された国際出願

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(21) 国際出願番号 PCT/JP98/01602 (22) 国際出願日 1998年4月7日(07.04.98) (30) 優先権データ 特願平9/89164 1997年4月8日(08.04.97) JP (71) 出願人 (米国を除くすべての指定国について) ダイキン工業株式会社(DAIKIN INDUSTRIES, LTD.)(JP/JP) 〒530-8323 大阪府大阪市北区中崎西2丁目4番12号 梅田センタービル Osaka, (JP) (72) 発明者; および (75) 発明者/出願人 (米国についてのみ) 上野明敏(UENO, Akitoshi)(JP/JP) 目崎丈統(MEZAKI, Takenori)(JP/JP) 〒591-8511 大阪府堺市金岡町1304番地 ダイキン工業株式会社 堺製作所 金岡工場内 Osaka, (JP) (74) 代理人 弁理士 前田 弘, 外(MAEDA, Hiroshi et al.) 〒550-0004 大阪府大阪市西区靱本町1丁目4番8号 太平ビル Osaka, (JP)		(81) 指定国 AU, CN, JP, NO, SG, US, 欧州特許 (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). 添付公開書類 国際調査報告書
(54)Title: REFRIGERATOR (54)発明の名称 冷凍装置 (57) Abstract A refrigerating/air-conditioning system for use in supermarkets, having an outdoor unit (60) and a plurality of use-side units (11 to 51) which are parallel to each other and connected to the outdoor unit (60). Each of the use-side units (11 to 51) comprises a first-type use-side unit (11, 21, 31) constituting a binary freezing cycle together with the outdoor unit (60) and a second-type use-side unit (41, 51) constituting a unitary freezing cycle together with the outdoor unit (60). The first-type use-side units (11, 21, 31) are used for a freezing showcase (10), a refrigerated showcase (20) and a food storage (30). The second-type use-side units (41, 51) are used for a food processing room (40) and a general air-conditioned room (50).		

(57)要約

スーパーマーケットの冷凍空調システムとして、1台の室外ユニット(60)に対し、互いに並列な複数台の利用側ユニット(11~51)を接続する。各利用側ユニット(11~51)を、室外ユニット(60)との間で二元冷凍サイクルを構成する第1タイプの利用側ユニット(11,21,31)と、室外ユニット(60)との間で一元冷凍サイクルを構成する第2タイプの利用側ユニット(41,51)とによって構成する。第1タイプの利用側ユニット(11,21,31)を、冷凍ショーケース(10)、冷蔵ショーケース(20)及び食品保管庫(30)に適用する。第2タイプの利用側ユニット(41,51)を、食品加工室(40)及び一般空調室(50)に適用する。

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