

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. 28

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DAVE WOLFE, NGUYEN MINH,
KURT MEISTER and DAN MATULICH

Appeal No. 2003-0094
Application No. 08/995,786

ON BRIEF

Before COHEN, ABRAMS, and BAHR, Administrative Patent Judges.
ABRAMS, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the examiner's final rejection of claims 21-26. Claims 1, 2 and 6-11 have been allowed, and the remaining claims have been canceled.

We AFFIRM.

BACKGROUND

The appellants' invention relates to an environmental control system. An understanding of the invention can be derived from a reading of exemplary claim 21, which has been reproduced below.

The prior art references of record relied upon by the examiner in rejecting the appealed claims are:

Singleton	2,409,159	Oct. 8, 1946
Endres	3,241,316	Mar. 22, 1966
Hendriks <u>et al.</u> (Hendriks)	5,319,925	Jun. 14, 1994
Wolfe <u>et al.</u> (Wolfe)	5,678,647	Oct. 21, 1997

Claims 21-23, 25 and 26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Singleton in view of either Wolfe or Hendriks.

Claim 24 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Singleton in view of either Wolfe or Hendriks, taken further in view of Endres.

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. 24) for the examiner's complete reasoning in support of the rejections, and to the Brief (Paper No. 23) and Reply Brief (Paper No. 25) 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.

The appellants' invention is directed to an air cycle machine for generating a stream of air to cool an enclosure such as a passenger compartment of a vehicle. It is driven by compressed air from a turbine, and provides cool air without the use of refrigerants and without directly impacting the performance of the turbine. The invention adds a fuel cell to the thermodynamic cycle in such a manner that the cooling function is provided independently of the electrical power generation of the fuel cell.

Claim 21, the sole independent claim, recites the invention in the following manner:

21. An environmental control system comprising:
 - an air cycle machine including a compressor and a cooling turbine;
 - a heat exchanger; and
 - a fuel cell;
 - the compressor supplying a first stream of compressed air to an oxidant inlet of the fuel cell and a second stream of compressed air to an inlet of the cooling turbine during operation of the air cycle machine;
 - the second stream being cooled by the heat exchanger.

The first of the examiner's rejections under 35 U.S.C. § 103(a) is that the subject matter of claim 21 would have been obvious to one of ordinary skill in the art in view of

the combined teachings of Singleton and Wolfe. In arriving at this conclusion, the examiner acknowledges that Singleton fails to disclose or teach the claimed fuel cell, but takes the position that it would have been obvious to add a fuel cell to the environmental control system of Singleton in view of the teachings of Wolfe. The appellants argue that no suggestion exists to combine the references in the manner proposed by the examiner.

The test for obviousness is what the combined teachings of the prior art would have suggested to one of ordinary skill in the art. See, for example, In re Keller, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981). In establishing a prima facie case of obviousness, it is incumbent upon the examiner to provide a reason why one of ordinary skill in the art would have been led to modify a prior art reference or to combine reference teachings to arrive at the claimed invention. See Ex parte Clapp, 227 USPQ 972, 973 (Bd. Pat. App. & Int. 1985). To this end, the requisite motivation must stem from some teaching, suggestion or inference in the prior art as a whole or from the knowledge generally available to one of ordinary skill in the art and not from the appellant's disclosure. See, for example, Uniroyal, Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 1052, 5 USPQ2d 1434, 1439 (Fed. Cir.), cert. denied, 488 U.S. 825 (1988).

Singleton discloses a system for generating cool air to cool a space 1. The system comprises a shaft 19 upon which are mounted a first drive turbine 3 that is caused to rotate by the hot gases issuing from a combustion chamber 5, a second drive

turbine 4 that is motivated by compressed air, and a compressor 2 that is driven by the turbines and provides a first stream of air to the combustion chamber and a second stream of air through a cooler and then to the second turbine. The air exhausted from the second turbine flows to the space to be cooled. With regard to the requirements of claim 21, Singleton fails to disclose or teach a fuel cell and the compressor supplying a stream of compressed gas to an oxidant inlet of the fuel cell.

Wolfe is directed to an apparatus for powering an electric motor to propel a vehicle and comprises “a control mechanism and a fuel cell for providing electric power directly to the electric motor” (column 3, lines 18-20). As shown in Figure 5, which is the embodiment to which the examiner has referred, a compressor 98 and an electric generator 100 are mounted on a shaft that is rotated by a turbine 104. The compressor supplies compressed air to a fuel cell 80. As explained in lines 30-46 of column 8, “[t]he generator electric power output 102 . . . supplements the fuel cell electric power output 96 . . . [and] is added to the fuel cell output voltage in order to produce power for the electric motor.” In order to provide start-up and control flexibility, a combustor 125 is provided which receives the exhaust gases from the fuel cell along with additional fuel and “completes the reaction” of partially-reacted fuel and oxidizer streams from the fuel cell to boost the inlet temperature to the turbine (column 10, lines 39-44).

The examiner proposes to add a fuel cell to the Singleton system “upstream of the combustor 126” because a fuel cell would provide the advantages of “lower

emissions, high efficiency power generation and enhanced electrical generating capacity,” with reference to Wolfe at “col. 8, lines 30 and following” (Answer, page 4). The examiner has not pointed out where Wolfe sets forth these advantages of adding a fuel cell to a combustor, and we find no such teachings. Our review reveals only mention that the generator “boosts the voltage of the fuel cell” (column 8, line 41), that the integration of the fuel cell, the turbine, the compressor and the generator provide “high efficiency power generation” (column 8, lines 53-55), that the fuel cell and the generator “complement each other to produce a desirable power output” (column 10, lines 20-22), and that the combustor brings the system up to a pressure at which the fuel cell exhaust supplies heat to the turbine, completes the reaction of partially-reacted fuel and oxidizer streams emanating from the fuel cell, and increases the temperature of the incoming gases to the turbine (column 10, lines 37-45). These factors hardly support the aforementioned reasons given by the examiner for adding a fuel cell upstream of the combustor but rather, from our perspective, provide justification for the opposite, that is, adding a combustor downstream of a fuel cell to increase the efficiency of a system in which a fuel cell provides the primary power.

The mere fact that the prior art structure could be modified does not make such a modification obvious unless the prior art suggests the desirability of doing so. See In re Gordon, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984). While the Singleton system provides cool air and does so by driving a turbine by means of heat

generated in a combustion chamber, it does not also provide electricity. Thus, in the absence of teachings in the applied references that the addition of a fuel cell would be warranted by an improvement to the combustor in providing driving gases to the turbine, there would appear to be no advantage to adding a fuel cell to the Singleton system. This being the case, we fail to perceive any teaching, suggestion or incentive in either Singleton or Wolfe which would have led one of ordinary skill in the art to provide the Singleton system with a fuel cell upstream of the combustor.

It is our conclusion that the combined teachings of Singleton and Wolfe fail to establish a prima facie case of obviousness with regard to the subject matter recited in claim 21. We therefore will not sustain the rejection of claim 21 on the basis of Singleton and Wolfe or, it follows, of the like rejection of claims 22, 23 and 25, which depend from claim 21.

Independent claim 26 also stands rejected as being unpatentable over Singleton and Wolfe. Like claim 21, it requires a cooling turbine for expanding a first stream of air and a fuel cell for receiving a second stream of air. For the reasons discussed above regarding the rejection of claim 21, we also will not sustain this rejection of claim 26.

Endres has been added to the other two references in the rejection of claim 24, which depends from claim 21. However, Endres does not overcome the deficiency in suggestion to combine Singleton and Wolfe in the manner proposed by the examiner in

the rejection of claim 21. The rejection of claim 24 as being unpatentable over Singleton, Wolfe and Endres is not sustained.

In an alternative to the rejection of Singleton in view of Wolfe, the examiner proposes to modify Singleton in the same manner by virtue of the teachings of Hendriks, which is directed to a system for generating electricity by means of a turbine driving a generator. With reference to the embodiment of Hendriks' Figure 4, pressurized gas for motivating the turbine is provided by a burner chamber 20 whose intake is supplied with compressed air from a compressor 2 and the exhaust gas issuing from a fuel cell 10. As was the case in Wolfe, Hendriks teaches that the fuel cell generates electricity (column 2, lines 50-52). However, Hendriks also sets forth other advantages for incorporating a fuel cell into the system along with the combustion chamber:

The application of this [fuel] cell may cause an additional increase in efficiency with the same air stream and a somewhat less fuel consumption in the burner chamber. This effect is due to the waste heat of the cell increasing the heat content of the burner chamber. When applying a high temperature fuel cell (in the order of 1000° C., such as with a solid oxide fuel cell SOFC) the burner chamber of the gas turbine might even become virtually superfluous. Column 2, lines 40-48.

Thus, Hendriks instructs one of ordinary skill in the art that the use of a fuel cell in conjunction with a combustion chamber in supplying motivating gas to the turbine increases the efficiency of the system, perhaps even to the point where the combustion chamber might not be necessary. Armed with this explicit suggestion, it is our view that

one of ordinary skill in the art would have been motivated to modify the Singleton system by providing a fuel cell upstream of the inlet to combustion chamber 5, with the exhaust gases from the fuel cell being fed into the combustion chamber, as is the case in Hendriks. The modified Singleton apparatus thus meets the terms of claim 21, in that the compressor supplies a first stream of air to the oxidant inlet of a fuel cell and a second stream of air to an inlet of the cooling turbine.

We therefore conclude that the combined teachings of Singleton and Hendriks establish a prima facie case of obviousness with regard to the subject matter of independent claim 21, and we will sustain this rejection. Since the appellants have chosen to group claims 22-25 with claim 21 with regard to this rejection (Brief, pages 2 and 3), the rejection of these claims as being unpatentable over Singleton and Hendriks also is sustained. The same is true of claim 26, which although rejected under different grounds (Endres was added), also was grouped with claim 21.

Although we have carefully considered the arguments presented by the appellants with regard to this rejection, they have not persuaded us that the rejection should not stand. These arguments (Brief, pages 5 and 6; Reply Brief, pages 2 and 3), for the most part focus on the fact that the Hendriks apparatus is an electrical generator and not an environmental control system and upon differences between the structure of the Hendriks system and that of Singleton. However, the examiner applied Hendriks for its teachings regarding the advantages gained by having a fuel cell that discharges its

exhaust into a combustion chamber in a machine in which a turbine is driven by hot gases to rotate a compressor along with another rotating machine. It is true that in the Hendriks system the rotating machine is a power turbine for generating electricity rather than a fluid conditioning apparatus, as in Singleton. Nevertheless, we agree with the examiner that one of ordinary skill in the art would have learned from Hendriks that there are advantages for utilizing a fuel cell in the same relationship in other analogous machines, such as that of Singleton.

CONCLUSION

The rejection of claims 21-23, 25 and 26 as being unpatentable over Singleton in view of Wolfe is not sustained.

The rejection of claim 24 as being unpatentable over Singleton in view of Wolfe and Endres is not sustained.

The rejection of claims 21-23, 25 and 26 as being unpatentable over Singleton in view of Hendriks is sustained.

The rejection of claim 24 as being unpatentable over Singleton in view of Hendriks and Endres is sustained.

A rejection of each of the claims having been sustained, the decision of the examiner is affirmed.

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

AFFIRMED

IRWIN CHARLES COHEN
Administrative Patent Judge

NEAL E. ABRAMS
Administrative Patent Judge

JENNIFER D. BAHR
Administrative Patent Judge

)
)
)
)
)
) BOARD OF PATENT
) APPEALS
) AND
) INTERFERENCES
)
)
)
)

Appeal No. 2003-0094
Application No. 08/995,786

Page 12

HUGH P. GORTLER
HONEYWELL INTERNATIONAL INC.
LAW DEPARTMENT, 36-2-76000
2525 WEST 190TH STREET
TORRANCE, CA 90504