United States District Court,
N.D. Illinois.

QUANTUM GROUP, INC,
Plaintiff.
v.
AMERICAN SENSOR, INC., American Sensor Electronics, Inc., and Klesman and Associates,
Defendants.
AMERICAN SENSOR ELECTRONICS INC. and Klesman and Associates,
Counter-claimants.
v.
QUANTUM GROUP, INC,
Counter-defendant.

May 5, 1997.

MEMORANDUM OPINION AND ORDER

HART

On February 9, 1996, plaintiff Quantum Group, Inc. ("Quantum") filed this action against defendants American Sensors Inc., American Sensor Electronics, Inc. and Klesman and Associates (collectively, "ASE"), claiming that ASE infringed U.S. Patent No. 4, 896,143 ("the '143 patent"). At issue in this action are claims 4, 5, 8 and 10 FN1 of the '143 patent. Presently pending is ASE's motion for summary judgment.

I. BACKGROUND

Quantum is the owner of the '143 patent, entitled "Gas Concentration Sensor with Dose Monitoring." The '143 patent is directed to a method for measuring a target gas concentration, such as carbon monoxide. This method can be used as the sensor system of a carbon monoxide detector.

Defendant American Sensors Electronics, Inc., based in Toronto, manufactures and sells a number of different models of carbon monoxide and smoke detectors. Its parent holding company is defendant American Sensors, Inc. Defendant Klesman and Associates, Inc. is a local distributer of ASE's products.

The '143 patent discloses the following background facts to the invention: For many years prior to plaintiff's patent, Figaro Engineering Co., Inc. of Osaka, Japan, had manufactured gas detection sensors using metallic oxide semiconductors sensors. As described in U.S. Patent No. 3,676,820, the Figaro sensors were based on tin oxide. The Figaro method detects carbon monoxide by measuring the resistance of the tin oxide. The utility of this methodology for carbon monoxide sensors, however, was compromised by tin oxide's sensitivity to other gases and by ambient temperature and humidity. In addition, the sensor tended to saturate with exposure even to low concentrations of gas if the levels of gas persisted.

In 1975, an individual named Le Vine disclosed a method in U.S. Patent No. 3,906,473 to enhance the sensor's sensitivity to carbon monoxide while decreasing responses from undesired organic vapors and reducing the possibility of saturation. Under Le Vine's method, the sensor is operated in a cyclic manner. The tin oxide sensor is heated to a high temperature for a short period of time, then reduced to a lower temperature for a period of time. The resistance of the tin oxide is measured at the end of the lower temperature period.

Le Vine's patent teaches that operating the sensors in a cyclic manner improves the performance of the sensors because the high temperature purges the sensor by driving off volatile components and returning the sensor to its high impedance state. When the sensor cools to the lower temperature, where it is more sensitive to CO, a more accurate measurement can be made. The sensor's cycling manner also prevents saturation.

Although the Le Vine method improved upon the Figaro method, problems still existed with the sensitivity of the sensor. The Le Vine method requires the use of a thermistor matched to the temperature coefficient of tin oxide to compensate for changes in ambient temperature. In addition, changes in humidity affect tin oxide's response, requiring humidity compensation, which is neither simple nor inexpensive. These sensitivity problems increased the chance of false alarms and prevented the use of the sensors in applications such as automatic shutoff devices for combustion appliances.

The '143 patent represents an innovation on Le Vine's methodology. The new methodology compensates for changes due to ambient temperature and humidity. Any additional compensatory elements, such as those required in the Le Vine method, are unnecessary. The sensors described in the '143 patent can operate effectively from below 15 percent to above 90 percent relative humidity and from below 0 degrees Celsius to above 50 degrees Celsius. The '143 patent method also allows for more accurate carbon monoxide measurement. Although accurate sensors had been based on expensive and short-lived electrochemical sensors, '143 patent sensors can be made inexpensively and are appropriate for applications such as safety shutoff systems for combustion devices.

The '143 patent utilizes the same high/low temperature cycle as the Le Vine method but differs in that the current supplied to heat the samples is a series of pulses, rather a constant supply. Measurements of the sensor's resistance are taken when the current is not flowing. Only two measurements are needed, one at a high temperature and one at a low temperature.

ASE's detectors also operate in a cyclic manner, heating the tin oxide sensor to a high temperature for a set period of time, followed by a longer period of heating the sensor to a lower temperature. Heating during the low temperature period is accomplished by pulsing the electrical current provided to the heating element of the tin oxide sensor. All resistance measurements are taken at the end of the low temperature cycle; no measurements are taken at the end of the high temperature cycle. ASE submits conflicting evidence as to the length of time the sensors' heaters are shut off, *i.e.*, the period during which measurements may be taken. ASE's Rule 30(b)(6) witness testified that the heater is shut off for four seconds, although its expert testified to a 90 second time period.

Although the parties dispute the exact method of measurement, they basically agree that ASE's detectors measure resistance only at the conclusion of the low temperature heating cycle. ASE explains that if the measurement indicates that resistance exceeds a certain value, a second resistance measurement is taken within one millisecond. ASE states that the second measurement is taken to ensure that an accurate reading

has been made. In certain situations, a third and fourth measurement will be made. If an accurate reading has been taken, digital register in the detector is incremented by the number 1. If a subsequent reading indicates that the concentration has decreased below the threshold value, the number stored in the register is decreased by one. The detectors contain separate registers for 100 ppm and 200 ppm threshold comparisons. When the 100 ppm comparison indicates that carbon monoxide concentration exceeds the 100 ppm threshold value, the content of the 100 ppm register is checked. If the 200 ppm comparison indicates that the 200 ppm threshold has been exceeded, than the 100 and 200 ppm registers are separately checked. If any of those checks indicates that a preset number has been exceeded, an alarm signal is generated.

Quantum filed its application for the '143 patent in April, 1987. In the first Office Action, on March 31, 1988, the Examiner allowed claims 17-19 (issued as claims 8-10) and objected to claims 12 and 13 on the grounds of indefiniteness. *See* 35 U.S.C. s. 112. Claim 12 was ultimately rejected as anticipated by a prior art reference. The Examiner also stated that claim 13 would be allowable if rewritten to overcome the rejection based on indefiniteness and to include all of the limitations of the base claim and any intervening claims. Quantum revised the claim to cure the indefiniteness objection and to include other limitations. After a further amendment to correct a typographical error, claim 13 was issued as claim 4.

On February 9, 1996, Quantum filed this action against ASE, alleging that ASE's carbon monoxide detectors infringed the '143 patent. Discovery was bifurcated as to liability and damages. At the close of the liability phase of discovery, ASE moved for summary judgment on the basis of noninfringement.

II. ASE'S MOTION FOR SUMMARY JUDGMENT

Rule 56(c) of the Federal Rules of Civil Procedure provides that summary judgment "shall be rendered forthwith if the pleadings, depositions, answers to interrogatories and admissions on file, together with the affidavits, if any, show that there is no genuine issue as to any material fact and that the moving party is entitled to a judgment as a matter of law." The purpose of summary judgment is to assess the proof in order to see whether there is a need for trial. Matsushita Electric Industrial Co., Ltd. v. Zenith Radio Corp., 475 U.S. 574, 586 (1986). On a motion for summary judgment, the entire record is considered with all reasonable inferences drawn in favor of the nonmovant and all factual disputes resolved in favor of the nonmovant. Oxman v. WLS-TV, 846 F.2d 448, 452 (7th Cir.1988); Jakubiec v. Cities Service Co., 844 F.2d 470, 471 (7th Cir.1988). The burden of establishing the lack of any genuine issue of material fact rests with the movant. Jakubiec, 844 F.2d at 473. The non-movant, however, "must set forth specific facts showing there is a genuine issue for trial, and cannot rest merely on the allegations contained in the pleadings. Celotex Corp. v. Catrett, 477 U.S. 317, 323 (1986).

Determining whether a patent is literally infringed involves a two-step analysis: first, the court determines the proper construction of the asserted claim, and second, the court decides whether the accused method or product infringes the asserted claim as properly construed. Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1581-82 (Fed Cir.1996). The first step, claim construction, is a question of law. *Id*. at 1582. The Federal Circuit has provided guidance for determining the proper construction of a claim:

It is well-settled that, in interpreting an asserted claim, the court should look first to the intrinsic evidence of record, *i.e.,* the patent itself, including the claims, the specification and, if in evidence, the prosecution history. Such intrinsic evidence is the most significant source of the legally operative meaning of disputed claim language.

First, we look to the words of the claims themselves, both asserted and nonasserted, to define the scope of the patented invention. Although words in a claim are generally given their ordinary and customary meaning, a patentee may choose to be his own lexicographer and use terms in a manner other than their ordinary meaning, as long as the special definition of the term is clearly stated in the patent specification or file history.

Thus, second it is always necessary to review the specification to determine whether the inventor has used any terms in a manner inconsistent with their ordinary meaning.... [T]he specification is always highly relevant to the claim construction analysis. Usually it is dispositive; it is the single best guide to the meaning of a disputed term.

Id. (citations omitted). In addition, a court may look to the prosecution history of the patent, if it is in evidence. *Id*. Where, as in most cases, intrinsic evidence alone resolves any ambiguity in a claim term, relying on extrinsic evidence is unnecessary and improper. *Id*. at 1583.

A. Claim 8

Claim 8 is a method for periodically monitoring carbon monoxide by "adding to a digital register when the concentration exceeds a selected value; and subtracting from a digital register when the concentration is less than the selected value." ASE contends that it is entitled to summary judgment as to claim 8 because its sensor devices lack the means for adding concentrations to and subtracting concentrations from the digital register. ASE asserts that the registers do not infringe claim 8 because they merely accumulate the number of occasions on which the detector senses a carbon monoxide level above a threshold value.

Although ASE 's register does not accumulate the actual concentration of the CO, *e.g.*, 200 ppm, ASE's register accumulates values dependent on and representative of gas concentrations. At his deposition, Mr. Almeida, ASE's Rule 30(b)(6) witness testified as follows:

: It is certainly adding to a data register there; right?

A: The data is being incremented one by one.

Q: And the action of incrementing the data depends on the digitized measurement of carbon monoxide concentration; right?

A: Yes.

The language of claim 8 requires only adding, not adding concentrations. The increment "1" represents a number exceeding a certain gas concentration. ASE acknowledges that its detectors periodically measure carbon monoxide concentrations. Summary judgment will be denied as to claim 8.

B. Claim 4

ASE argues that it is entitled to a judgment as a matter of law that its products do not infringe claim 4 of the '143 patent because its products are based on the prior art of the Le Vine patent, rather than the teaching of the '143 patent. Issued claim 4 states as follows:

A gas concentration sensor system comprising:

a conductive metal oxide gas sensor having resistance which is variable in response to gas concentration, including concentration of a target gas;

means connected to the gas sensor for measuring a first resistance of the gas sensor at a lower temperature;

means connected to the gas sensor for intermittently heating the gas sensor from the lower temperature to a higher temperature; means connected to the gas sensor for measuring a second resistance of the gas sensor at the higher temperature;

means connected to the measuring means for determining target has concentration as a function of both the first and second resistances;

register means for accumulating values of target gas concentrations exceeds a selected value; and

means for subtracting values from the register means when target gas concentration is less than selected value.

1. Scope of Claim 4

ASE first claims that it is entitled to summary judgment as to claim 8 because its sensors measure resistance only after the low temperature cycle. ASE asserts that it is practicing the Le Vine method of using high/low cycles to purge the sensor, rather than utilizing the '143 patent's methodology requiring measurements at the conclusion of both cycles. ASE concludes:

[B]y the words of the claim itself, the second resistance measurement cannot be taken at *any* temperature higher than that of the low temperature cycle. The claim is restricted to a resistance measurement taken during or immediately following the high temperature cycle of the device.

ASE admits that it makes more than one measurement, but states that the second measurement is taken within one millisecond of the first measurement to ensure that an accurate measurement has been made. ASE asserts that the difference between the two temperatures at the times of measurement is infinitesimal.

Quantum responds that ASE's detectors infringe claim 4 because they measure resistance at one temperature and take a second measurement at a different temperature. Quantum argues that claim 4 does not designate a particular order or sequence of measurement. Quantum asserts that a millisecond time span between measurements and an infinitesimal temperature drop cannot be presumed because the period where the heater shut off is at least four seconds. Quantum questions the plausibility of ASE's claim that it makes the second measurement for accuracy purposes. According to Quantum, the true reason for the second measurement is to compensate for humidity effects, just as the '143 patent teaches.

The first step of the analysis, determining the scope of the patent, involves principally two questions: First, does claim 4 require a measurement to be taken after the high temperature cycle or does claim 4 only require that the two measurements be taken at different temperatures? The second question to be answered, assuming that a measurement need not be taken after the high temperature cycle, is whether there is a limit as to how small the differential in temperatures may be.

As to whether claim 4 requires that a resistance measurement be taken after the high temperature cycle, the language of the patent is examined first. Claim 4 requires a means to heat the sensor "from the lower temperature to the higher temperature" and means "for measuring a second resistance of the gas sensor at the higher temperature." From this language, it would appear that the second resistance measurement must be taken at the temperature to which the sensor is heated. The specification, however, states that the period between the pulses when the current is not flowing may be used for the measurement of the sensor's resistance. The preferred embodiment further notes that "[a]lthough the method has been described in terms of measuring two resistances at two different temperatures, it will be apparent that enhanced results may be provided by making three or more measurements at different temperatures."

To be consistent with this language, claim 4 must be interpreted to mean that the higher temperature measurement need not be taken precisely at the end of the high temperature cycle. The purpose of the high temperature cycle is to purge the sensor and return it to its high impedance state-this is the teaching of the Le Vine patent. The teaching of the '143 patent is that two measurements at different temperatures allow "the effect due to humidity ... [to] be deduced by suitable computation, and compensation can be mathematically performed." The specification states that "[t]he resistance measurements made just after the high current interval are more dependent on ambient temperature and humidity than carbon monoxide concentrations." Therefore, claim 4 requires only that measurements be taken at different temperatures during a non-pulse period so that they are capable of being used in a calculation to deduce the effects due to humidity and ambient temperature.

Quantum argues that claim 4 does not include a humidity compensation limitation, but the specification expressly provides that the '143 patent's "improvement [over Le Vine] compensates for response changes due to changes in ambient temperature and humidity ... without the need for additional compensating elements." If claim 4 is read to exclude this limitation, then there is no improvement on the Le Vine methodology.

Quantum also argues that claim 4 does not require any specific differential in temperature because the language of claim 4 refers only generally to "higher" and "lower" temperatures. The language of claim 4 does not limit the these temperatures to specific ranges, therefore it would be improper to read specific numerical range into claim 4. But similarly, the patent's stated innovation over Le Vine cannot be ignored. *See* Ekchian v. Home Depot. Inc., 104 F.3d 1299, 1303 (Fed.Cir.1997) (although term not limited in claim language, within the context of patent "conductive liquid-like medium," means a medium sufficiently conductive to perform its stated function as a variable capacitor plate). The temperature differential between the two measurements must be large enough to deduce the effects due to humidity and ambient temperature through a mathematical calculation, but this differential is not limited to the differential stated in the preferred embodiment.

2. ASE's Detectors

ASE asserts that its detectors do not fall within the scope of the patent because they do not measure resistance at "higher" and "lower" temperatures. ASE asserts that its resistance measurements are taken one millisecond apart and, inferentially, any drop in temperature between the two measurements is infinitesimal. The exact method of ASE's detectors, however, is disputed. ASE's expert and Rule 30(b)(6) witness testified to long periods of time where the heater is shut off, 90 seconds and four seconds, respectively. ASE has not explained the conflicting testimony, nor has it provided a reason for the lengthy period during which the heater is turned off. ASE acknowledges that up to four resistance measurements may be taken per cycle, but

does not explain when the third and fourth measurements are taken. Given the long gap in time where the heater is turned off, the temperature drop between the four potential measurements could be great enough that one temperature is more dependent upon the effects of humidity and the other is relatively more sensitive to carbon monoxide than humidity. If this were the case, and ASE's detectors deduced the effects of humidity and ambient temperature based on the multiple measurements, then they would be utilizing the teaching of the '143 patent, rather than merely Le Vine's method. ASE has not established that it is entitled to summary judgment as to claim 4.

IT IS THEREFORE ORDERED that:

(1) Motion of defendants American Sensors, Inc., American Sensor Electronics, Inc. and Klesman and Associates for summary judgment [30] is denied.

(2) The parties are directed to appear at a status hearing on May 7, 1997 at 9:15 a.m. and present a schedule for completion of all damage discovery within 90 days.

(3) The parties shall present their views with respect to the appointment of a court expert at the hearing on May 7, 1997.

FN1. Claim 5 is dependent on claim 4; claim 10 is dependent on claim 8. ASE does not address claims 5 and 10 in its motion and supporting memorandum. Therefore, only claims 4 and 8 will be addressed.

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