UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte LEE JUBY, RUSSELL BENSTEAD, and SIMON REDFORD

Appeal 2007-4120
Application 11/075,942
Technology Center 3700

Decided: February 11, 2008

Before MURRIEL E. CRAWFORD, JENNIFER D. BAHR, and
ANTON W. FETTING, *Administrative Patent Judges*.

BAHR, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Lee Juby et al. (Appellants) appeal under 35 U.S.C. § 134 from the Examiner's decision rejecting claims 1 through 17. We have jurisdiction over this appeal under 35 U.S.C. § 6 (2002).

THE INVENTION

Appellants' invention is directed towards a system for generating back-up electrical power, thereby providing an uninterruptible power supply (Spec. 1). The system includes a multi-stage air compressor and dryer 10 adapted to charge a pressure vessel 11 with a volume of compressed gas (Spec. 3 and fig. 1), a valve 14 for releasing gas from the vessel 11 at a predetermined pressure (Spec. 4 and fig. 1), a scroll expander 15 for allowing expansion of the compressed gas (Spec. 5 and fig. 1), and an electrical generator 16 for generating electrical energy (Spec. 5 and fig. 1). The energy contained in the compressed gas is recovered as mechanical energy when the compressed gas is allowed to expand in the scroll expander 15 (Spec. 2). The mechanical energy is then converted into electrical energy by the electrical generator 16 which is connected to the shaft 15a of the scroll expander 15 (Spec. 2 and fig. 1).

Claim 1 is illustrative of the claimed invention and reads as follows:

> 1. A system for generating back-up electrical power, comprising
>
> a vessel adapted to contain a volume of compressed gas,
>
> a valve to release gas from the vessel at a predetermined pressure,
>
> a scroll expander adapted to receive and pass said released gas and having a rotary member to be rotated by the flow of said released gas passed by the expander, and
>
> an electrical generator drivingly connected to the rotatable member of the expander thus to generate a supply of electrical power.

THE REJECTIONS

The Examiner relies upon the following references as evidence of unpatentability:

J. Parnag	US 3,531,943	Oct. 6, 1970
Ahrens	US 4,281,256	Jul. 28, 1981
Sullivan	WO 02/090747 A2	Nov. 14, 2002

Appellants seek review of the Examiner's rejections of claims 1-2, 4, and 6-17 under 35 U.S.C. §103(a) as unpatentable over Ahrens in view of Sullivan and claims 3 and 5 under 35 U.S.C. §103(a) as unpatentable over Ahrens in view of Sullivan and in further view of Parnag.

The Examiner provides reasoning in support of the rejections in the Answer (mailed February 20, 2007). Appellants present opposing arguments in the Appeal Brief (filed August 21, 2006).

FACTS

Ahrens

We make the following findings of fact with respect to Ahrens:

1. Ahrens teaches a system for generating electrical power including a vessel 23 for storing compressed air, a valve 27 for releasing the compressed air, a recuperator (heater) 30, a reciprocating internal combustion engine 22, and an electrical generator 21 connected to the reciprocating internal combustion engine 22 (col. 2, l. 66 through col. 3, l. 7 and fig. 2).
2. When generating electrical power, fuel is injected into reciprocating engine 22 and compressed air is withdrawn through valve 27 and

introduced into the reciprocating engine 22 through valve 29 after being heated in recuperator 30. The compressed air and the fuel are burned and expanded in the reciprocating engine 22, thereby driving the electrical generator 21 to produce electrical power (col. 3, ll. 8-22).

3. The reciprocating engine 22 acts as an expander when the system generates electrical power and as a compressor when storing compressed air (col. 3, ll. 23-30).

4, The air is compressed at a pressure of 10-80 atmospheres (col. 2, ll. 3-5).

5. Ahrens teaches a second embodiment including a multi-stage power generating system having a high pressure (HP) subsystem and a low pressure (LP) subsystem (col. 3, ll. 45-55 and fig. 3).

Sullivan

We make the following findings of fact with respect to Sullivan:

6. Sullivan teaches a power generation system including a prime mover subsystem 1 (high pressure (HP) subsystem) and a heat energy utilization subsystem 10 (low pressure (LP) subsystem) that uses the unusable exhaust steam from the prime mover subsystem to generate supplemental electrical power (p. 1, ll. 3-8 and fig. 1).

7. The prime mover system uses air from compressor 2 combined in combustor 4 with fuel from fuel source 3 to form a high-temperature, high-pressure combustion gas which enters a microturbine or a reciprocating internal combustion engine 5 where the gas uses its

energy to turn shaft 8, which is connected to alternator 6, causing the alternator 6 to produce electrical energy (p. 17, l. 22 through p. 18. l. 10).

8. After passing through the microturbine or the reciprocating internal combustion engine 5 and losing energy, the remaining combustion gas 7 is passed to the heat energy utilization subsystem 10 (p. 19, ll. 4-5).

9. The heat energy utilization subsystem 10 includes an evaporator 60, a valve 72, a scroll expander 30, a generator 80, and a condenser 40 (p. 18, ll. 11-25 and fig. 1).

10. The valve 72 regulates the amount of pressurized fluid flowing into scroll expander 30 such that the pressurized fluid gives up its energy via expansion within the scroll expander 30 to ultimately produce electrical power by generator 80 (p. 19, l. 23 through p. 20, l. 11).

11. The scroll expander 30 can be used as both a compressor and an expander (p. 6, ll. 11-13).

12. A scroll expander provides advantages such as reduced number of components, elimination of valves, and ease of operation (p. 7, ll. 5-13).

13. The heat energy utilization subsystem 10 (low pressure subsystem) can be used as an auxiliary system or as a stand-alone power generation source for a lower power mode (p. 4, ll. 22-23 and p. 8, ll. 8-10).

Parnag

We make the following findings of fact with respect to Parnag:

14. Parnag teaches the use of a dryer 102 in combination with a multi-stage compressor 161 when processing combustible gasses (col. 6, ll. 60-63 and col. 8, ll. 11-15).
15. The gas is dehydrated in vessel 102 (col. 3, ll. 41-45).

OPINION

Appellants argue claims 1-2, 4, and 6-17 together as a group. Therefore, in accordance with 37 C.F.R. §41.37(c)(1)(vii), we have selected claim 1 as the representative claim to decide the appeal, with claims 2, 4, and 6-17 standing or falling with claim 1. In view of Appellants' arguments, we will address the rejection of claims 3 and 5 separately.

Claims 1-2, 4, and 6-17

The issue presented in this appeal is whether Appellants have demonstrated that the Examiner has erred in determining that the subject matter of claim 1 is unpatentable over Ahrens in view of Sullivan. This issue turns on whether the combination of Ahrens and Sullivan proposed by the Examiner would result in the claimed invention.

The Examiner contends that it would have been obvious for one of ordinary skill in the art to replace the reciprocating internal combustion engine 22 of Ahrens with the scroll expander 30 of Sullivan "because both expanders are functionally equivalent" (Ans. 3). Appellants argue that "a scroll expander is not an obvious replacement for a reciprocating expander in [a] high pressure ratio application" (Br. 6), because: (1) "scroll expanders have a <u>much</u> lower in-built volume ratio than reciprocating expanders" (Br.

5-6) (underlining added); (2) a scroll expander is a non-combustion device, whereas the expander of Ahrens requires a combustion cycle (Br. 7-8); and (3) scroll expanders are used as part of an auxiliary system in combination with a primary power system (Br. 8).

With regard to Appellants' first argument, Appellants calculate that the optimum volume ratio for an expander used in a compressed gas back-up power system, as that of Ahrens, is 8.5:1-11.4:1 (based on Appellants' assumption of an optimum pressure ratio of 20:1-30:1), whereas a typical scroll expander has a volume ratio of 2:1 to 3:1 (Br. 5). Accordingly, Appellants take the position that it would not have been obvious to a person skilled in the art to replace the reciprocating expander of Ahrens with the scroll expander of Sullivan. We disagree with Appellants' position because Appellants have not provided any objective evidence that a typical scroll expander has a volume ratio of 2:1 to 3:1. The arguments of counsel cannot take the place of evidence in the record. *In re Schulze*, 346 F.2d 600, 602 (CCPA 1965). The Specification merely states that an air expander "<u>may</u> have a 3:1 'expansion ratio'" (Spec. 10) (underlining added). The use of the term "may" implies that the expansion ratio (volume ratio) of a scroll expander may have other values higher or lower than 3:1. We note that the system of Ahrens requires compressed air at a pressure of 10 to 80 atmospheres (approximately 10-80 bar) (Finding of Fact 4).[1] Using Appellants' calculations (Br. 5), for a pressure range of 10-80 bar, we calculate the resulting volume ratio for the reciprocating expander of Ahrens

[1] Similar to the device of Ahrens, we note that Appellants' invention requires the compressed air to be at a pressure of 10 bar prior to being introduced into the scroll expander 15 (Spec. 4).

to be about 5:1 to 23:1. Thus, we note that although the upper limit of the range is much higher, the lower limit of 5:1 is not that much higher than Appellants' argued range of 2:1 to 3:1 for a scroll expander. We also note that because the amount of electrical power produced by a compressed gas back-up power system is dependent on the expansion of the compressed gas (Findings of Fact 2 and 10), a system with an expander having a low volume ratio (expansion ratio) will produce a lower amount of electrical power. Therefore, although the scroll expander of Sullivan may not be an optimum replacement for the reciprocating expander of Ahrens, we find that it will nonetheless function as required, albeit at a lower power level. "A known or obvious [product] does not become patentable simply because it has been described as somewhat inferior to some other product for the same use." *In re Gurley*, 27 F.3d 551, 554 (Fed. Cir. 1994). The reason to modify the reference may often prompt a person of ordinary skill in the art to do what the inventor has done, but for a different purpose or to solve a different problem. It is not necessary that the prior art suggest the combination to achieve the same advantage or result discovered by an applicant. *See, e.g., In re Kahn*, 441 F.3d 977, 987 (Fed. Cir. 2006). "The fact that the motivating benefit comes at the expense of another benefit, … should not nullify its use as a basis to modify the disclosure of one reference with the teachings of another. Instead, the benefits, both lost and gained, should be weighed against one another." Winner Int'l Royalty Corp. v. Wang, 202 F.3d at 1349 n.8 (Fed. Cir. 2000). In this case, a scroll expander provides other advantages such as reduced number of components, elimination of valves, and ease of operation (Finding of Fact 12) that would outweigh its capacity

limitations, especially in lower power applications where such capacity limitations are not an issue.

We disagree with Appellants' second argument, because obviousness does not require that all of the features of the secondary reference be bodily incorporated into the primary reference *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). Moreover, the artisan is not compelled to blindly follow the teaching of one prior art reference over the other without the exercise of independent judgment. *Lear Siegler, Inc. v. Aeroquip Corp.*, 733 F.2d 881, 889, 221 USPQ 1025, 1032 (Fed. Cir. 1984). After all, "[a] person of ordinary skill is also a person of ordinary creativity, not an automaton." *KSR Int'l. Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1742 (2007). We note that both the reciprocating expander of Ahrens and the scroll expander of Sullivan are used as either an expander or as a compressor (Findings of Fact 3 and 11). Both devices use a pressurized gas to produce electrical energy (Findings of Fact 2 and 10). Both devices are part of systems that employ a high pressure (HP) subsystem and a low pressure (LP) subsystem (Findings of Fact 5 and 6). Both devices can be used as an auxiliary system or as a stand-alone power generation source (Findings of Fact 1, 2, 5 and 13). Hence, we agree with the Examiner that both devices are functionally equivalent (Ans. 3). As such, modifying the system of Ahrens to provide the scroll expander of Sullivan would not have been uniquely challenging to a person of ordinary skill in the art because it is no more than "the simple substitution of one known element for another or the mere application of a known technique to a piece of prior art ready for the improvement." *KSR*, 127 S.Ct. at 1741. Therefore, the substitution appears to be the product not

of innovation but of ordinary skill and common sense. Accordingly, we find that the scroll expander of Sullivan would have been a predictable replacement for the reciprocating expander of Ahrens.

As to Appellants' third argument, we disagree with Appellants' position because Sullivan specifically teaches that the heat energy utilization subsystem 10 (low pressure subsystem) can be used both as an auxiliary system and as a stand-alone power generation source for a lower power mode (Finding of Fact 13). Furthermore, the system of Ahrens can also be used as a stand-alone power generation source (Findings of Fact 1 and 2). Therefore, if the desired output electrical power level is lower, we find that it would have been obvious to use the scroll expander of Sullivan in the device of Ahrens because a scroll expander provides advantages such as reduced number of components, elimination of valves, and ease of operation (Finding of Fact 12).

For the foregoing reasons, Appellants' arguments do not persuade us the Examiner erred in rejecting claim 1 as unpatentable over Ahrens in view of Sullivan. The rejection of claim 1, and claims 2, 4, and 6 through 17 standing or falling with claim 1, is sustained.

Claims 3 and 5

With respect to claims 3 and 5, the Examiner found that "it would have been obvious…to a person having ordinary skill in the art to use the multi-stage compressor and dryer in Ahrens . . . as taught by Parnag . . . for the purpose of achieving the specific conditions of the working fluid" (Ans. 4).

First, Appellants argue that "[w]hat the Examiner has indicated as a dryer is not a dryer but a vessel" (Br. 10). We disagree. Parnag specifically teaches that the gas is dehydrated in vessel 102 (Finding of Fact 15). Hence, we find that vessel 102 functions as a dryer and as such, it is a dryer.

Secondly, Appellants argue that the multi-stage compressor in the instant claimed invention is also a dryer (Br. 11). Appellants' argument, as we understand it, is that the compressor and the dryer of the instant claimed invention form an integral structure, whereas in the combination of Ahrens in view of Sullivan and in further view of Parnag they form a separable structure. Even assuming the claim requires an integral compressor and dryer, this argument is not persuasive. We note that in *In re Larson*, 340 F.2d 965, 968 (CCPA 1965), the court affirmed a rejection holding that a claimed integral structure was obvious over a separable structure of the prior art because "the use of a one piece construction instead of the structure disclosed in [the prior art] would be merely a matter of obvious engineering choice."

Thirdly, Appellants appear to argue that it would not have been obvious to combine the multi-stage compressor and dryer disclosed in Parnag with Ahrens (Br. 11) because they are from such different technologies. This argument is not persuasive. "When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability." *KSR*, 127 S.Ct. at 1740. As discussed above, the Examiner reasons that such combination would have been obvious "for the purpose of

achieving the specific conditions of the working fluid." Appellants have not explained why any differences in technologies between Parnag and Ahrens are of such a nature as to have dissuaded a person of ordinary skill in the art at the time of Appellants' invention from utilizing a multi-stage compressor and dryer in combination to bring the stored compressed air in Ahrens' vessel 23 to its desired working pressure and humidity conditions, as reasoned by the Examiner.

For the foregoing reasons, Appellants' arguments do not persuade us the Examiner erred in rejecting claims 3 and 5 as obvious over Ahrens in view of Sullivan and in further view of Parnag. The rejection of claims 3 and 5 is sustained.

SUMMARY

The decision of the Examiner to reject claims 1-17 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv) (2006).

AFFIRMED

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