The opinion in support of the decision being entered today was not written
for publication and is not binding precedent of the Board.

Paper No. 24

UNITED STATES PATENT AND TRADEMARK OFFICE

**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Ex parte LENNY LOW and RANDY PON

Appeal No. 2004-1456
Application No. 09/624,151

ON BRIEF

Before COHEN, ABRAMS and BAHR, Administrative Patent Judges.

BAHR, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the examiner's final rejection of claims 24-37, which are all of the claims pending in this application.

We AFFIRM-IN-PART.

BACKGROUND

The appellants' invention relates to a spacecraft radiator system using a heat pump. Further understanding of the invention may be obtained from a reading of representative claim 24, which is reproduced in the opinion section of this decision.

The examiner relied upon the following prior art references in rejecting the appealed claims:

Camaret	4,756,493	Jul. 12, 1988
Scaringe et al. (Scaringe)	5,142,884	Sep. 1, 1992
Homer et al. (Homer)	5,310,141	May 10, 1994

The following rejections are before us for review.

Claims 24-37 stand rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that appellants, at the time the application was filed, had possession of the claimed invention.

Claims 24-37 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the invention.

Claims 24, 25, 28, 30, 31, 36 and 37 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Scaringe.

Claims 27, 32 and 33 stand rejected under 35 U.S.C. § 103 as being unpatentable over Scaringe in view of Homer.

Claims 29, 34 and 35 stand rejected under 35 U.S.C. § 103 as being unpatentable over Scaringe in view of Camaret.

Rather than reiterate the conflicting viewpoints advanced by the examiner and the appellants regarding the above-noted rejections, we make reference to the answer (Paper No. 18) for the examiner's complete reasoning in support of the rejections and to the brief and reply brief (Paper Nos. 17 and 19) for the appellants' arguments thereagainst.

OPINION

In reaching our decision in this appeal, we have given careful consideration to the appellants' specification and claims, to the applied prior art references, and to the respective positions articulated by the appellants and the examiner. As a consequence of our review, we make the determinations which follow.

Claim 24, the sole independent claim before us on appeal, reads as follows:

> 24. In a spacecraft having a plurality of surfaces, including at least one radiating surface and at least one solar loaded surface, a heat dissipating system for dissipating heat from a spacecraft payload comprising:
>
> an evaporator which receives a fluid medium heated by said payload, and evaporates said medium producing an evaporated fluid medium at a first operating temperature,
>
> a compressor which receives the evaporated fluid medium and compresses the evaporated fluid medium raising the temperature of the evaporated fluid medium to a second operating temperature which is greater than the temperature of the at least one solar loaded surface; and

> a radiator-condenser which receives the compressed fluid medium from the compressor and radiates the heat from the spacecraft through said radiator-condenser and said at least one solar loaded surface.

The written description rejection

The examiner alleges that the application as originally filed fails to provide support for the limitation in claim 24 that the compressor raises the temperature of the evaporated fluid medium to a second operating temperature which is *greater than the temperature of the at least one solar loaded surface*. The examiner is correct that appellants' specification does not expressly disclose that the compressor raises the temperature of the evaporated fluid medium to a temperature which is greater than the temperature of the at least one solar loaded surface. The test for determining compliance with the written description requirement, however, is whether the disclosure of the application as originally filed reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter, rather than the presence or absence of literal support in the specification for the claim language. See Vas-Cath, Inc. v. Mahurkar, 935 F.2d 1555, 1563-64, 19 USPQ2d 1111, 1116-17 (Fed. Cir. 1991) and In re Kaslow, 707 F.2d 1366, 1375, 217 USPQ 1089, 1096 (Fed. Cir. 1983).

In this instance, appellants' specification informs us on page 2 that:

> Currently used state-of-the-art spacecraft radiator systems have the radiator temperature either the same or lower than the payload or source temperature. In contrast, the heat pump system employed in the present invention allows the temperature of the radiator-condenser to be elevated,

> thereby reducing the required area of the spacecraft radiator and the mass of the spacecraft.
>
> Typical spacecraft currently use the north and south faces of the spacecraft as primary radiating surfaces. The other spacecraft surfaces (east, west, earth and aft) are usually not effective as primary radiating surfaces due to high relative solar loading. Using the present heat pump system, spacecraft radiator temperatures can be elevated, and therefore these other surfaces of the spacecraft (west, east, earth and aft) can be effectively used as radiating surfaces.

The present specification further discloses on page 3 that:

> The heat pipe radiator panels of conventional spacecraft heat dissipating systems are at or below the source or payload temperature as opposed to the present invention which is at elevated temperature. Currently deployed spacecraft use north-south radiating surfaces, while the present invention allows all surfaces of the spacecraft to be in thermal communication and be effectively used as radiators.

According to the disclosure on page 4 of appellants' specification, the heat pump of the present invention comprises an evaporator 22, a compressor 23 and an expansion valve 24. The compressor 23 elevates the temperature of the fluid above that of the evaporator 22 and is coupled to the radiator-condenser 26 disposed on selected surfaces of the spacecraft which radiates heat from the system and the spacecraft.

From the above disclosures in appellants' specification as originally filed, one of ordinary skill in the art of heat transfer would have understood that, in the conventional

systems discussed in appellants' specification using heat pipes to transport heat from the payload to the radiator panels, the solar loaded surfaces (east, west, earth and aft) are not effective as heat radiating surfaces because the temperatures of these surfaces approach or exceed the temperature of the payload due to high relative solar loading, thus preventing effective heat transfer from the payload to the radiating surfaces via a heat pipe system. Such a person would also have inferred from the above-quoted disclosure on page 2 of appellants' specification that appellants contemplated the use of a heat pump system to elevate the temperature of the heat transfer fluid above that of the solar loaded east, west, earth and aft surfaces, thereby enabling them to be effectively used as radiating surfaces.

For the above reasons, we conclude that appellants' specification as originally filed is sufficient to provide written description support for the limitation in claim 24 regarding the elevation of the fluid medium temperature to above that of the at least one solar loaded surface. The examiner's rejection under the first paragraph of 35 U.S.C. § 112 thus cannot be sustained on this basis.

The remainder of the examiner's bases for determining that appellants' specification fails to provide written description support for the subject matter in appellants' claims appear to stem from the examiner's false impression that the specification provides no disclosure of using a solar loaded surface as a heat radiating surface. On the contrary, appellants' specification clearly states in the last paragraph

on page 2 that the east, west, earth and aft surfaces, which are usually not effective as primary radiating surfaces due to high relative solar loading, can be effectively used as radiating surfaces using the heat pump system of appellants' invention. One of ordinary skill in the art would have understood from that disclosure that appellants contemplated using the solar loaded surfaces as radiating surfaces. It follows that the examiner's rejection under the first paragraph of 35 U.S.C. § 112 likewise cannot be sustained on these bases. In light of the above, we shall not sustain the examiner's rejection of claims 24-37 under the first paragraph of 35 U.S.C. § 112.

The indefiniteness rejection

The examiner's assessment on page 7 of the answer that, if the heat pump recited in claim 35 is considered to encompass the evaporator, compressor, radiator-condenser and expansion valve, then the separate recitation of the radiator-condenser appears to constitute a double recitation, is inapposite. Neither claim 35, including the recitations in claim 24 from which it depends, nor appellants' specification defines the heat pump as including the radiator-compressor. Claim 24, which recites the evaporator, compressor and radiator-condenser as part of a heat dissipating system, not a heat pump, makes no mention of a heat pump. Furthermore, as defined in appellants' specification (page 4), the "heat pump 21 comprises an evaporator 22, a compressor 23, and an expansion valve 24 which are coupled in a closed-loop manner to the radiator-condenser 26 in the manner shown in Fig. 2." We read this disclosure as

defining the heat pump as comprising only the evaporator, compressor and expansion valve, with the heat pump being coupled in a closed-loop manner to the radiator-condenser. Moreover, as illustrated in appellants' Figure 2, the radiator-condenser is clearly not part of the heat pump 21 (note the dotted line denoted by the reference numeral 21).

Nevertheless, we shall sustain the indefiniteness rejection as to claims 35-37, inasmuch as appellants have conceded on page 11 of their brief that the rejection of claims 35-37 as being indefinite because "the heat pump" lacks antecedent basis in the claims, is appropriate and that these claims are deserving of correction. For the reasons which follow, we shall not, however, sustain the rejection of claims 24-34.

The examiner's criticism of the terminology "heat out" in claim 26 is without merit, as this would be understood by one of ordinary skill in the heat exchange field to mean heat transferred from the radiator-condenser. Likewise, while the term "smooth" in claim 27 is a relative term, we agree with appellants (brief, page 12) that one of ordinary skill in the field of heat exchangers would understand what is meant by "smooth walled tubing." As for the examiner's criticism that it is not clear what structures correspond to the "radiator-condenser" in claims 24-37, it appears clear to us from appellants' specification that the radiator-condenser 26 is a heat exchange structure in which the fluid medium is condensed and the heat dissipated thereby is radiated out from said heat exchange structure. With regard to the limitation in claim 31 that the compressor

comprises means for elevating the temperature of the fluid medium above the temperature of fluid medium in the evaporator, one familiar with compressors would understand what types of structures are conventionally used to compress the fluid medium to thereby elevate its temperature. Finally, the issue of whether the "at least one deployable radiating surface" in claim 34 and the "one or more deployable radiating surfaces" in claim 35 refer to or are in addition to the at least one radiating surface previously recited in claim 24 is one of breadth, not indefiniteness. Just because a claim is broad does not mean that it is indefinite. See In re Johnson, 558 F.2d 1008, 1016 n.17, 194 USPQ 187, 194 n.17 (CCPA 1977); In re Miller, 441 F.2d 689, 693, 169 USPQ 597, 600 (CCPA 1971); In re Gardner, 427 F.2d 786, 788, 166 USPQ 138, 140 (CCPA 1970) and Ex parte Scherberich, 201 USPQ 397, 398 (Bd. App. 1977).

The prior art rejections

We shall not sustain any of the prior art rejections. Each of the examiner's prior art rejections is grounded in part on the examiner's mistaken determination that Scaringe meets the limitations in claim 24 that the compressor raises the temperature of the evaporated fluid medium to a second operating temperature which is greater than the temperature of the at least one solar loaded surface and that the radiator-condenser radiates heat from the compressed fluid medium through the at least one solar loaded surface. In dealing with these limitations, the examiner states on page 8 of the answer that

> [a] spacecraft inherently is a three-dimensional object and thus inherently has a plurality of surfaces, at least one of which is radiating and at least one of which is solar loaded. The radiator-condenser and the heat pipe network that are part of the heat dissipating apparatus for use on the spacecraft are disposed on the spacecraft in one way or another and are thus inherently coupled (directly or indirectly) to one of the plurality of the interior and/or exterior surfaces of the spacecraft. The compressor 33 or 33' is inherently operationally coupled to some spacecraft power source. Little or no patentable weight is given to the functional language in the claims (i.e., the limitations relating to raising the temperature of the fluid medium to a particular operating level as claimed). A reverse Rankine thermodynamic cycle heat pump is a standard vapor compression cycle heat pump by definition.

As an initial matter, the examiner's dismissal of the limitation relating to raising the temperature of the fluid medium to a temperature above that of the at least one solar loaded surface as deserving of little or no patentable weight is inappropriate. It is well settled that all words in a claim must be considered in judging the patentability of that claim against the prior art. See In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970).

While the compressors and condenser of Scaringe's heat pump system are thermally coupled to the radiator 20 by a heat pipe and while one of ordinary skill in the art would most probably infer that the radiator 20 is associated with at least one external surface of the spacecraft for heat rejection from the spacecraft, Scaringe gives absolutely no indication that the heat pump or radiator is in thermal communication with a solar loaded surface, which one of ordinary skill in the art would understand to mean a

surface other than the north or south face, or that the temperature of the fluid medium is raised above that of a solar loaded surface. Like appellants, Scaringe (column 2, lines 15-17) recognizes that the use of heat pumps in heat dissipation systems in spacecraft can improve the heat rejection capability of a spacecraft by permitting the heat-rejection temperature to be raised, which makes the radiator more efficient. Unlike appellants, however, Scaringe, does not disclose raising the heat-rejection temperature to a temperature above that of a solar loaded surface to permit such to be effectively used as a radiating surface.

For the foregoing reasons, we cannot sustain the rejection of claim 24, or claims 25, 28, 30, 31, 36 and 37 depending therefrom, as being anticipated[1] by Scaringe. Finding nothing in the additional teachings of Homer and Camaret relied upon in rejecting the remaining dependent claims which overcomes the above-noted deficiency of Scaringe, we also cannot sustain the rejections of claims 27, 32 and 33 as being unpatentable over Scaringe in view of Homer and claims 29, 34 and 35 as being unpatentable over Scaringe in view of Camaret.

CONCLUSION

[1] Anticipation is established only when a single prior art reference discloses, expressly or under the principles of inherency, each and every element of a claimed invention. RCA Corp. v. Applied Digital Data Sys., Inc., 730 F.2d 1440, 1444, 221 USPQ 385, 388 (Fed. Cir. 1984). In other words, there must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention. Scripps Clinic & Research Found. v. Genentech Inc., 927 F.2d 1565, 1576, 18 USPQ2d 1001, 1010 (Fed. Cir. 1991).

To summarize, the rejection of claims 24-37 under 35 U.S.C. § 112, first paragraph, is reversed and the rejection of claims 24-37 under 35 U.S.C. § 112, second paragraph, is sustained as to claims 35-37 and reversed as to claims 24-34. The rejections of claims 24, 25 and 27-37 under 35 U.S.C. §§ 102 and 103 are reversed. The examiner's decision is affirmed-in-part.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED-IN-PART

IRWIN CHARLES COHEN Administrative Patent Judge	)
NEAL E. ABRAMS Administrative Patent Judge	) BOARD OF PATENT) APPEALS) AND) INTERFERENCES
JENNIFER D. BAHR Administrative Patent Judge	)

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