

Patent No. 6,854,287
Petition for *Inter Partes* Review

Paper No. _____

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VERTIV CORPORATION

Petitioner

v.

VALTRUS INNOVATIONS LTD. and KEY PATENT INNOVATIONS LTD.

Patent Owners

Patent No. 6,854,287
Original Issue Date: February 15, 2005

Title: COOLING SYSTEM

Inter Partes Review No. Unassigned

PETITION FOR *INTER PARTES* REVIEW
UNDER 35 U.S.C. § § 311-319 AND 37 C.F.R. § 42.100 *ET. SEQ.*

TABLE OF CONTENTS

	Page
I. Introduction.....	1
II. Mandatory Notices.....	1
A. Real Party in Interest.....	1
B. Related Matters.....	2
C. Counsel.....	3
D. Notice of Service Information.....	3
E. Payment of Fees.....	4
III. Grounds for Standing.....	4
IV. Identification of Challenge and Relief Requested.....	4
V. The ‘287 Patent.....	5
A. Summary of Subject Matter.....	5
B. Relevant Prosecution History.....	13
C. Person of Ordinary Skill in the Art (“POSITA”).....	17
D. Claim Construction.....	17
VI. THE PRIOR ART.....	18
VII. Statement Of How Each Claim Is Unpatentable.....	30
A. Ground 1: Anticipation by Newton (Claims 1–4 and 7–9).....	30
B. Ground 2: Obviousness Over Newton and the Knowledge of a POSITA (Claims 5 and 6).....	43
C. Ground 3: Anticipation by Shimizu (Claims 1–4, 7, and 9).....	47
D. Ground 4: Anticipation by Baer (Claims 1, 3, 7, and 9).....	60
VIII. The Board Should Not Exercise Its Discretion Under Sections 314(a) or 325(d).....	69
Section 314(a).....	69
Section 325(d).....	72
IX. Conclusion.....	72

LISTING OF EXHIBITS

Exhibit No.	Description
Ex. 1001	U.S. Patent No. 6,854,287 (“the ’287 patent”)
Ex. 1002	Declaration of John P. Abraham, Ph.D.
Ex. 1003	Prosecution History of the ’287 patent
Ex. 1004	SL 16700 (DataCool Brochure.pdf)
Ex. 1005	U.S. Patent No. 6,556,624 (“Stahl”)
Ex. 1006	U.S. Patent Publication No. 2003/0067745A1 (“Patel”)
Ex. 1007	U.S. Patent No. 3,384,155 (“Newton”)
Ex. 1008	U.S. Patent No. 5,317,907 (“Shimizu”)
Ex. 1009	U.S. Patent No. 5,467,609 (“Feeney”)
Ex. 1010	U.S. Patent No. 6,006,528 (“Arima”)
Ex. 1011	U.S. Patent Publication No. 2001/0042616A1 (“Baer”)
Ex. 1012	Declaration of Tanya Zeif

LISTING OF CHALLENGED CLAIMS

Claim 1	
1[pre]	A method for cooling a room configured to house a plurality of computer systems, said method comprising:
1[a]	providing a plurality of heat exchanger units configured to receive air from said room and to deliver air to said room;
1[b]	supplying said plurality of heat exchanger units with cooling fluid from an air conditioning unit;
1[c]	cooling said received air through heat exchange with the cooling fluid in the plurality of heat exchanger units;
1[d]	sensing temperatures at one or more locations in said room;
1[e]	controlling at least one of the temperature of said cooling fluid and said air delivery by said plurality of heat exchanger units to said room in response to said sensed temperatures at said one or more locations; and
1[f]	wherein the step of controlling said air delivery by said plurality of heat exchanger units comprises individually manipulating a mass flow rate of the cooling fluid supplied to each of the plurality of heat exchanger units.
Claim 2	
[2]	The method according to claim 1, wherein said step of controlling at least one of a temperature of said cooling fluid and said air delivery to said room comprises varying an output of said air conditioning unit to control the temperature of said cooling fluid.
Claim 3	
[3]	The method according to claim 1, further comprising: determining whether the sensed temperatures at one or more locations in said room are within a predetermined range.

Claim 4	
[4]	The method according to claim 3, further comprising: varying the cooling fluid temperature in response to the sensed temperatures at one or more locations in said room being outside of said predetermined range.
Claim 5	
[5]	The method according to claim 4, further comprising: increasing said cooling fluid temperature in response to a sum of the sensed temperatures at one or more locations being below said predetermined range.
Claim 6	
[6]	The method according to claim 4, further comprising: decreasing said cooling fluid temperature in response to a sum of the sensed temperatures at one or more locations being above said predetermined range.
Claim 7	
[7]	The method according to claim 1, wherein the step of manipulating a mass flow rate of the cooling fluid supplied to each of the plurality of heat exchanger units further comprises metering the flow of cooling fluid through each of said plurality of heat exchanger units with a plurality of valves positioned along respective cooling fluid lines configured to channel cooling fluid from the air conditioning unit to the plurality of heat exchanger units.
Claim 8	
[8]	The method according to claim 1, wherein the step of manipulating a mass flow rate of the cooling fluid supplied to each of the plurality of heat exchanger units further comprises metering the flow of cooling fluid through said plurality of heat exchanger units with a plurality of pumps positioned along respective cooling fluid lines configured to channel cooling fluid from the air conditioning unit to the plurality of heat exchanger units.

Claim 9	
[9]	The method according to claim 1, further comprising: manipulating a mass flow rate of the cooling fluid supplied to the plurality of heat exchanger units in substantially independent manners with respect to each of the plurality of heat exchanger units.

I. INTRODUCTION

Vertiv Corporation (“Petitioner”) requests *inter partes review* of claims 1–9 (“Challenged Claims”) of U.S. Patent No. 6,854,287 (Ex. 1001, “the ‘287 patent”). The ‘287 patent is currently assigned to Valtrus Innovations Limited (“Valtrus”) and Key Patent Innovations Ltd. (“KPI”) (collectively, “Patent Owners”). The Challenged Claims relate to methods and systems of varying the temperature of cooling fluid and the air delivery by heat exchanger units to a room in response to sensed temperatures in the room. The prior art cited herein anticipates and renders obvious the Challenged Claims, and there is a reasonable likelihood that Petitioner will prevail. As such, Petitioner respectfully submits that the Board should institute review and cancel the Challenged Claims.

II. MANDATORY NOTICES

A. Real Party in Interest

Petitioner Vertiv Corporation is the real party in interest. No entity other than Vertiv Corporation is funding, controlling, or otherwise had an opportunity to provide input regarding this Petition; no entity other than Vertiv Corporation will fund, control, or otherwise have an opportunity to provide input regarding any resulting IPR trial; no entity other than Vertiv Corporation has reviewed this Petition.

B. Related Matters

The '287 patent is the subject of the following pending civil actions:

- *Valtrus Innovations Limited et al v. DataBank Holdings Ltd.*, Case No. 2-24-cv-00777-JRG (E.D. Texas) (“*DataBank*”);
- *Valtrus Innovations Limited et al v. TierPoint, LLC*, Case No. 2-24-cv-00776-JRG (E.D. Texas) (“*TierPoint*”);
- *Vertiv Corporation v. Valtrus Innovations Limited*, Case No. 2-24-cv-00907-JRG (E.D. Texas) (“*Vertiv Declaratory Judgment Action*”);
- *Valtrus Innovations Limited v. NTT Data Services, LLC et al*, Case No. 2-24-cv-00361-JRG (“*Lead Case*”).

The *Vertiv Declaratory Judgment Action* has been consolidated for pre-trial purposes in the *Lead Case*.

In addition to the above actions, the '287 patent was the subject of the following civil actions, in which Petitioner had intervened, and which were previously dismissed by the parties:

- *Valtrus Innovations Limited v. Digital Realty Trust, Inc. et al*, Case No. 2-24-cv-00139-JRG (E.D. Texas) (“*Digital Realty I*”);
- *Valtrus Innovations Limited et al v. Digital Realty Trust, Inc. et al*, Case No. 2-24-cv-00535-JRG (E.D. Texas) (“*Digital Realty IP*”);

Patent No. 6,854,287
Petition for *Inter Partes* Review

- *Valtrus Innovations Ltd. v. Dawn Acquisitions LLC (d/b/a Evoque Data Center Solutions)*, Case No. 2:24-cv-00142-JRG (E.D. Texas);
- *Valtrus Innovations Ltd. v. CyrusOne, LLC*, Case No. 2:24-cv-00534-JRG (E.D. Texas).

C. Counsel

Lead Counsel: Timothy Maloney (Registration No. 38,233)

Address: Nixon Peabody LLP, 70 West Madison, Suite 5200, Chicago, IL 60602-4378; Tel: 312-977-4451.

Backup Counsel: Daniel Schwartz (Registration No. 55,603)

Matthew Werber (Registration No. 62,056)

Allison Strong (Registration No. 79,349)

Address: Nixon Peabody LLP, 70 West Madison, Suite 5200, Chicago, IL 60602-4378; Tel: 312-977-4432.

D. Notice of Service Information

Please address all correspondence to the lead counsel at the address shown above. Petitioner consents to service by email at the following email addresses:

tmaloney@nixonpeabody.com; djschwartz@nixonpeabody.com;

mwerber@nixonpeabody.com; astrong@nixonpeabody.com; and

DLVertiv@nixonpeabody.com.

E. Payment of Fees

Petitioner authorizes the Patent and Trademark Office to charge Deposit Account No. 50-4181 (Customer ID No. 70001) for the fees required by 37 C.F.R. §42.15(a) for this Petition and authorizes the payment of any additional fees to be charged to this Deposit Account.

III. GROUNDS FOR STANDING

Petitioner certifies that the ‘287 patent is available for IPR and that Petitioner is not barred or estopped from requesting IPR on the grounds identified herein.

IV. IDENTIFICATION OF CHALLENGE AND RELIEF REQUESTED

The ‘287 patent issued from U.S. Application No. 10/697,697, filed October 31, 2003, a divisional of U.S. Application No. 10/210,040, filed August 2, 2002. Ex. 1001, Cover. Thus, patentability is governed by pre-AIA 35 U.S.C. §§102–103.

Petitioner requests that the Challenged Claims of the ‘287 patent be cancelled based on the following grounds:

Ground	Claims	Description
1	1–4, 7–9	Anticipated under § 102(b) by Newton (Ex. 1007)
2	5–6	Obvious under §103(a) over Newton and the knowledge of a POSITA
3	1–4, 7, 9	Anticipated under § 102(b) by Shimizu (Ex. 1008)
4	1, 3, 7, 9	Anticipated under § 102(b) by Baer (Ex. 1011)

Newton issued on May 21, 1968, which was more than one year before the August 2, 2002 priority date of the '287 patent. Ex. 1007, cover. Thus, Newton was publicly available and qualifies as pre-AIA 35 U.S.C. §102(b) prior art. Ex. 1002 ¶98.

Shimizu issued on June 7, 1994, which was more than one year before the August 2, 2002 priority date of the '287 patent. Ex. 1008, cover. Thus, Shimizu was publicly available and qualifies as pre-AIA 35 U.S.C. §102(b) prior art. Ex. 1002 ¶108.

Baer was published on November 22, 2001, which was before the August 2, 2002 priority date of the '287 patent. Ex. 1011, cover. Thus, Baer qualifies as pre-AIA 35 U.S.C. §102(a) prior art. Ex. 1002 ¶116.

Petitioner's challenges are supported by the Declaration and testimony of John P. Abraham, Ph.D., an expert in design, development and evaluation of fluid flow and heat exchange systems for cooling electronics with more than 20 years of experience. Ex. 1002 ¶¶12–27.

V. THE '287 PATENT

A. Summary of Subject Matter

The '287 patent relates to managing heat and controlling temperature throughout a building environment having rooms that house computer systems, one of many examples being data centers. Ex. 1002 ¶50. The specification mentions

known challenges associated with removing heat generated by the computer racks of a data center. Ex. 1001, 1:42–62. The specification acknowledges that data centers have conventionally been cooled using air conditioning systems that include multiple air conditioning units and other components such as condensers, fans, etc. Ex. 1001, 1:63–2:3. According to the ‘287 patent, “conventional cooling systems often incur greater amounts of operating expenses than may be necessary to sufficiently cool the heat generating components contained in the racks of data centers.” Ex. 1001, 2:26–29. The ‘287 patent asserts, for example, that conventional air conditioning systems for data centers were not able to vary cooling fluid output based on the cooling needs at particular locations throughout the data center, and that it was supposedly typical to operate such systems at maximum capacity regardless of the heat loads being generated by the computer racks. Ex. 1001, 2:10–14.

As discussed more fully below, those assertions are at best overstated. It was well-known and conventional to those having ordinary skill in the art to control the operation of air conditioning systems in a manner responsive to localized heat profiles and cooling requirements to provide sufficient amounts of cooling air at low enough temperatures at the locations where cooling is needed and without wasting energy by overusing the air condition system. Ex. 1002 ¶51.

The '287 patent includes Figure 1 to illustrate the layout of a typical data center housing computer equipment in a series of racks 12.

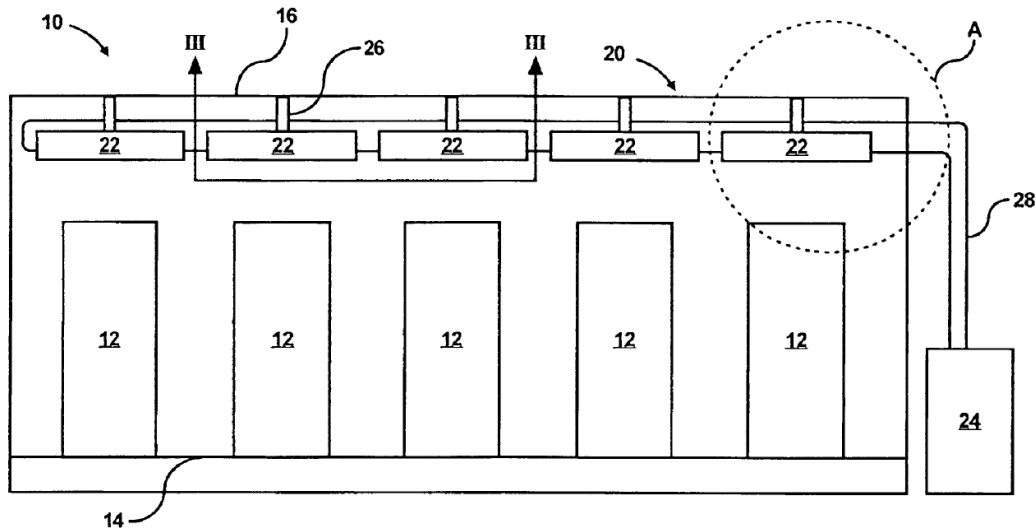


FIG. 1

Ex. 1001, FIG. 1. The disclosed data center cooling system 20 includes heat exchange units (HEUs) 22 and a cooling device 24. Ex. 1001, 4:46–47. The HEUs 22 are supported above the racks 12 and are designed to take in warm air and output cooled air. Ex. 1001, 4:19–23; 4:46–49. The disclosed HEUs 22 include fans 30 for directing air to flow through the unit. Ex. 1001, 5:56–59. A fluid line runs through each HEU below the fans and circulates cooling fluid through the HEU. As air flows over the fluid line, heat is transferred from the air to the cooling fluid lowering the temperature of air delivered by the HEU back to the room. Ex. 1001, 5:66–6:5; Ex. 1002 ¶52.

These types of units were well-known and common components of data center and other building cooling systems before the August 2, 2002 priority date of the '287 patent, as discussed more fully below. Ex. 1002 ¶53. The '287 patent acknowledges that the disclosed HEUs implement conventional technology already in use for data center cooling systems, and mentions a DataCool™ environmental control system provided by Liebert as one commercially available example.¹ Ex. 1001, 4:49–53.

A 2001 Liebert product brochure provides an overview of this commercially available DataCool™ system.² *See generally* Ex. 1004. The Liebert DataCool™ system uses a coolant distribution unit to distribute cooling fluid to heat exchangers equipped with adjustable fans. Ex. 1004, 4. These fans direct cooling to the locations most in need. Ex. 1004, 4. Coolant from the Coolant Distribution Units (CDUs) is sent to the fan coil heat exchangers through pipes. Ex. 1004, 4. The CDU can be positioned as an interface with a building's chilled water system. Ex. 1004, 4; Ex. 1002 ¶54.

¹ The Liebert entity referenced in the '287 patent is a predecessor entity to Petitioner.

² The declaration of Tanya Zeif, a Records Request Processor at the Internet Archive, confirms that the DataCool brochure was available for download from Liebert's website prior to the priority date of the '287 patent. *See generally* Ex. 1012.

The '287 patent indicates that the HEUs should be positioned near racks that generate greater amounts of heat to provide higher cooling air flow rates and/or lower temperature air as compared to racks that generate less heat. Ex. 1001, 4:64–5:63. Operating data center cooling systems so that the volume and temperature of cooling air supplied to particular regions meets the cooling needs of those regions was not a new concept. Ex. 1002 ¶55. For example, that was one of the primary operating principles of the commercially available DataCool™ system, which was referenced in the specification of the '287 patent. Ex. 1001, 4:49–53. Ex. 1002 ¶55; *see also* Ex. 1004.

The '287 patent also acknowledges that cooling devices for removing heat from the cooling fluid returned from the air cooling heat exchange units (device 24 depicted in Figure 1) were also well-known. Ex. 1002 ¶56. The specification states that “any reasonably suitable type of cooling device designed to adequately cool the cooling fluid” may be used. Ex. 1001, 5:28–30. As examples of suitable cooling devices, the specification identifies heat exchangers, heat pumps, variable capacity chillers, or evaporative cooling, as well as cooling devices that implement a closed-loop refrigeration cycle for transferring heat from the cooling fluid to the refrigerant. Ex. 1001, 5:32–40.

The specification further discusses the capability of suitable cooling devices to adjust the temperature of the cooling fluid supplied to the HEUs. Ex. 1001, 5:30–

32. Cooling fluid temperature control was also conventional as of the '287 patent priority date. Ex. 1002 ¶57. This capability was present, for example, in the commercially available DataCool™ system. Ex. 1002 ¶57; *see also* Ex. 1001, 4:49–53; Ex. 1004. That system included coolant distribution units (CDUs) that absorbed heat from the cooling fluid into a chilled water loop to maintain the cooling fluid temperature. Ex. 1004, 4–5. A controller operated each CDU to maintain the cooling fluid at a desired temperature, and it could adjust the cooling fluid temperature based on temperature and humidity conditions in the data center. Ex. 1004, 3–4.

Figure 3 of the '287 patent provides a schematic overhead illustration of a closed-loop cooling system in which cooling fluid supplied from a cooling device flows through several HEUs 22 and then circulates back to the cooling device. Figure 3 is reproduced below. Ex. 1002 ¶58.

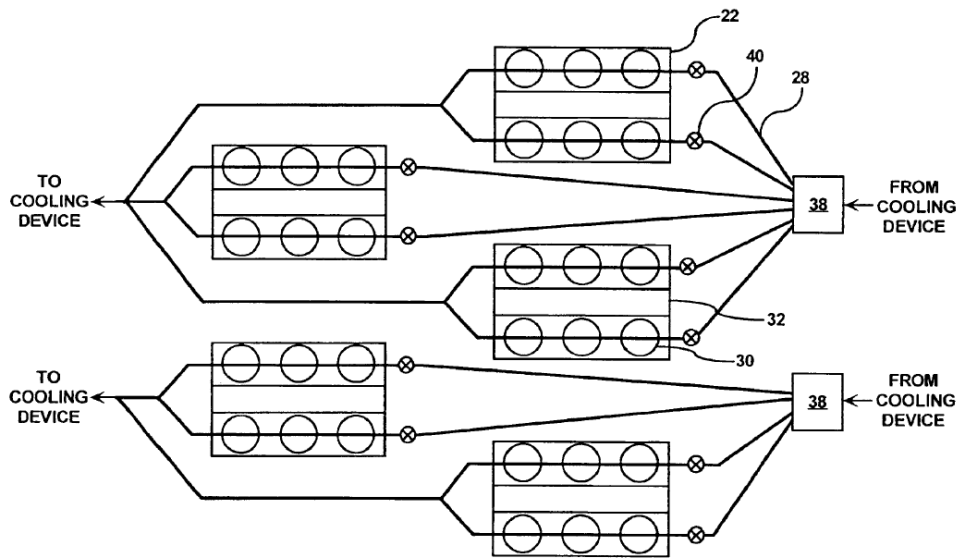


FIG. 3

Ex. 1001, FIG. 3. The cooling fluid flows through fluid lines 28 extending from pumps 38. Ex. 1002 ¶58. The HEUs 22 include fans 30 for circulating air over fluid lines positioned below the fans 30. Ex. 1002 ¶58. The supply of cooling fluid flowing through fluid lines 28 to individual HEUs 22 is controllable by the pumps 38 and/or by flow control valves 40. Ex. 1001, 7:35–47. This arrangement allows independent control of the temperature of air flowing out of each of the HEUs 22. Ex. 1001, 7:48–51. For example, the flow of cooling fluid through HEUs 22 positioned near racks whose computer systems are idle may be restricted or halted. Ex. 1001, 7:52–55.

Figure 4, reproduced below, is a block diagram showing controllers used to operate the system. Ex. 1002 ¶59.

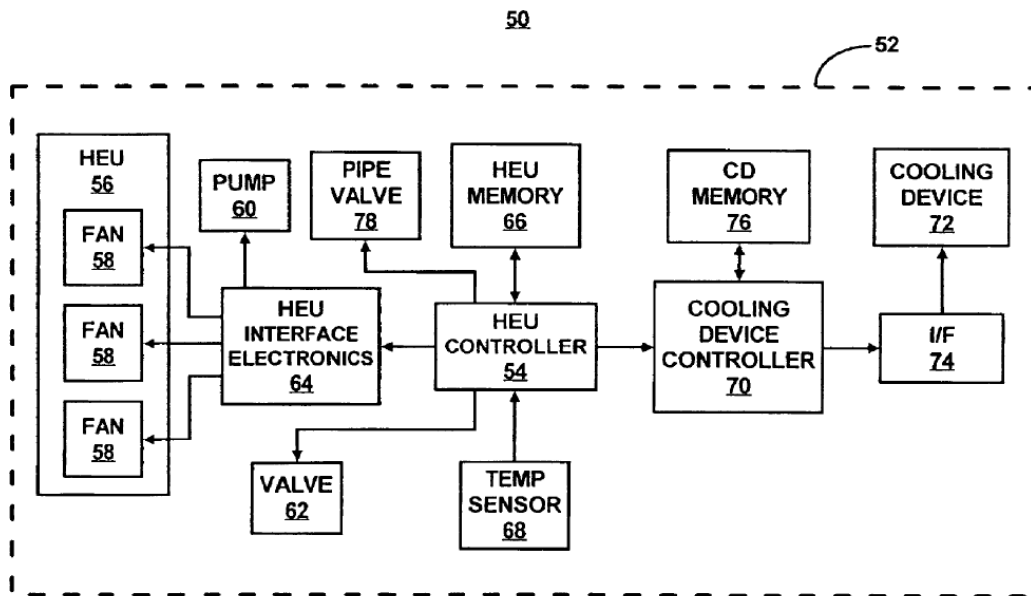


FIG. 4

Ex. 1001, FIG. 4. In this figure, the HEUs are designated 56 having fans 58. Ex. 1002 ¶59. A cooling device 72 supplies cooling fluid via pump 60 through fluid lines equipped with valves 78 and 62. Ex. 1002 ¶59. The system also includes a temperature sensor 68, as shown. Ex. 1001, 8:8–65.

The HEU controller 54 operates the fans 58, pump 60, and valves 78 and 62 in response to temperature measurements by temperature sensor 68. Ex. 1001, 8:24–37. For example, the HEU controller 54 may operate to manipulate the corresponding HEU 56 and/or fans 58 to change the volume flow rate, velocity, and other characteristic of the air flow, for the change in temperature. Ex. 1001, 9:37–43. The HEU controller 54 may also interact with a cooling device controller 70 to cause the cooling device controller 70 to manipulate the temperature of the cooling

fluid by controlling the operation of the cooling device 72. Ex. 1001, 9:43–45; Ex. 1002 ¶60. Depending on the type of cooling device, this may involve controlling a variable speed compressor, a heat exchanger, a chilled water heat exchanger, a centrifugal chiller, etc. to manage the heat transferred out of the cooling fluid to vary the cooling fluid temperature. Ex. 1001, 8:38–59.

The '287 patent specification indicates that by controlling the flow of air from individual HEUs and/or controlling the temperature of cooling fluid circulating through individual HEUs in the manner disclosed, the operation of the cooling system 52 may be optimized while lowering energy costs required to cool the computer systems in the racks. Ex. 1001, 9:46–57; Ex. 1002 ¶61.

B. Relevant Prosecution History

The application for the '287 patent was filed on October 31, 2003 claiming priority to a related application filed on August 2, 2002. Ex. 1001, cover. A Non-Final Rejection was issued by the Office on May 4, 2004, rejecting all pending claims; there were twenty-one pending claims at this time. Ex. 1003, 299–300. Claims 1, 2, 30, 31 and 39 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,557,624 (Ex. 1005, “Stahl”), claims 22–24 and 32–41 were rejected under 35 U.S.C. § 103(a) over Stahl in view of U.S. Patent No. 5,946,926 (“Hartman”), claims 5 and 9–11 were rejected under 35 U.S.C. § 103(a) over Stahl in view of U.S. Patent No. 6,283,380 (“Nakanishi”), and claim 19 was

rejected under 35 U.S.C. § 103(a) over Stahl in view of Hartman and Nakanishi.
Ex. 1003, 301–04.

In a Response submitted on October 4, 2004, the applicant, Hewlett-Packard Company (“Applicant”), amended the pending claims so that they each recite a cooling system, cooling method, or computer readable storage medium for implementing a cooling method that involves cooling air through a plurality of heat exchanger units supplied with cooling fluid and controlling certain aspects of the operation of the plurality of heat exchanger units in response to sensed temperatures at one more locations in a room. Ex. 1003, 279–87. For example, the Applicant amended claim 1 as follows:

1. (Currently amended) A method for cooling a room configured to house a plurality of computer systems, said method comprising:

providing a plurality of heat exchanger units configured to receive air from said room and to deliver air to said room;

supplying said plurality of heat exchanger units with cooling fluid from an air conditioning unit;

cooling said received air through heat exchange with the cooling fluid in the plurality of heat exchanger units;

sensing temperatures at one or more locations in said room;

controlling at least one of the temperature of said cooling fluid and said air delivery by said plurality of heat exchanger units to said room in response to said sensed temperatures at said one or more locations; and

wherein the step of controlling said air delivery by said plurality of heat exchanger units comprises individually manipulating a mass flow rate of the cooling fluid supplied to each of the plurality of heat exchanger units.

Ex. 1003, 280.

In the accompanying remarks, the Applicant acknowledged that Stahl describes a cooling system that includes a heat exchanger through which coolant fluid flows and fan units for blowing air over the heat exchanger to cool the air supplied into a room. Ex. 1003, 289. The Applicant characterized the relevant heat exchanger 110 of Stahl as “a continuous tube through which coolant fluid flows in the vicinities of the fan units 120.” Ex. 1003, 289.

For context, Figure 2 of Stahl is reproduced below showing an overhead view of fan units 120 containing fans 130 and cooling fluid flowing through a circuitous heat exchanger 110 beneath the fan units.

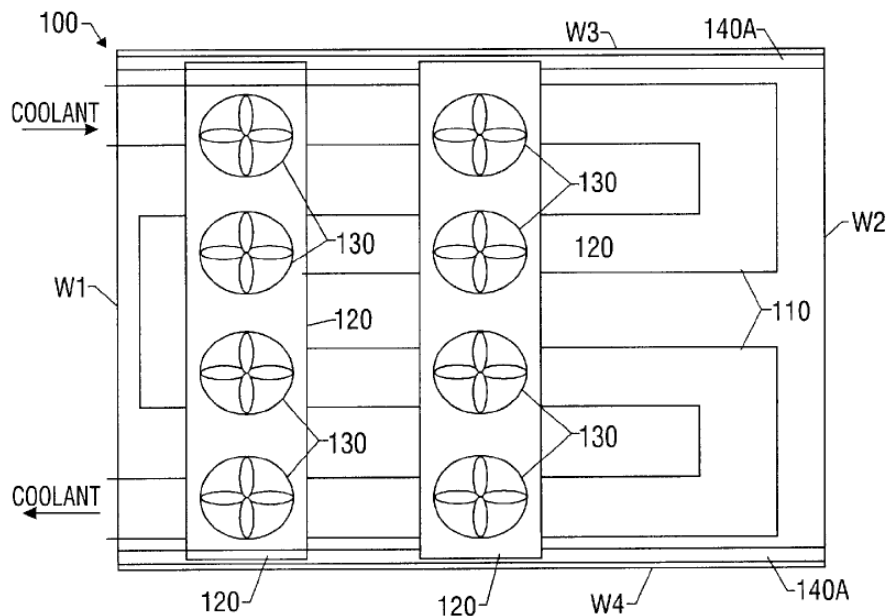


FIG. 2

Ex 1005, Figure 2. The Applicant argued that this cooling system differed from that of the claim because “Stahl [] does not disclose that a mass flow rate of the coolant fluid supplied into each of a plurality of heat exchangers is manipulated.” Ex. 1003, 289. The Applicant emphasized that “the cooling fluid flow in the vicinities of the fan units 120 is the same for each fan unit 120.” Ex. 1003, 290.

On October 26, 2004, the Office issued a Notice of Allowance, which allowed all of the pending claims as amended. Ex. 1003, 265–71. In the Reasons for Allowance, the Examiner indicated that independent claim 1 was patentable

because Stahl does not teach the method/system of cooling a room wherein the mass flow rate of the cooling fluid supplied to each of the heat exchangers is individually manipulated. Ex. 1003, 270.

C. Person of Ordinary Skill in the Art (“POSITA”)

A POSITA at the time of the alleged invention of the ’287 patent would have at least a bachelor’s degree in mechanical or chemical engineering or an equivalent discipline, together with four years of experience in the design and/or operation of cooling systems for buildings or electronics or computer systems; or a master’s degree in mechanical or chemical engineering or an equivalent discipline, with two years of experience in design and/or development of temperature management systems for buildings or electronics or computer systems. Ex. 1002 ¶¶30–33.

D. Claim Construction

Pursuant to 37 C.F.R. § 42.100(b), claims subject to IPR are construed according to their plain and ordinary meaning. Petitioner’s position is that the claim terms are understood pursuant to their plain and ordinary meaning as understood by a POSITA in light of the specification and file history. Petitioner provides its understanding of that plain and ordinary meaning for the terms that may be relevant to institution in the table below. Ex. 1002 ¶¶68–72.

Claim Term	Petitioner’s Proposed Construction
“air conditioning unit” (claims 1, 2, 7, 8)	“any device that supplies cooling fluid to a plurality of heat exchanger units”
“cooling fluid” (claims 1–2, 4–9)	“any suitable heat transfer fluid, e.g., chilled water, R134a refrigerant, and ethylene glycol solutions”

VI. THE PRIOR ART

A. U.S. Patent No. 3,384,155 (“Newton”)

Newton relates to air conditioning systems for multi-room buildings, in particular those having “interior zones, where the thermal loads are due almost entirely to lighting, office equipment and people, may require cooling all year long.” Ex. 1007, 1:21–40. As discussed below, Newton discloses that automated coolant fluid flow control based on temperature conditions in locally managed zones was a conventional practice decades before the priority date of the ’287 patent. Ex. 1002 ¶98. Newton also teaches automated fan speed control for greater temperature control within each managed zone. Ex. 1002 ¶98.

The disclosed system can supply either heating or cooling water to heat exchangers dedicated to particular zones of a building. Ex. 1007, 1:10–13. A control system monitors ambient temperature sensed by temperature sensors in each zone and controls the supply of the water to the heat exchangers based on the heating or cooling needs of individual zones. Ex. 1007, 1:12–18, 2:5–26. Ex. 1002 ¶99.

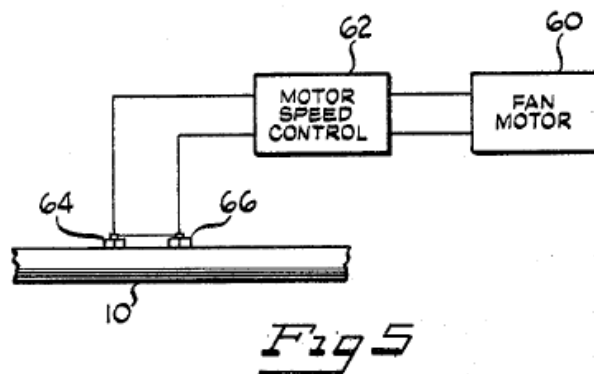
valve 18 (yellow), which selectively supplies cold or hot water to the inlet side of a liquid pump by way of line 21. Ex. 1007, 2:65–70. Ex. 1002 ¶101.

The disclosed system is capable of cycling between supplying hot and cold water to the room units via a timing mechanism 19 which actuates the three-way supply valve 18. Ex. 1007, 5:16–19. When conditions are such that none of the zones require cooling, valve 18 is set to continuously supply hot water from heater 14 to all room units 16. Ex. 1007, 5:43–47. When conditions require heating in some zones and cooling in other zones, timer 19 causes valve 18 to alternate between supplying hot water through heater 14 and cold water through chiller 12 at regular time intervals. Ex. 1007, 5:53–6:1. When heating is no longer required in any zone, valve 18 supplies chilled water continuously. Ex. 1007, 6:1–5. Ex. 1002 ¶102.

As shown in Figure 1 above, the inlet line 25 to each air conditioning unit includes a valve 36 actuated by a control 38. A temperature sensing bulb 40 measures the air temperature in the zone. The control 38 adjusts valve 36 in response to “the temperature of the air in the zones to be conditioned as sensed by temperature responsive bulbs 40 (or other suitable means)” Ex. 1007, 3:25–28; FIG. 4. The control 38 also checks the temperature of water available to the room unit heat exchangers as sensed by temperature responsive bulbs 42. Ex. 1007, 3:29–32. “When any of the bulbs 40 senses a temperature above the desired

temperature level thereby calling for cooling, valves 36 will open only if cold water is circulating through conduit 10; and, if bulbs 40 sense a temperature below the desired temperature level, thereby calling for heating, valves 36 will open only if hot water is circulating through conduit 10.” Ex. 1007, 3:32–39. Ex. 1002 ¶103.

The room air conditioning units of Newton’s system each include a fan 22 or other suitable air circulating means. Ex. 1002 ¶104. For example, item 22 in unit 16 located in Zone A in Figure 1. Ex. 1007, 3:4–7. Newton teaches implementing the disclosed system with automatic control of the fan speed of each room air conditioning unit to achieve more accurate temperature control. Ex. 1002 ¶104. Such a control scheme is illustrated in Figure 5, which augments the water flow control valve operation discussed above. Ex. 1007, 3:66–71.

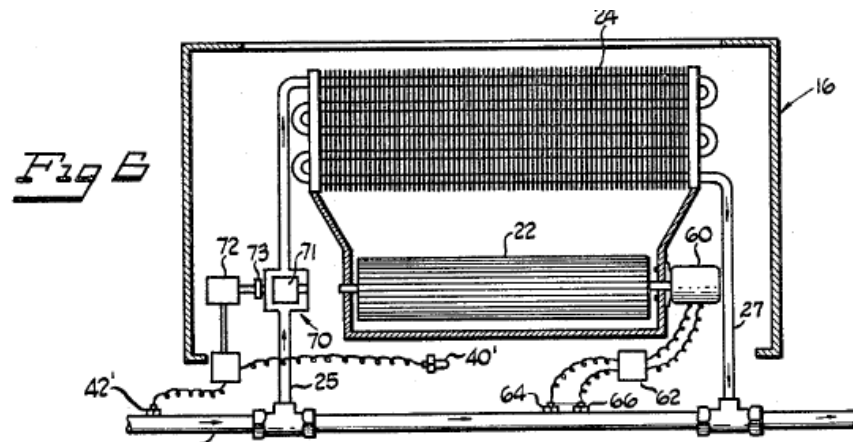


Ex. 1007, FIG. 5.

A controller 62 controls the speed of the fan motor 60. The signal to controller 62 is produced by two thermistors 64 and 66 coupled in series and located in thermal relation with liquid conduit 10. Ex. 1002 ¶105. The thermistors

are designed so that their combined resistance is at a minimum when the temperature of water flowing through line 10 is within a preset range, such as 65 F and 75 F. The resistance will increase in proportion to the water temperature varying above or below this range, resulting in the motor speed control 62 producing a signal that increases the fan speed as the water available to the room unit heat exchanger gets colder or hotter. Ex. 1007, 3:71–4:16. Ex. 1002 ¶105.

Another embodiment of Newton's system is illustrated in Figure 6, provided below.



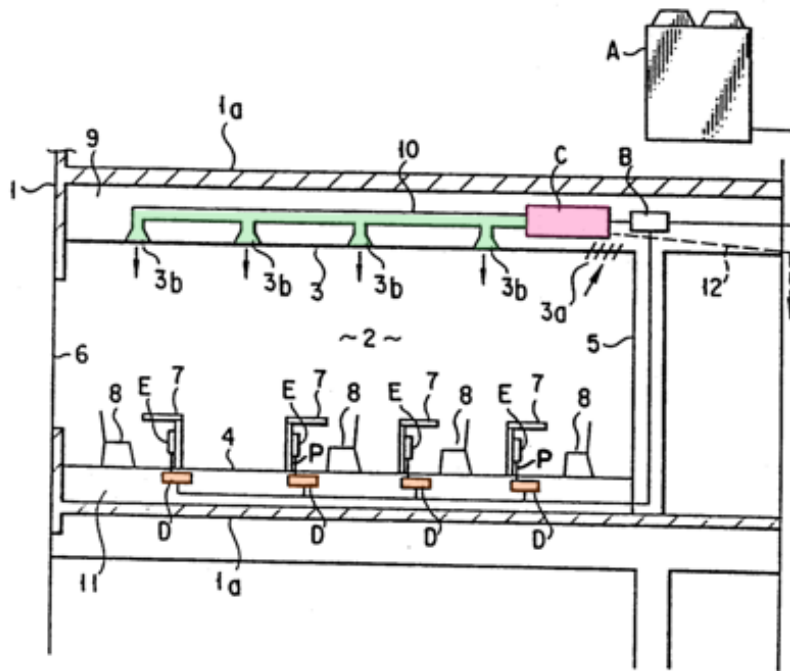
Ex. 1007, FIG. 6. This embodiment replaces the water flow control valve 36 at the inlet of each room air conditioning unit with a pump 70. Ex. 1007, 4:17–25. Newton teaches that the control circuitry 38' works similarly to that described for control 38 in relation to flow valve 36, except that controller 38' controls the motor 72 of the pump to manipulate the water flow in response to sensed temperature conditions in the zone. Ex. 1007, 4:26–35. Ex. 1002 ¶106.

Newton teaches that automated fan speed control can also be used in embodiments using pumps to control the water flow to the room air conditioning units. Ex. 1007, 4:35–38. Ex. 1002 ¶107.

B. U.S. Patent No. 5,317,907 (“Shimizu”)

Shimizu describes an air conditioning system having an ambient air-conditioning unit and multiple personal air-conditioning units. Ex. 1008, Abstract; Ex. 1002 ¶108. An outdoor compressor unit provides compressed refrigerant and an outdoor heat exchanger discharges heat absorbed by the refrigerant into external air. Ex. 1008, 2:15–23. The refrigerant circulates through the ambient indoor heat exchanger and through the heat exchangers in the personal air-conditioning units for absorbing heat from the internal air. Ex. 1008, 2:23–28.

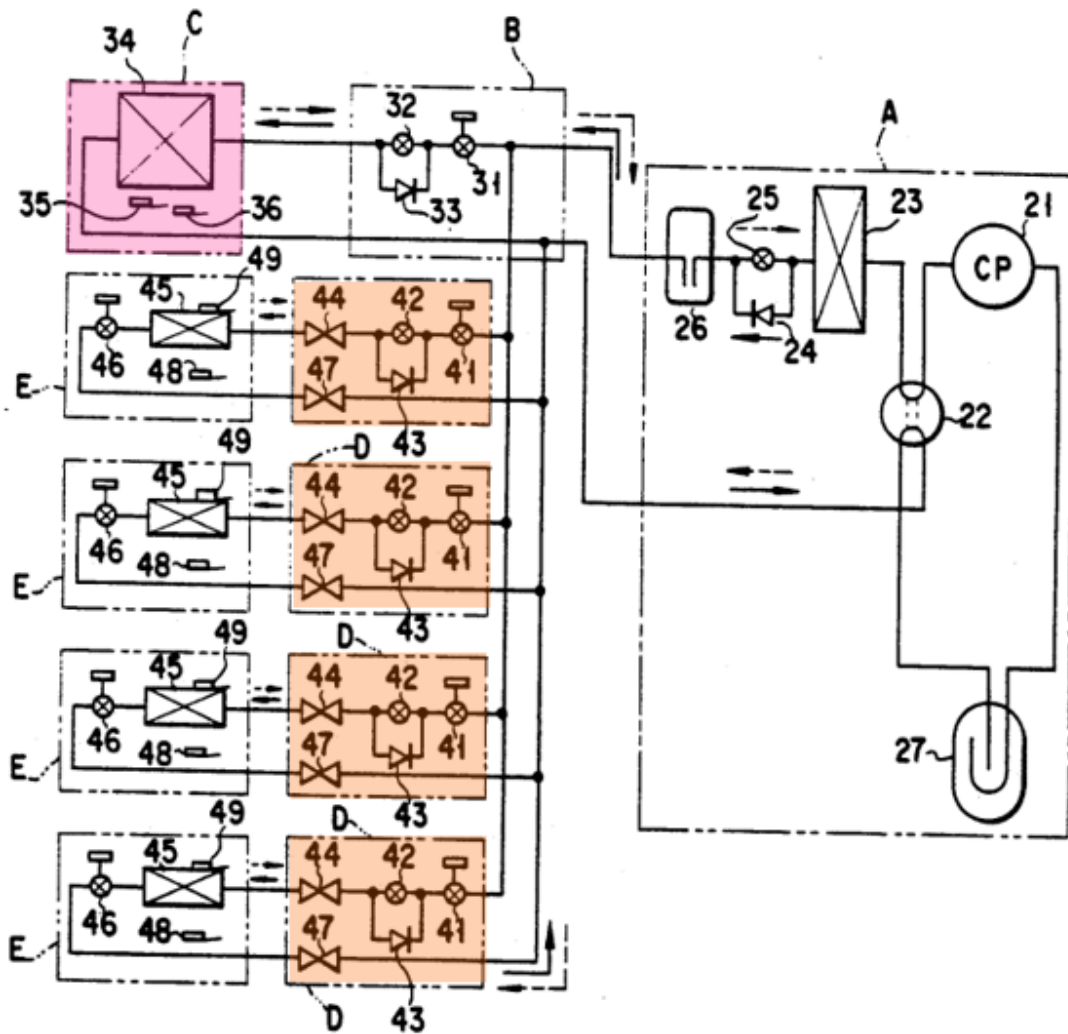
Figure 1, an annotated version of which is provided below, illustrates an embodiment of the system disclosed in Shimizu



F I G. 1

Ex. 1008, FIG. 1 (annotated). As shown in FIG. 1, an ambient air-conditioning unit C (pink) is used for air-conditioning the whole space of the room and distributes cooled air through outlet ports 3b of a duct 10 (green). Ex. 1008, 3:61–64. An outdoor unit A is connected to distribution unit B via a refrigerant pipe. Ex. 1008, 4:18–20. The system also includes personal air-conditioning units E for separately air-conditioning spaces around the desks 7. Ex. 1008, 3:65–68. Ex. 1002 ¶109.

Figure 2, an annotated version of which is provided below, shows additional details of the overall refrigerant cycle.



F I G. 2

Ex. 1008, FIG. 2 (annotated). As shown, the distribution unit B is connected to the ambient air-conditioning unit C (pink) and to flow dividing units D (orange) for connecting each personal air-conditioning unit to the outdoor unit A. Ex. 1008, 4:7–17. Each of the flow dividing units D includes a flow control valve 41 and expansion valve 42 for cooling. Ex. 1008, 4:44–47. Ex. 1002 ¶110.

The ambient air-conditioning unit C includes an indoor heat exchanger 34 and an air temperature sensor 35 for sensing temperature of air in the room. Ex. 1008, 4:38–43. A “control unit 55 is connected to the air temperature sensor 35,” and to an “indoor fan 56 [that] feeds internal air into the indoor heat exchanger 34.” Ex. 1008, 5:32–38. Ex. 1002 ¶111.

The refrigerant flow to the ambient air-conditioning unit C is regulated based on sensed temperature in the room. Ex. 1002 ¶¶112–113. In particular, the temperature of the internal air in the room 2 is detected by the air temperature sensor 35, a difference between the detected temperature and the preset temperature is detected to determine an air-conditioning load, and then the opening of the flow control valve 31 is controlled so that refrigerant of an amount corresponding to the air-conditioning load flows into the ambient air-conditioning unit C. Ex. 1008, 8:44–56.

With regard to each personal air conditioning unit E, refrigerant from outdoor heat exchanger 23 flows into the indoor heat exchanger 45 through flow control valve 41 corresponding to the personal air-conditioning unit E. The refrigerant evaporates in the indoor heat exchanger 45 to provide a cooling effect. Ex. 1008, 7:32–38. The refrigerant flow to each personalized air conditioning unit C is also regulated in response to sensed temperature. First, the temperature of the air around the unit is detected by the corresponding air temperature sensor 48, a difference

between the detected temperature and a preset temperature is detected, and then flow control valve 41 is controlled to manipulate refrigerant flow corresponding to the air-conditioning load in the vicinity of the personal air-conditioning unit. Ex. 1008, 7:63–8:7. Ex. 1002 ¶114.

The Shimizu reference also teaches automated monitoring and control of the refrigerant temperature to prevent condensation. Ex. 1002 ¶115; Ex. 1008, 8:8–25.

C. U.S. Patent Publication No. 2001/0042616a1 (“Baer”)

Baer is directed to air conditioning systems adapted to cool electronics enclosures. Ex. 1011, Abstract. Baer addresses the need for stable temperature and humidity control of facilities containing dense arrangements of electronic equipment. Ex. 1011, [0002]. Baer explains the known challenges of removing large amounts of heat generated by the electronic equipment in such installations using conventional room air conditioners alone, which created a need to develop additional localized cooling solutions for enclosures containing electronic equipment. Ex. 1011, [0003]. Ex. 1002 ¶116.

Baer provides a high-level summary of this solution to this problem as follows:

The principle of operation of the present system is as follows: Air from the computer room at the ambient temperature and humidity is taken into the enclosure and heated by the electronic equipment. The air is then expelled through a heat exchanger, which cools the air back to the ambient temperature. The exiting air is cooled using an external source

of chilled water, glycol or a suitable dielectric fluid, which is typically readily available in commercial installations. By returning the air exiting the enclosure to the ambient temperature in the room, the load on the room air conditioning is reduced or eliminated. Furthermore, the cooling fluid provides a more efficient heat transfer medium for removing heat from the room than the room air, as would be the case with a conventional prior art cooling system.

Ex. 1011, [0005]; *see also* Ex. 1002 ¶117.

Figure 1, an annotated version of which is provided below, illustrates an embodiment of Baer's disclosed computer cabinet cooling system.

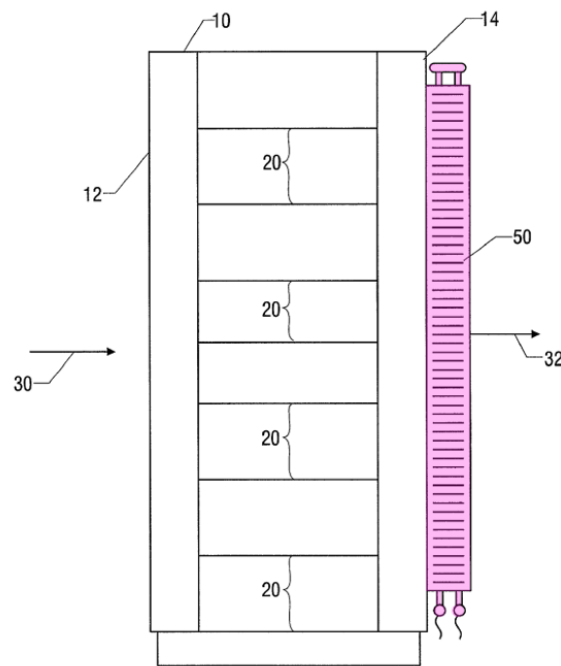


FIG. 1

Ex. 1011, FIG. 1 (annotated). As shown Figure 1, rack 10 houses electronic equipment such as computer devices supported on mounting racks 20. Cooling fans integral to the computer equipment draw air 30 from the room to absorb heat generated by the electronics. Ex. 1011, [0021]. Heat exchanger 50 (pink) mounted

on the rear 40 of rack enclosure 10 cools the heated air so that cooled air 32 flows out the back 14 of the enclosure 10 and returns to the computer room without contributing additional heat load to the room air conditioning system. Ex. 1011, [0021]–[0023]. Ex. 1002 ¶118.

Figure 2 provides more detail regarding the design of the heat exchanger 50 (pink in the annotated version of Figure 1, above).

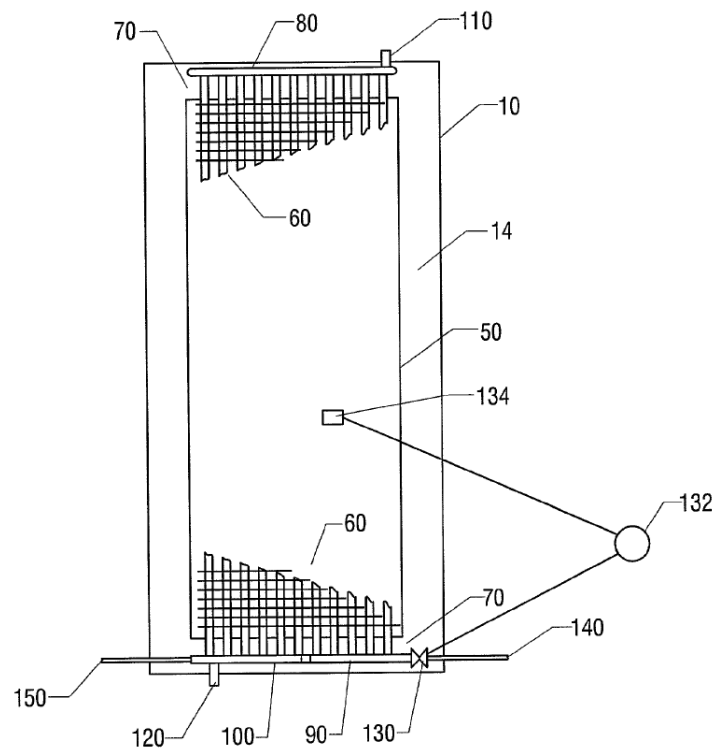


FIG. 2

Ex. 1011, FIG. 2. Ex. 1002 ¶119.

Temperature controller 132 receives input from a temperature sensor 134 on the back of heat exchanger 50 which measures the temperature of the air leaving

the heat exchanger. Ex. 1002 ¶120. The temperature controller 132 operates the modulating valve 130 “to ensure that the air exiting the heat exchanger is at the same temperature as the room temperature of the computer room in which the equipment is housed.” Ex. 1011, [0027]; *see also* Ex. 1002 ¶120.

“The flow of cooling fluid is modulated by valve 130 to regulate the amount of cooling fluid passing through the [heat] exchanger, which in turn controls the amount of heat absorbed and the temperature of the exiting air. The cooling fluid then enters inlet header 90 and passes upward through cooling tubes 72.” Ex. 1011, [0030]; *see also* Ex. 1002 ¶¶121–124.

VII. STATEMENT OF HOW EACH CLAIM IS UNPATENTABLE

A. Ground 1: Anticipation by Newton (Claims 1–4 and 7–9)

As set forth below, claims 1–4 and 7–9 are anticipated under § 102(b) by Newton (Ex. 1007). Ex. 1002 ¶¶125–183.

Claim 1

Set forth below is a discussion of each limitation of claim 1, in conjunction with the relevant disclosures of each claim limitation by Newton.

1[pre] – “A method for cooling a room configured to house a plurality of computer systems, said method comprising:”

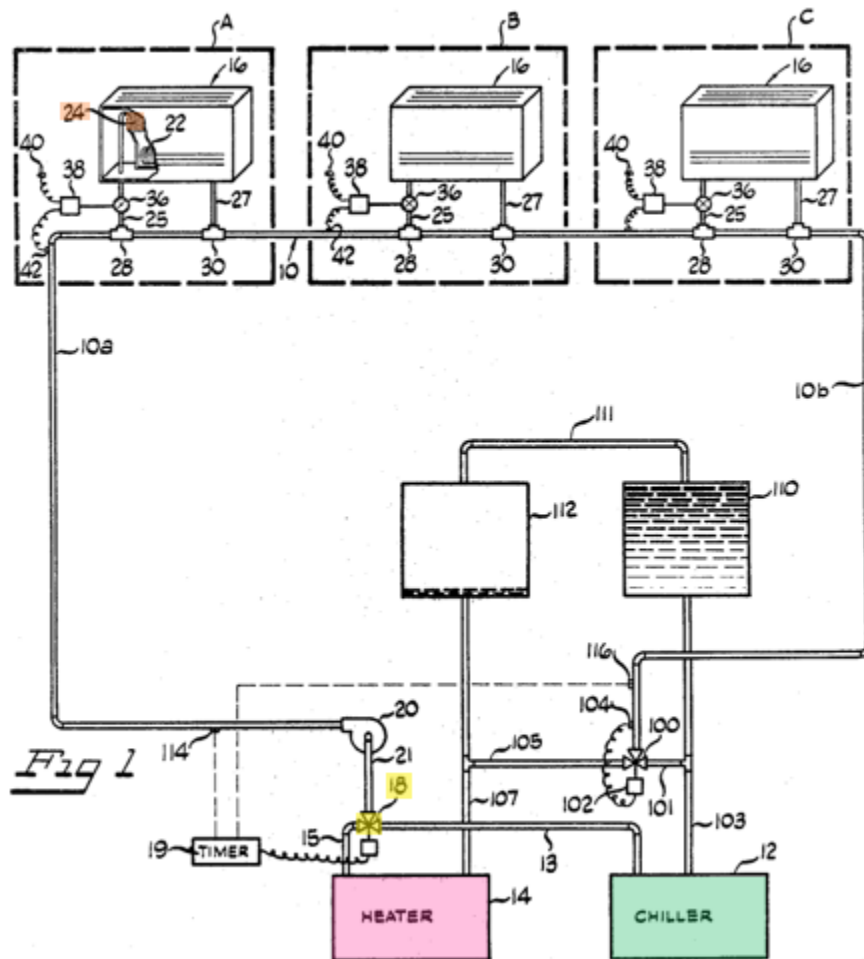
The preamble of claim 1 of the ‘287 patent introduces the subject matter of claim 1 in very broad terms. The plain meaning of “a room configured to house a

plurality of computer systems” would apply to any room equipped with a power source for operating computer equipment. Ex. 1002 ¶¶127–128.

If the preamble is limiting, Newton discloses the preamble in relation to its disclosures of methods of using air conditioning systems for buildings such as office buildings having “interior zones, where the thermal loads are due almost entirely to lighting, office equipment and people, [which] may require cooling all year long.” Ex. 1007, 1:21–40. A POSITA reviewing Newton in the timeframe of the ’287 patent priority date would understand the reference to “office equipment” generating “thermal loads” as including computer systems. Additionally, a POSITA would understand that the components and operating principles of the type of air conditioning system disclosed in Newton are applicable to cool any type of room that requires cooling, including rooms that house computer systems. Thus, Newton discloses limitation 1[pre]. Ex. 1002 ¶129.

1[a] – “providing a plurality of heat exchanger units configured to receive air from said room and to deliver air to said room;”

As illustrated in the annotated version of Figure 1, provided below, Newton’s disclosed cooling system and method involves multiple air conditioning units 16 each having a heat exchanger 24 (orange).



Ex. 1007, FIG. 1 (annotated). Each room air conditioning unit 16 is dedicated to a “zone” to be conditioned (e.g., zones A, B, and C). Ex. 1007, 2:58–64. According to Newton’s teachings, a zone is a region where varying thermal loads are generated. *See, e.g.,* Ex. 1007, 1:24–40, 6:73–75. Newton also indicates that the depicted arrangement of room units and zones is “merely representative of a large number of such units and zones in a typical multi-room installation.” Ex. 1007, 2:71–3:3. Thus, a POSITA understands the disclosure of Newton to include

multiple (i.e., a plurality of) air conditioning units in a single room. Ex. 1002 ¶¶130–131.

The room air conditioning units of Newton’s system each include a fan 22 or other suitable air circulating means, such as item 22 in unit 16 located in Zone A in Figure 1. Ex. 1007, 3:4–7. A POSITA would have understood that each fan functions to cause room air to circulate through the air conditioning unit, i.e., to cause air to be received by the unit from the room and then discharged back into the room. Indeed, Newton’s claims specifically mention that the air conditioning units of the disclosed system include “air circulating means for circulating room air over the heat exchanger.” Ex. 1007, 6:72–7:3. Ex. 1002 ¶¶132–133.

1[b] – “supplying said plurality of heat exchanger units with cooling fluid from an air conditioning unit;”

As explained in Section V.D. above, a POSITA would understand the term “air conditioning unit” to refer to a device that supplies cooling fluid to a plurality of heat exchanger units, and that the term “cooling fluid” includes any suitable heat transfer fluid. Ex. 1002 ¶¶134–135.

In Newton’s disclosed system and method, water circulates through a closed circuit conduit system 10 that interconnects a liquid chiller 12, a heater or boiler 14, and multiple air conditioning units 16. Ex. 1007, 2:58–64. The circulating water is supplied to the heat exchanger 24 of each unit through an inlet line 25 and leaves

the heat exchanger through an outlet line 27. Ex. 1007, FIG. 1, 3:4–9. When operating in a cooling mode, the liquid circulating in conduit 10 and through the heat exchangers is cold water from a chiller 12 of the disclosed air conditioning system. Ex. 1007, 5:53–6:5. Ex. 1002 ¶¶136–137.

1[c] – “cooling said received air through heat exchange with the cooling fluid in the plurality of heat exchanger units;”

A POSITA would understand that when operating in the cooling mode, heat from the room air flowing through the room air conditioning units 16 is transferred to the chilled water circulating in the unit’s heat exchanger 14 to cool the air. Newton expressly describes this in claim 1 of Newton, which recites: “temperature control means associated with each of said room units, said control means being operative to effect heat transfer between the circulating heat exchange medium and the air in said zones” Ex. 1007, 7:18–24; Ex. 1002 ¶¶138–140.

1[d] – “sensing temperatures at one or more locations in said room;”

In relation to the embodiment of Figure 1, Newton discloses measuring the air temperature in each zone with temperature sensing bulbs 40. Ex. 1007, 3:25–28, FIGs. 1 and 4. In relation to the embodiment of Figure 6, in which the flow of water to the heat exchangers 24 is controlled by a pump 70 instead of a flow control valve, Newton discloses sensing the air stream on the inlet side of fan 22 using temperature sensing bulb 40'. Ex. 1007, FIGs. 4 and 6, 4:26–29. Ex. 1002 ¶¶141–144.

1[e] – “controlling at least one of the temperature of said cooling fluid and said air delivery by said plurality of heat exchanger units to said room in response to said sensed temperatures at said one or more locations; and”

This claim limitation requires controlling *at least one* of the temperature of the cooling fluid or the air delivery by the heat exchangers. Newton’s disclosed system performs *both* of these control operations. Ex. 1002 ¶¶145–146.

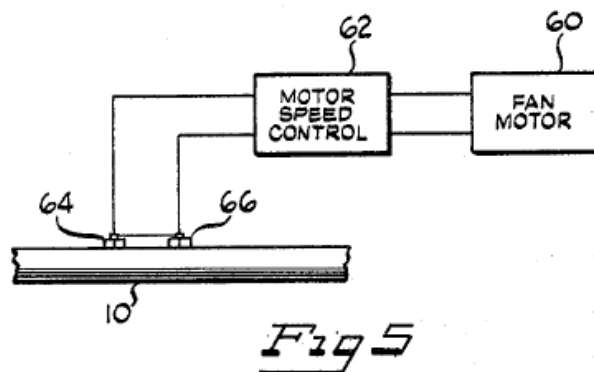
With regard to controlling cooling fluid temperature, Newton’s system includes a heater 14 and a chiller 12 and can vary the temperature of the water circulating in the closed-loop conduit 10 between hot and cold by operation of three-way valve 18 on the inlet side of pump 20. Ex. 1007, 2:58–70. When sensed temperature conditions are such that none of the zones require cooling, valve 18 is set to continuously supply hot water from heater 14 to all room units 16. Ex. 1007, 5:43–47. When conditions are such as to require heating in some zones and cooling in other zones, timer 19 causes valve 18 to alternate between supplying hot water through heater 14 and cold water through chiller 12 at regular time intervals. Ex. 1007, 5:53–6:1. When heating is no longer required in any zone, valve 18 supplies chilled water continuously. Ex. 1007, 6:1–5; Ex. 1002 ¶147.

Individual room air conditioning units 16 sense the air temperature in their zone using temperature sensing bulbs 40. Ex. 1007, 3:25–28, FIG. 4. “When any of the bulbs 40 senses a temperature above the desired temperature level thereby calling for cooling, valves 36 will open only if cold water is circulating

through conduit 10; and, if bulbs 40 sense a temperature below the desired temperature level, thereby calling for heating, valves 36 will open only if hot water is circulating through conduit 10.” Ex. 1007, 3:32–39. Ex. 1002 ¶148.

Therefore, Newton’s system and control method discloses adjusting the temperature of the water supplied to the heat exchangers of individual room air conditioning units in response to sensed air temperature in the associated zones indicating a need for cooling. Ex. 1002 ¶149.

With regard to controlling air delivery, the room air conditioning units each include a fan, such as item 22 in the unit 16 located in Zone A in Figure 1. Ex. 1007, 3:4–7. Newton teaches automatic control of the fan speed per the control scheme depicted in Figure 5 (reproduced below) which augments the water flow control valve operation discussed above for better temperature control. Ex. 1007, 3:66–71. Ex. 1002 ¶150.



Ex. 1007, FIG. 5.

Controller 62 controls the speed of the fan motor 60 based on a signal produced from two thermistors 64 and 66 that increases in proportion to how much the sensed water temperature is outside of a preset range, such as 65 F to 75 F. The motor control 62 produces a signal that increases the fan speed as the water available to the room unit heat exchanger gets colder or hotter. Ex. 1007, 3:71–4:16. Thus, Newton also discloses controlling the air delivery in response to sensed temperatures in the room, i.e., the temperature of the water circulating through the heat exchanger unit. Ex. 1002 ¶151.

Newton also controls air delivery by individually manipulating the flow of chilled water to each heat exchanger in response to measured temperature of the corresponding zone, as discussed in relation to limitation 1[f] below. Ex. 1002 ¶¶152–153.

1[f] – “wherein the step of controlling said air delivery by said plurality of heat exchanger units comprises individually manipulating a mass flow rate of the cooling fluid supplied to each of the plurality of heat exchanger units.”

According to this claim limitation, one way to control “air delivery” as that term is used in claim 1 is by individually manipulating the mass flow rate of cooling fluid supplied to each of the plurality of heat exchanger units. In Newton’s system, a control system monitors ambient temperature sensed by temperature sensors in

each zone and controls the supply of the water to the heat exchangers based on the cooling needs of individual zones. Ex. 1007, 1:12–18, 2:5–26; Ex. 1002 ¶¶154–155.

As discussed in relation to limitation 1[e], each of Newton's room air conditioning units 16 sense the air temperature of its zone with temperature sensing bulbs 40. Ex. 1007, 3:25–28, FIG. 4. When the temperature sensed by a given unit exceeds the desired temperature for the zone, and chilled water is circulating in the closed-loop conduit 10, a control 38 opens water control valve 36 to allow the chilled water to flow through the unit's heat exchanger. Ex. 1007, 3:25–39. Conversely, as a POSITA would readily understand, whenever the sensed temperature falls within the desired range, the valve will be closed and prevent water flow through the heat exchanger. Each room air conditioning unit has its own water control valve 36, temperature sensors 40 and 42, and control 38 such that the flow of water through each unit is manipulated independently. *See, e.g.*, Ex. 1007, FIG. 2; *see also* Ex. 1002 ¶156.

Newton's alternative embodiment of Figure 6 also discloses individually manipulating the flow of chilled water to each heat exchanger unit in response to sensed temperatures, albeit by controlling a water pump instead of a control valve. Ex. 1007, 4:17–35. Ex. 1002 ¶¶157–158.

Claim 2 – “The method according to claim 1, wherein said step of controlling at least one of a temperature of said cooling fluid and said air delivery to said room comprises varying an output of said air conditioning unit to control the temperature of said cooling fluid.”

As explained above, Newton discloses the method of claim 1.

As discussed above, to remain consistent with claim limitation 1[b], the “air conditioning system” refers to the system that supplies cooling fluid to the heat exchanger units. Newton discloses a chiller 12 and heater 14 and three-way valve 18 for controlling temperature of water supplied to the inlet of pump 20 for circulation to the heat exchanger units. Ex. 1007, FIG. 1; 2:65–70. The valve 18 varies the temperature of circulating water and it does so in response to sensed temperatures in the zones. Ex. 1007, 5:16–41. As explained above, Newton teaches that if sensed temperatures are such that some zones require cooling, the control will cause chilled water to circulate at set time intervals. If all zones require cooling, the control will cause chilled water to circulate continuously. Ex. 1007, 5:53–6:5. Ex. 1002 ¶¶159–162.

Claim 3 – “The method according to claim 1, further comprising: determining whether the sensed temperatures at one or more locations in said room are within a predetermined range.”

As explained above, Newton discloses the method of claim 1.

The control 38 for each room air conditioning unit determines when the unit’s temperature sensing bulb 40 “senses a temperature above the desired temperature

level thereby calling for cooling” Ex. 1007, 3:32–39. The control 38' of the embodiment shown in Figure 6 works the same way but manipulates a water pump instead of a water flow valve. Ex. 1007, 4:26–38. Ex. 1002 ¶¶163–166.

Claim 4 – “The method according to claim 3, further comprising: varying the cooling fluid temperature in response to the sensed temperatures at one or more locations in said room being outside of said predetermined range.”

As explained above, Newton discloses the method of claim 3.

As discussed above, Newton’s disclosed system automatically adjusts its operations in response to changing conditions in one or more of zones being managed. For example, when cooling is not required in any zone, the system will continuously circulate hot water through conduit 10 for use by room unit heat exchangers in zones that require heating. Ex. 1007, 5:43–47. However, when the sensed temperature of a zone subsequently exceeds the desired range, the control system will adjust three-way valve 18 to so that chilled water is circulated, either periodically or continuously (if no zones require additional heating). Ex. 1007, 5:53–6:5. Thus, Newton discloses varying the fluid temperature in response to one or more sensed temperatures being outside of a predetermined range. Ex. 1002 ¶¶167–170.

Claim 7 – “The method according to claim 1, wherein the step of manipulating a mass flow rate of the cooling fluid supplied to each of the plurality of heat exchanger units further comprises metering the flow of cooling fluid through each of said plurality of heat exchanger units with a plurality of valves positioned along respective cooling fluid lines configured to channel cooling fluid from the air conditioning unit to the plurality of heat exchanger units.”

As explained above, Newton discloses the method of claim 1.

The flow control valves 36 at the inlet of each heat exchanger disclose the plurality of valves positioned along respective cooling fluid lines recited in this limitation. As shown in Figure 1, the valves 36 are each positioned along a respective inlet line 25 extending from inlet fittings 28 installed in the closed-loop water conduit 10. The water chiller 12 connects to the conduit 10 through line 13, valve 18 and pump 20. Ex. 1007, FIG. 1, 3:25–32. Each control valve 36 functions to meter the flow of cooling water to the associated heat exchanger 24. Ex. 1007, 3:25–40. Additionally, Newton discloses an embodiment in Figure 6 that includes a small pump 70 associated with each of the individual heat exchangers 24 for controlling coolant flow. Ex. 1007, 4:17–25. Ex. 1002 ¶¶171–174.

Claim 8 – “The method according to claim 1, wherein the step of manipulating a mass flow rate of the cooling fluid supplied to each of the plurality of heat exchanger units further comprises metering the flow of cooling fluid through said plurality of heat exchanger units with a plurality of pumps positioned along respective cooling fluid lines configured to channel cooling fluid from the air conditioning unit to the plurality of heat exchanger units.”

As explained above, Newton discloses the method of claim 1.

As explained above, the embodiment shown in Newton's Figure 6 meters the water flow into each heat exchanger by controlling the motor of pump 70 in response to sensed temperatures conditions in the zone. Ex. 1007, 4:17–35; Ex. 1002 ¶¶175–178.

Claim 9 – “The method according to claim 1, further comprising: manipulating a mass flow rate of the cooling fluid supplied to the plurality of heat exchanger units in substantially independent manners with respect to each of the plurality of heat exchanger units.”

As explained above, Newton discloses the method of claim 1.

Newton's system architecture and control method are designed to handle the varying heat loads associated with different zones of a building. Newton mentions, for example, that at any given time some zone may require heating while others require cooling. Ex. 1007, 5:53–6:1. Newton's system can automatically adjust to the varying needs because it controls each unit independent of the other units. Ex. 1002 ¶¶179–181.

As discussed in relation to limitation 1[f], each room air conditioning unit of Newton's system has its own water control valve 36, temperature sensors 40 and 42, and control 38 such that the flow of water through each unit is manipulated independently. Ex. 1007, 3:25–39. Newton's alternative embodiment of Figure 6 discloses individually manipulating a pump at the inlet of each heat exchanger to

control the flow of chilled water to the heat exchanger unit in response to sensed temperatures. Ex. 1007, 4:17–38; Ex. 1002 ¶¶182–183.

B. Ground 2: Obviousness Over Newton and the Knowledge of a POSITA (Claims 5 and 6)

As set forth below, claims 5 and 6 are obvious under § 103(a) over Newton (Ex. 1007) and the knowledge of a POSITA. Ex. 1002 ¶¶184–195.

Claim 5 – “The method according to claim 4, further comprising: increasing said cooling fluid temperature in response to a sum of the sensed temperatures at one or more locations being below said predetermined range.”

Claim 5 depends from claim 4, which is disclosed by Newton. The added limitation recites: “increasing said cooling fluid temperature in response to a sum of the sensed temperatures at one or more locations being below said predetermined range.” Newton does not explicitly disclose computing a sum of temperatures or increasing the cooling fluid temperature if the sum is below a predetermined range. However, this would have been obvious to a POSITA. Ex. 1002 ¶185.

Like the '287 patent, Newton is directed to cooling environments within buildings containing computer equipment. Newton solves a similar problem, i.e., to provide cooling for varying heat loads generated by equipment such as computers to maintain a desired temperature distribution throughout the environment. Like the '287 patent, Newton's cooling system includes air cooling heat exchangers at various locations supplied with water from a central source, with the temperature

and flow rate of the water circulating through individual heat exchangers being adjustable based on air temperature conditions near the heat exchanger. Ex. 1002 ¶186.

Most limitations of claims 1–9 are disclosed in Newton. This confirms how close the reference is to the '287 patent and confirms that a POSITA would look to Newton as a starting point when facing problems similar to those addressed in the '287 patent. Like the '287 patent, Newton teaches comparing data representing current air temperature conditions to desired air temperature conditions to identify locations that need cooling. And like the '287 patent, Newton provides for changing the circulating water temperature to achieve the desired heat transfer with the air, and recognized the benefits of this capability when managing varying heat loads of different regions of a building. Ex. 1002 ¶187.

A POSITA would understand that there are a limited number of ways to assess the cooling needs of a particular location within a building. The method of claim 5 involves determining whether the sum of sensed temperatures at one or more locations is below a predetermined range. A POSITA would understand that assessing a sum of multiple temperature measurements could provide additional insight into local air temperature conditions for use in determining whether to adjust the cooling fluid temperature. For example, a sum of temperatures measured at different times could reflect whether an out-of-range temperature condition is

persisting and could also reflect the total magnitude of the required heating or cooling. Alternatively, a sum of temperatures measured near different heat exchange units within a location could correlate to the size of the out-of-range temperature region. Ex. 1002 ¶188.

Newton similarly teaches assessing cooling and heating demands associated with each of multiple heat exchanger locations for determining whether to increase or decrease the temperature of the circulating water. The demand at each unit is assessed by comparing sensed air temperature at each heat exchange unit to a desired temperature level. Ex. 1007, 3:25–39. When conditions require heating by some heat exchangers and cooling by others, the system changes the circulating water temperature between hot and cold. Ex. 1007, 5:16–6:1. Newton further teaches performing the temperature cycling operation “[d]epending on the relative demand for heating or cooling” Ex. 1007, 5:70–6:1. For example “if the cooling loads are above some predetermined level (approximately 75% of the maximum load for the entire building), valve 18 will be positioned . . . so as to continuously circulate chilled fluid from chiller 12.” Ex. 1007, 5:24–29. Ex. 1002 ¶189.

Thus, Newton teaches evaluating the total cooling and heating demands, determined by measuring air temperatures at multiple heat exchanger locations, to determine whether to change the temperature of circulating water—akin to using a temperature summation. It would have been obvious from a POSITA’s knowledge

to assess the total cooling or heating demand by determining whether the sum of temperatures sensed at multiple heat exchanger locations is above or below a predetermined range. Assessing a sum of temperatures is one of a limited number of ways of assessing an aggregate heating or cooling demand within a region—that is, the total magnitude of the heating or cooling demand. Ex. 1002 ¶190.

Generating a sum of temperature values measured at multiple locations and comparing the sum to a predetermined range is a way to assess cooling needs within a building location; and adjusting the cooling fluid temperature as appropriate, would have been exceedingly straightforward using the existing features of Newton's system and the capabilities of a POSITA. Furthermore, this approach would have predictably resulted in a fast and reliable determination of regions where air temperatures are below optimal temperature conditions justifying increasing the water temperature. Ex. 1002 ¶191.

A POSITA would have had a reasonable expectation of success because it would have been a routine and obvious matter for a POSITA to modify Newton's system and methodology because the system already includes temperature sensors for each heat exchanger and a control system capable of comparing measured temperatures to desired temperature level and to adjust the circulating water temperature based on the total cooling demand. The simple, routine and low-cost nature of modifying the control algorithms of Newton to determine whether a sum

of measured temperatures is within a predetermined range as a means for assessing an aggregate cooling demand, which would have ensured a reasonable expectation of success, would have further motivated a POSITA. Ex. 1002 ¶192.

Thus, ample motivation existed for a POSITA to modify Newton's control methodology in order to arrive at the method of claim 5. Ex. 1002 ¶193.

Claim 6 – “The method according to claim 4, further comprising: decreasing said cooling fluid temperature in response to a sum of the sensed temperatures at one or more locations being above said predetermined range.”

Dependent claim 6 is analogous to claim 5 but requires decreasing the cooling fluid temperature when the computed sum of sensed temperatures is above the predetermined target temperature. This, too, would have been obvious to a POSITA for essentially the same reasons just explained. Ex. 1002 ¶194.

Thus, the subject matter of dependent claims 5 and 6 would have been obvious in view of Newton and a POSITA's knowledge. Ex. 1002 ¶195.

C. Ground 3: Anticipation by Shimizu (Claims 1–4, 7, and 9)

As set forth below, claims 1–4, 7, and 9 are anticipated under § 102(b) by Shimizu (Ex. 1008). Ex. 1002 ¶¶196–249.

Claim 1

Set forth below is a discussion of each limitation of claim 1, in conjunction with the relevant disclosures of each claim limitation by Shimizu.

a. 1[pre] – “A method for cooling a room configured to house a plurality of computer systems, said method comprising:”

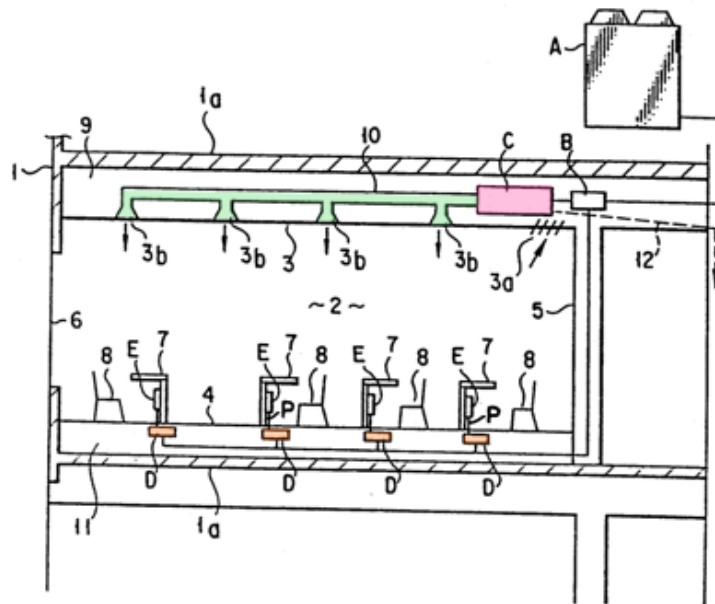
As discussed above in relation to Ground 1, a POSITA would understand the phrase “a room configured to house a plurality of computer systems” to apply to any room equipped with a power source for operating computer equipment. Although the ’287 patent specification mentions the cooling of data centers, the preamble language is not limited to methods of cooling data centers or other specialized facilities, does not mention any required features of the room beyond the capability to house computer systems, and does not specify any type or arrangement of the computer systems. Ex. 1002 ¶199.

As discussed above, Shimizu discloses an air conditioning system for cooling the internal space of a room of a building containing desks 7 and chairs 8. Ex. 1008, 3:48–55. Shimizu illustrates the system in the context of a building having a space beneath a floor 4 “for accommodating the electrical wirings of computer and business machines.” Ex. 1008, 4:1–6. A POSITA would thus understand the disclosed system and methods to apply to buildings having rooms configured to house computer systems. Ex. 1002 ¶¶200–201.

Thus, to the extent that the preamble is considered a claim limitation, Shimizu discloses limitation 1[pre].

1[a] – “providing a plurality of heat exchanger units configured to receive air from said room and to deliver air to said room;”

Figure 1, an annotated version of which is provided below, illustrates an embodiment of the system disclosed in Shimizu



F I G. 1

Ex. 1008, FIG. 1 (annotated).

An outdoor unit A includes a variable-capability compressor 21 that compresses the refrigerant, which then condenses to the liquid phase in an outdoor heat exchanger 23. Ex. 1008, 2:15–23, 4:29–34, 7:28–31. Ex. 1002 ¶¶202–204.

An ambient air conditioning unit C (pink) provides air conditioning for the whole space of the room. It receives room air and distributes cooled air through

outlet ports 3b of a duct 10 (green). Ex. 1008, 3:61–64. The ambient air conditioning unit C includes an indoor heat exchanger 34. Ex. 1008, 4:38–43. Ex. 1002 ¶205.

The system also includes personal air conditioning units E for separately cooling spaces around the desks 7. Ex. 1008, 3:65–68. Each personal air conditioning unit E includes an indoor heat exchanger 45. Ex. 1008, 4:48–55. An indoor fan 61 feeds air into each indoor heat exchanger 45. Ex. 1008, 5:43–50. Ex. 1002 ¶206.

This discloses to a POSITA an air conditioning system that includes multiple heat exchanger units that receive warm air from the room and deliver cooled air to the room. Ex. 1002 ¶207.

1[b] – “supplying said plurality of heat exchanger units with cooling fluid from an air conditioning unit;”

As explained in Section V.D. above, a POSITA would understand the plain and ordinary meaning of the term “air conditioning unit” in the claims of the ’287 patent to refer to a device that supplies cooling fluid to a plurality of heat exchanger units, and that the term “cooling fluid” includes any suitable heat transfer fluid. Ex. 1002 ¶209.

Figure 2, an annotated version of which is provided below, shows additional details of the overall refrigerant cycle.

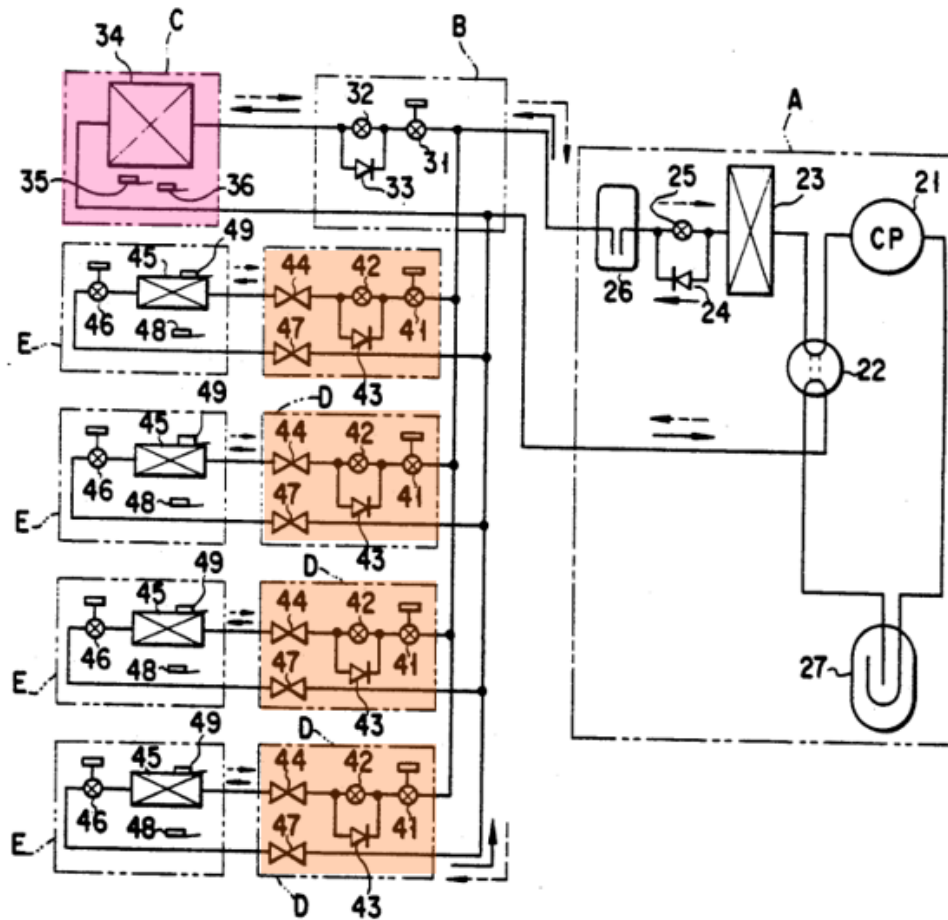


FIG. 2

Ex. 1008, FIG. 2 (annotated).

Outdoor unit A supplies refrigerant through distribution unit B to the ambient air-conditioning unit C (pink). Ex. 1008, 4:14–17 and 4:24–28. The distribution unit B is also connected to dividing units D (orange), which control the flow of refrigerant from outdoor unit A to personal air-conditioning units E. Ex. 1008, 4:7–17 and 4:44–47. Ex. 1002 ¶¶210–211.

Shimizu's disclosure of supplying two-phase refrigerant cooling fluid from outdoor unit A to a heat exchanger of the ambient indoor air conditioner as well as to the heat exchangers of multiple personal air-conditioning units meets limitation 1[b]. Ex. 1002 ¶212.

1[c] – “cooling said received air through heat exchange with the cooling fluid in the plurality of heat exchanger units;”

Shimizu indicates that the heat exchangers of ambient air conditioning unit C and of the personal air conditioning units E are “for exchanging the heat of received refrigerant with the heat of internal air” resulting in “cooling the whole space in the room” and “separately cooling the discrete spaces in the room.” Ex. 1008, 2:23–28, 2:34–35, and 2:41–42; *see also* Ex. 1008, 5:45–50; 13:13–14; 14:38–45; 14:64–65; 15:42–55; 16:24–31. Ex. 1002 ¶214.

1[d] – “sensing temperatures at one or more locations in said room;”

The ambient air-conditioning unit C of Shimizu's system includes an air temperature sensor 35 for sensing temperature of air in the room. Ex. 1008, 4:38–43. Each personal air conditioning unit E includes temperature sensor 48 for sensing air temperature and temperature sensor 49 on an indoor heat exchanger 45 for sensing the heat exchanger temperature. Ex. 1008, 4:48–55; *see also* Ex. 1008, 5:46–47; 5:63–64; 7:67; 11:14–15; 11:66; FIG. 5. Ex. 1002 ¶217.

1[e] – “controlling at least one of the temperature of said cooling fluid and said air delivery by said plurality of heat exchanger units to said room in response to said sensed temperatures at said one or more locations; and”

This claim limitation requires controlling *at least one* of temperature of the cooling fluid or air delivery by the heat exchangers. As discussed below, Shimizu discloses performing *both* control operations. Ex. 1002 ¶¶219–220.

With regard to controlling cooling fluid temperature, Shimizu’s system controls the refrigerant temperature in two respects. The first relates to controlling the temperature at which the refrigerant evaporates in the air cooling heat exchangers of the personal air-conditioning units. The control unit 60 of each personal air conditioning unit determines the dew point temperature of the internal air derived from the measured air temperature and humidity. Ex. 1008, 6:54–56; 6:67–7:5. If the detected temperature of heat exchanger 45 is below the dew point temperature (which would lead to condensation), the opening of the evaporative pressure regulator 46 is narrowed to raise the refrigerant temperature so that the detected heat exchanger temperature is above the dew point temperature. Ex. 1008, 8:8–25. As a POSITA would have understood as of the priority date of the ’287 patent, narrowing the flow passage through pressure regulator 46 increases the refrigerant pressure and thus its evaporation temperature. This control of refrigerant temperature is in response to measured air room air temperature. Ex. 1002 ¶221.

Shimizu also controls refrigerant temperature output from the compressor 21 of outdoor unit A and does so in response to measured temperatures in the room. In particular, the ambient air-conditioning unit C detects the room air temperature using sensor 35 and computes a difference from a preset desired temperature to determine an air-conditioning load. Ex. 1008, 8:44–52. The air conditioning load for each personalized air conditioning unit E is computed as a difference between the air temperature around the unit detected by temperature sensor 48 and a preset temperature. Ex. 1008, 7:63–8:3. The total sum of the air conditioning loads is derived and a control unit 50 adjusts the frequency of the voltage signal driving the motor 21M of compressor 21 based on the total air-conditioning load. Ex. 1008, FIGs. 4 and 7, 5:22–27, 9:6–12. Ex. 1002 ¶222.

As a POSITA would have understood, adjusting the speed of the compressor motor changes how much the refrigerant vapor is compressed by the compressor, affecting its pressure and temperature. Therefore, this aspect of the control system of Shimizu also discloses controlling the refrigerant temperature in response to temperatures measured at one or more locations in the room. Ex. 1002 ¶223.

Therefore, Shimizu's system and control method disclose controlling the temperature at which the refrigerant evaporates in the heat exchangers of personal air conditioning units E and controlling the temperature of refrigerant supplied to

the heat exchangers, in response to temperatures sensed at multiple locations in the room. Ex. 1002 ¶224.

With regard to controlling “air delivery,” the next limitation 1[f] indicates that this includes the technique of individually manipulating the mass flow rate of cooling fluid supplied to each of a plurality of heat exchanger units (which affects the temperature of the delivered air) in response to sensed temperature at one or more locations. Shimizu also discloses this step, as discussed in relation to limitation 1[f] below. Ex. 1002 ¶225.

1[f] – “wherein the step of controlling said air delivery by said plurality of heat exchanger units comprises individually manipulating a mass flow rate of the cooling fluid supplied to each of the plurality of heat exchanger units.”

A portion of the refrigerant passing from the outdoor heat exchanger 23 through the liquid receiver 26 flows into the indoor heat exchanger 34 of ambient unit C via the flow control valve 31 and expansion valve 32. Ex. 1008, FIG. 2, 7:52–62. The refrigerant flow to the heat exchanger is regulated based on sensed temperature in the room. In particular, the temperature of the internal air in the room 2 is detected by the air temperature sensor 35, a difference between the detected temperature and the preset temperature is computed to determine an air conditioning load, and then the opening of the flow control valve 31 is controlled so that

refrigerant of an amount corresponding to the air-conditioning load flows into the heat exchanger. Ex. 1008, 8:44–56. Ex. 1002 ¶228.

Refrigerant from outdoor heat exchanger 23 flows into the indoor heat exchanger 45 of each personal air conditioning unit E through a corresponding flow control valve 41. Ex. 1008, FIG. 2, 7:32–38. The refrigerant flow to each heat exchanger 45 is regulated in response to the sensed temperature. The temperature of the air around the unit is detected by the corresponding air temperature sensor 48 and a difference between the detected temperature and a preset temperature is detected. Then flow control valve 41 is controlled to manipulate refrigerant flow corresponding to the air-conditioning load in the vicinity of the personal air-conditioning unit. Ex. 1008, FIG. 5, 7:63–8:7; *see also* Ex. 1008, 4:44–48; 6:31–33; 8:4; FIG. 5. Ex. 1002 ¶229.

Claim 2 – “The method according to claim 1, wherein said step of controlling at least one of a temperature of said cooling fluid and said air delivery to said room comprises varying an output of said air conditioning unit to control the temperature of said cooling fluid.”

As explained above, Shimizu discloses the method of claim 1.

As discussed above, Shimizu discloses varying the motor speed and thus the output of compressor 21 in response to the total air conditioning load determined by the comparison of sensed room temperatures at multiple locations to preset temperatures. Ex. 1008, FIGs. 4 and 7, 5:22–27, 7:63–8:3, 8:44–52, 9:6–12. This

affects the temperature and flow rate of the refrigerant supplied to the heat exchanger units. Ex. 1002 ¶¶231–234.

Claim 3 – “The method according to claim 1, further comprising: determining whether the sensed temperatures at one or more locations in said room are within a predetermined range.”

As explained above, Shimizu discloses the method of claim 1.

The disclosed system of Shimizu regulates refrigerant flow to the heat exchangers of the ambient air conditioning unit and of the personal air conditioning units based on calculating differences between the sensed air temperature and the temperature preset by a user. Ex. 1008, FIG. 5, 7:63–8:7, 8:44–56. A POSITA would have understood from Shimizu’s teachings that when a sensed temperature is above the preset temperature, Shimizu’s control system identifies this as an air conditioning load of a magnitude proportional to the computed temperature difference. Thus, Shimizu discloses determining whether a sensed temperature at one or more locations is within a predetermined range, i.e., the range consisting of temperatures below the preset temperature. Ex. 1002 ¶¶235–238.

Claim 4 – “The method according to claim 3, further comprising: varying the cooling fluid temperature in response to the sensed temperatures at one or more locations in said room being outside of said predetermined range.”

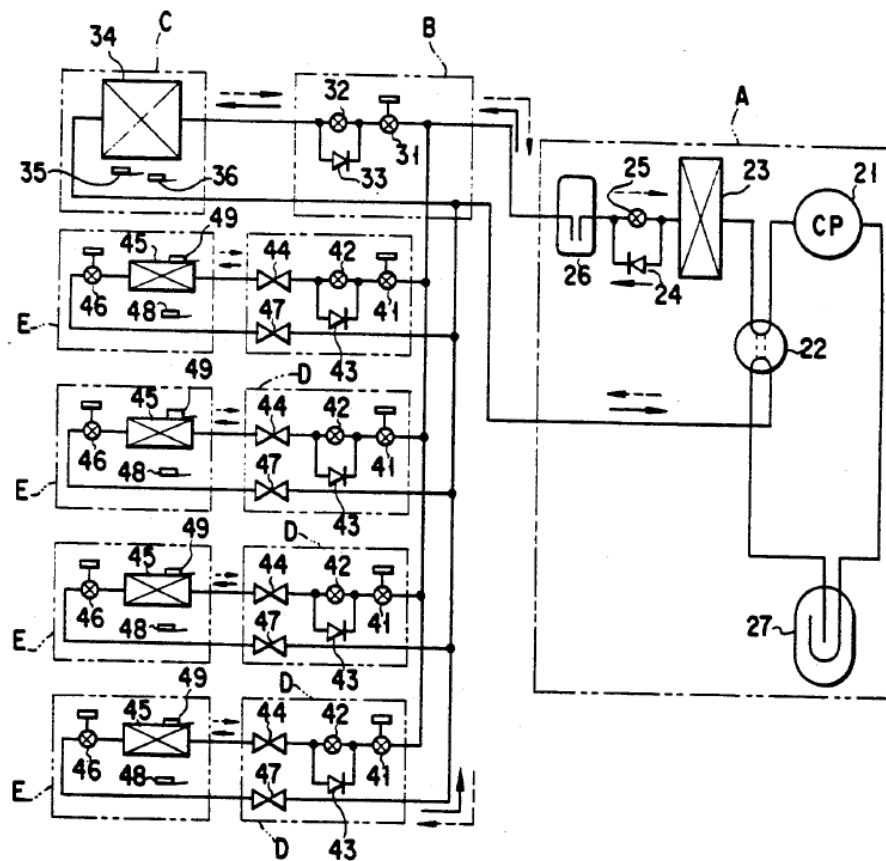
As explained above, Shimizu discloses the method of claim 3.

Shimizu's disclosed system automatically adjusts the compressor output in response to the total air conditioning load, and this directly affects the temperature of the refrigerant circulated to the heat exchanger units. Ex. 1008, FIGs. 4 and 7, 5:22–27, 7:63–8:3, 8:44–52, 9:6–12. The control system determines the air conditioning load for each unit based on sensed air temperature near the unit being outside of the predetermined range (i.e., being higher than the preset temperature). Ex. 1008, FIG. 5, 7:63–8:7, 8:44–56. Ex. 1002 ¶¶239–242.

Claim 7 – “The method according to claim 1, wherein the step of manipulating a mass flow rate of the cooling fluid supplied to each of the plurality of heat exchanger units further comprises metering the flow of cooling fluid through each of said plurality of heat exchanger units with a plurality of valves positioned along respective cooling fluid lines configured to channel cooling fluid from the air conditioning unit to the plurality of heat exchanger units.”

As explained above, Shimizu discloses the method of claim 1.

As shown in Figure 2, an annotated version of which is provided below, the flow control valve 31 at the inlet of indoor heat exchanger 34 is positioned along a fluid line extending through distribution unit B (blue) for metering the flow of refrigerant from outdoor unit A (yellow) to the heat exchanger 34. Each flow control valve 41 is positioned along fluid lines for metering the flow of refrigerant to a respective heat exchanger 45 of a personal air-conditioning unit. Ex. 1002 ¶¶243–246.



F I G. 2

Ex. 1008, FIG. 2 (annotated).

Claim 9 – “The method according to claim 1, further comprising: manipulating a mass flow rate of the cooling fluid supplied to the plurality of heat exchanger units in substantially independent manners with respect to each of the plurality of heat exchanger units.”

As explained above, Shimizu discloses the method of claim 1.

As discussed in relation to limitation 1[f], the ambient air conditioning unit and each personal air conditioning unit has its own refrigerant control valve and temperature sensor, and the control system disclosed in Shimizu manipulates each

control valve independently of the others based on the computed air conditioning load of the individual unit. Ex. 1002 ¶¶247–250.

D. Ground 4: Anticipation by Baer (Claims 1, 3, 7, and 9)

As set forth below, claims 1, 3, 7, and 9 are anticipated under § 102(b) by Baer (Ex. 1011). Ex. 1002 ¶¶251–293.

Claim 1

Set forth below is a discussion of each limitation of claim 1, in conjunction with the relevant disclosures of each claim limitation by Baer.

1[pre] – “A method for cooling a room configured to house a plurality of computer systems, said method comprising:”

As discussed above in relation to Ground 1, a POSITA would understand the phrase “a room configured to house a plurality of computer systems” to apply to any room equipped with a power source for operating computer equipment. Ex. 1002 ¶¶253–254.

Baer discloses an air conditioning system for cooling computer rooms. “The principle of operation of the present system is as follows: Air from the computer room at the ambient temperature and humidity is taken into the enclosure and heated by the electronic equipment. The air is then expelled through a heat exchanger, which cools the air back to the ambient temperature.” Ex. 1011, [0005]. Ex. 1002 ¶¶255–256.

Thus, to the extent that the preamble is considered a claim limitation, Baer discloses limitation 1[pre].

1[a] – “providing a plurality of heat exchanger units configured to receive air from said room and to deliver air to said room;”

Figure 1, an annotated version of which is provided below, illustrates Baer’s disclosed computer cabinet cooling system. Ex. 1002 ¶258.

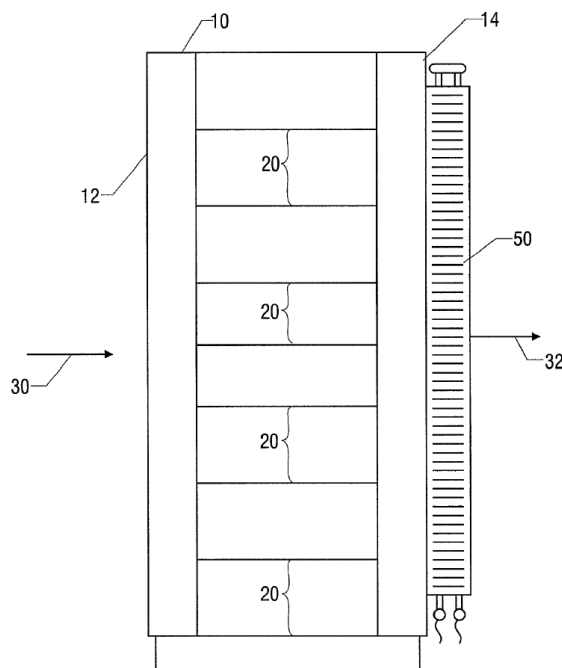


FIG. 1

Ex. 1011, FIG. 1 (annotated).

Rack 10 houses electronic equipment such as computer devices supported on mounting racks 20. Cooling fans integral to the computer equipment draw air 30 from the room through the front 12 of rack enclosure 10 so that the air passes over the equipment and absorbs heat generated by the electronics. Ex. 1011, [0021]. Heat exchanger 50 (pink) mounted on the rear 40 of rack enclosure 10 absorbs the heat

added to the air by the electronic equipment. The cooled air 32 flows out the back 14 of rack enclosure 10 and returns to the computer room without contributing additional heat load to the room air conditioning system. Ex. 1011, [0023]. Ex. 1002 ¶259.

A POSITA would have recognized that a typical computer room contains multiple rack enclosures. Baer indicates that its disclosures addresses a need “to install additional localized cooling for *enclosures* containing electronic equipment that will remove the heat generated by the electronic equipment from the room” Ex. 1008, [0003] (emphasis added). Therefore, Baer discloses providing multiple heat exchangers, each associated with one of multiple rack enclosures within a room, and each operating to receive warm air from the room and to return cooled air to the room. *See, e.g.*, Ex. 1008, [0004]–[0005]; [0008]–[0010]; [0022]–[0023]; [0030]. Ex. 1002 ¶260.

1[b] – “supplying said plurality of heat exchanger units with cooling fluid from an air conditioning unit;”

As explained in Section V.D. above, a POSITA would understand the term “air conditioning unit” in the claims of the ’287 patent to refer to a device that supplies cooling fluid to a plurality of heat exchanger units, and that the term “cooling fluid” includes any suitable heat transfer fluid. Ex. 1002 ¶263.

to the inlet 140, operating the cycle continuously.” Ex. 1011, [0028]. A POSITA would have understood the described cooling flow circulation to apply to the heat exchangers mounted to other rack enclosures in the computer room as well, each receiving cooling fluid from the external cooling source and returning it to the external cooling source after absorbing heat from the air. Ex. 1002 ¶265.

1[c] – “cooling said received air through heat exchange with the cooling fluid in the plurality of heat exchanger units;”

Baer indicates that each heat exchanger coupled to each rack enclosure receives air heated by the electronics equipment and “cools the air back to the ambient temperature.” Ex. 1011, [0005]. Heat exchanger 50 mounted on rack enclosure 10 “absorbs the heat added to the air by the electronic equipment.” Ex. 1011, [0023]. Cooled air 32 flows out the back 14 of the enclosure 10 and “then returns to the computer room” without contributing additional heat load to the room air conditioning system. Ex. 1011, [0023]. Ex. 1002 ¶¶267–269.

1[d] – “sensing temperatures at one or more locations in said room;”

Baer discloses that temperature controller 132 receives input from “a temperature sensor 134 on the back of heat exchanger 50 to measure the temperature of the air leaving the heat exchanger.” Ex. 1011, FIG. 2; [0027]. This teaches sensing temperatures at the location of each rack enclosure. *See, e.g.*, Ex. 1011, FIG. 2; [0027]; [0042]. Ex. 1002 ¶¶270–272.

1[e] – “controlling at least one of the temperature of said cooling fluid and said air delivery by said plurality of heat exchanger units to said room in response to said sensed temperatures at said one or more locations; and”

This claim limitation requires controlling *at least one* of temperature of the cooling fluid or air delivery by the heat exchangers. With regard to controlling “air delivery,” the next limitation 1[f] indicates that this includes the technique of individually manipulating the mass flow rate of cooling fluid supplied to each of a plurality of heat exchanger units (which affects the temperature of the delivered air) in response to the sensed temperature at one or more locations. Baer discloses this step, as discussed in relation to limitation 1[f] below. *See also* Ex. 1011, Claims 7; 12; 13; 17. Ex. 1002 ¶¶273–275.

1[f] – “wherein the step of controlling said air delivery by said plurality of heat exchanger units comprises individually manipulating a mass flow rate of the cooling fluid supplied to each of the plurality of heat exchanger units.”

As discussed, cooling fluid flow into each heat exchanger is controlled by a modulating valve 130. Ex. 1011, FIG. 2, [0027]. Baer’s disclosed temperature controller 132 receives input from a temperature sensor 134 on the back of heat exchanger 50 which measures the temperature of air leaving the heat exchanger. Temperature controller 132 operates the modulating valve 130 “to ensure that the air exiting the heat exchanger is at the same temperature as the room temperature

of the computer room in which the equipment is housed.” Ex. 1011, [0027]; *see also* Ex. 1011, [0042]. Ex. 1002 ¶¶276–277.

Figure 4 shows a bottom view of the heat exchanger 50.

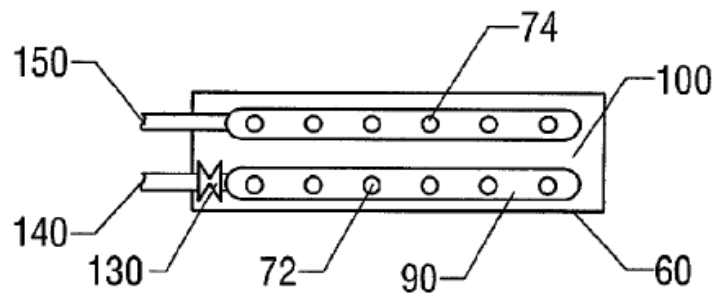


FIG. 4

Ex. 1011, FIG. 4. Baer indicates that “[t]he flow of cooling fluid is modulated by valve 130 to regulate the amount of cooling fluid passing through the exchanger, which in turn controls the amount of heat absorbed and the temperature of the exiting air.” Ex. 1011, [0030]. Ex. 1002 ¶278.

Baer similarly describes a thermostatic valve 320 coupled to a coolant supply line and thermostatic operator 322 that changes the valve position according to sensed temperature. *See, e.g.*, Ex. 1011, FIG. 6B. “The valve controls the flow of cooling fluid in the heat exchanger and ensures that the air exiting the heat exchanger is at the same temperature as the room temperature of the computer room in which the enclosure is housed.” Ex. 1011, FIG. 7, [0038]–[0039], [0042]. Ex. 1002 ¶279.

Therefore, Baer discloses individually manipulating a mass flow rate of cooling fluid supplied to each of the plurality of heat exchanger units in response to air temperature sensed at each rack enclosure. Ex. 1002 ¶280.

Claim 3 – “The method according to claim 1, further comprising: determining whether the sensed temperatures at one or more locations in said room are within a predetermined range.”

As explained above, Baer discloses the method of claim 1.

Baer discloses that the temperature sensor 134 on the back of each heat exchanger 50 measures the temperature of the air leaving the heat exchanger. Ex. 1011, FIG. 2; [0027]. The controller 132 receives the sensed temperature values and manipulates the cooling fluid flow modulating valve 132 “to ensure that the air exiting the heat exchanger is at the same temperature as the room temperature of the computer room in which the equipment is housed.” Ex. 1011, [0027]; *see also* Ex. 1011, [0042]. Ex. 1002 ¶¶281–283.

A POSITA would have understood from these teachings that controller 132 has a target temperature range that reflects the desired room temperature and manipulates the cooling flow modulating valve 132 when the sensed temperature is not within the desired room temperature range. Thus, Baer discloses determining whether a sensed temperature at one or more locations is within a predetermined range, i.e., the desired room temperature range. Ex. 1002 ¶¶284–285.

Claim 7 – “The method according to claim 1, wherein the step of manipulating a mass flow rate of the cooling fluid supplied to each of the plurality of heat exchanger units further comprises metering the flow of cooling fluid through each of said plurality of heat exchanger units with a plurality of valves positioned along respective cooling fluid lines configured to channel cooling fluid from the air conditioning unit to the plurality of heat exchanger units.”

As explained above, Baer discloses the method of claim 1.

The coolant flow modulating valve 130 at the inlet of each heat exchanger is positioned along fluid line 140 for metering the flow of coolant from a chiller or other external source to the heat exchanger 50. Ex. 1011, FIG. 2; [0027]. The thermostatic valve 320 of Baer’s alternative embodiment is also coupled to a coolant supply line for controlling fluid in the heat exchanger. Ex. 1011, FIG. 7; *see also* Ex. 1011, [0041]–[0042]. Ex. 1002 ¶¶286–289.

Claim 9 – “The method according to claim 1, further comprising: manipulating a mass flow rate of the cooling fluid supplied to the plurality of heat exchanger units in substantially independent manners with respect to each of the plurality of heat exchanger units.”

As explained above, Baer discloses the method of claim 1.

As discussed in relation to limitation 1[f], each heat exchanger of Baer’s system has a dedicated cooling fluid modulating valve and temperature sensor, and the disclosed control system manipulates each modulating valve independently of the others based on the sensed temperature of air exiting the heat exchanger. *See also* Ex. 1011, FIG. 7; [0027]; [0042]. Ex. 1002 ¶¶290–293.

VIII. THE BOARD SHOULD NOT EXERCISE ITS DISCRETION UNDER SECTIONS 314(A) OR 325(D)

The Board should decline to exercise its discretion to not institute trial under Sections 314(a) or 325(d).

Section 314(a)

The parties are both involved in the *Vertiv Declaratory Judgment Action*, but that litigation is at an early stage. As explained below, the factors identified by the Board in *Fintiv* favor institution. *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 at 5–6 (PTAB Mar. 20, 2020) (precedential).

Factor 1: This factor is neutral where no party has requested a stay. *See, e.g., Nokia of America Corporation f/k/a Alcatel-Lucent USA Inc. et al v. Wireless Alliance, LLC*, PTAB-IPR2024-00619, Paper 19 at 9 (PTAB Sept. 13, 2024) (granting institution); *Google LLC v. Flypsi, Inc.*, PTAB-IPR2023-00361, Paper 9 at 7–8 (PTAB July 31, 2023) (same).

Factor 2: Jury selection has been scheduled for April 6, 2026 in the *Lead Case*. *Lead Case*, Dkt. 60 at 2. Any final written decision would likely be due by August 26, 2026, making any final decision in this proceeding statutorily due less than four months after trial. Thus, factor 2 weighs against discretionary denial. *See, e.g., Ericsson Inc. et al v. XR Communications LLC d/b/a Vivato Technologies*, IPR2024-00868, Paper 8 at 29 (PTAB Dec. 13, 2024) (“[T]rial is currently scheduled

less than five months before the Final Written Decision in this proceeding is due . . .
. We determine that the facts pertaining to this factor weigh against exercising our discretion to deny institution under § 314(a).”).

Factor 3: To date, the parties have invested little in the *Vertiv Declaratory Judgment Action*. Claim construction proceedings have not begun, there have been no depositions, and expert reports have not been exchanged. “Because of the significant investment that remains in the parallel district court proceeding, . . . factor 3 weighs against exercising discretion to deny institution.” *Hewlett Packard Enterprise Company et al v. Cobblestone Wireless, LLC*, IPR2024-00707, Paper 17 at 49 (PTAB Sept. 24, 2024).

Factor 4: If trial is instituted, Petitioner does not intend to assert in the *Vertiv Declaratory Judgment Action* that the claims of the ‘287 patent are invalid on the same grounds raised during this proceeding. *Ericsson Inc. et al v. XR Communications LLC d/b/a Vivato Technologies*, IPR2024-00868, Paper 8 at 30 (PTAB Dec. 13, 2024) (explaining that such a stipulation “mitigates to some degree the concerns of duplicative efforts between the district court and the Board, as well as concerns of potentially conflicting decisions.”). Additionally, Petitioner has not raised any issues of invalidity in the *Vertiv Declaratory Judgment Action* at this time.

Moreover, Petitioner, as an Intervenor, previously served invalidity contentions in the prior *Digital Realty* and *CyrusOne* actions that have since been

dismissed. Those contentions were based on several prior art references not in the Petition, as well as invalidity based on non-patent/publication prior art. Accordingly, “there is not complete overlap in the issues. . . . [and thus,] this fourth factor does not favor discretionary denial.” *SAP America, Inc. v. Isix IP LLC*, IPR2024-00615, Paper 9 at 25 (PTAB Sept. 26, 2024).

Factor 5: The parties to this proceeding and the *Vertiv Declaratory Judgment Action* are the same. Valtrus is a plaintiff in *TierPoint* and *DataBank* in which it asserts the ‘287 patent against Vertiv’s customers, but Vertiv is not a party to those actions.

Factor 6: This Petition presents “compelling” arguments for unpatentability of the challenged claims for the reasons discussed above. *See* USPTO Memorandum, Interim Procedure for Discretionary Denials in AIA Post Grant Proceedings with Parallel District Court Litigation, 4–5 (June 21, 2022) (“the PTAB will not deny institution based on *Fintiv* if there is compelling evidence of unpatentability”); *see also CommScope Techs. LLC v. Dali Wireless, Inc.*, IPR2022-01242, Paper 23 at 3–5 (Feb. 27, 2023) (precedential) (evidence is compelling when it is “highly likely that the petitioner would prevail with respect to at least one challenged claim”). Thus, institution is consistent with the significant public interest against “leaving bad patents enforceable.” *Thryv, Inc v. Click-To-Call Techs., LP*, 140 S. Ct. 1367, 1374 (2020).

The balance of considerations under the *Fintiv* factors strongly favors institution of trial.

Section 325(d)

The prior art used in the Petition was not before the Examiner during examination, and no comparable art was considered. Consequently, no § 325(d) factors favor denial.

IX. CONCLUSION

Petitioner respectfully requests institution of IPR.

Respectfully submitted,

Dated: February 26, 2025

By: /Timothy P. Maloney/
Timothy P. Maloney
Reg. No. 38,233
Nixon Peabody LLP
70 West Madison, Suite 5200,
Chicago, IL 60602-4378
Tel. (312) 977-4451
Fax (833) 818-8070

Patent No. 6,854,287
Petition for *Inter Partes* Review

CERTIFICATE OF COMPLIANCE

I hereby certify that this Petition complies with the word count limitation of 37 C.F.R. § 42.24(a)(1)(i) because the Petition contains approximately 13,970 words, excluding the parts of the Petition exempted by 37 C.F.R. § 42.24(a)(1), which is less than 14,000 words. Counsel relies on the word count of the computer program used to prepare the response on February 26, 2025.

Dated: February 26, 2025

By: /Timothy P. Maloney/
Lead Counsel for Petitioner

Patent No. 6,854,287
Petition for *Inter Partes* Review

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing Petition for *Inter Partes* Review together with all exhibits and other papers filed therewith was served on February 26, 2025, by placing a copy into FEDERAL EXPRESS directed to the attorney of record for the patent at the following address:

Botos Churchill IP Law LLP – Malik
430 Mountain Avenue, Suite 401
New Providence, NJ 07974
UNITED STATES

A courtesy copy has also been provided to the following counsel of record for Patent Owners in *Vertiv Corporation v. Valtrus Innovations Limited*, Case No. 24-cv-00907-JRG (E.D. Tex.):

Matthew Berkowitz
Reichman Jorgensen Lehman & Feldberg LLP
100 Marine Parkway, Suite 300
Redwood Shores, CA 94065
mberkowitz@reichmanjorgensen.com

By: /Timothy P. Maloney/
Lead Counsel for Petitioner