THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 19

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte WOLFGANG HEIMBERG

Appeal No. 1998-1503
Application No. 08/676,907

ON BRIEF

Before HAIRSTON, KRASS, and RUGGIERO, Administrative Patent Judges.

KRASS, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the final rejection of claims 2 and 3, the only claims pending in the application.

The invention is directed to a circuit for driving an excitation coil of an electromagnetically driven reciprocating pump for use in a fuel injection device.

Independent claim 2 is reproduced as follows:

2. A reciprocating pump used as a fuel injection device, comprising:

an excitation coil which is driven by an excitation current;

an armature operatively associated with the excitation coil for operating a fluid-displacement element of the pump; and

an excitation circuit operative for supplying current pulses to the excitation coil, the excitation circuit comprising:

a power transistor in series with the excitation coil and with a measuring resistor having a side connected to the transistor;

a comparator having an output and two inputs, the output being connected to a control input of the transistor;

one input of the comparator being responsive to a selectively variable reference signal corresponding to a predetermined target current in the excitation coil; and

the other input of the comparator being connected to the side of the measuring resistor that is connected to the transistor and thus being responsive to the actual current through the excitation coil, so that the comparator compares the actual current and the target current and operates to drive the transistor to adjust the actual current to the

target current, and to turn off the current through the excitation coil when the actual current exceeds the target current, so that the current through the excitation coil is repeatedly switched off and on as long as the reference signal prevails at the one input of the comparator,

whereby the excitation coil is controlled by both the duration and amplitude of the reference signal to the comparator.

The examiner relies on the following references:

Takahashi 4,377,144	Mar. 22, 1983	
Suquet	4,944,281	Jul. 31, 1990

In addition, the examiner relies on admitted prior art [APA], at page 1 of the specification, regarding the notoriety of using reciprocating pumps to drive fuel injectors.

Claims 2 and 3 stand rejected under 35 U.S.C. § 103 as unpatentable over Suquet in view of APA and Takahashi.

Reference is made to the briefs and answer for the respective positions of appellant and the examiner.

OPINION

We reverse.

We have reviewed the evidence before us, including, inter alia, the arguments of appellant and the examiner and the applied references and we conclude therefrom that although the examiner has established a prima facie case of obviousness with regard to the claimed subject matter, shifting the burden to appellant, appellant has presented an argument against the prima facie case which has not, in our view, been adequately addressed by the examiner. Accordingly, while we find the decision here to be a close call, we are constrained to find for appellant.

More specifically, the examiner has applied Suquet to show circuitry for regulating current in an inductive load. That circuitry, shown in Suquet's Figure 2A, for example, includes the claimed transistor, comparator and measuring resistor connected in a like manner to achieve a similar result but for the claimed "selectively variable reference signal" and the claimed "reciprocating pump." The examiner relies on Takahashi to show a variable reference voltage by showing a two level reference voltage and argues that it would have been obvious to employ such a variable reference signal in the circuit of Suquet. We do not disagree and, in fact, in

our view, even without Takahashi, it appears to us that the skilled artisan would have recognized that the fixed reference voltage, 6, of Suquet may be made variable when it is desired to change the signal to which the measured signal is compared. Thus, allowing the reference signal in Suquet to be variable would have enabled the artisan to control the amplitude of the current flowing in the inductive load. The examiner also relies on APA in contending the obviousness of employing a well known reciprocating pump for the inductive load, 1, of Suquet, especially in view of Suquet's disclosure (column 1, lines 16-17) that the patented device is applicable to the solenoid valves of fuel injectors.

The examiner's reasoning, at first blush, appears reasonable and the examiner's explanation of the applicability of the applied references and reasons for combining the references establishes, in our view, a prima facie case of obviousness.

At this point, the burden was shifted to appellant to rebut, by persuasive argument and/or objective evidence, the prima facie case of obviousness.

Appellant has argued that neither Suquet nor Takahashi is directed to a reciprocating pump, as claimed. Appellant explains that while these two references are directed to devices within the field of fuel injection, they are directed to the opening and closing of a valve. We agree. The opening and closing of a solenoid valve, as in Suquet and/or Takahashi, is determinative of the duration of the time in which the valve is open/closed. The examiner has pointed to nothing within the teachings of Suquet or Takahashi that would indicate that the excitation coil, or inductive load, is also controlled, in addition to duration of a reference signal, by the amplitude of the reference signal.

Appellant argues that the opening/closing of a valve in Suquet and Takahashi allows fuel "already under pressure" to flow into a combustion chamber. The examiner dismisses this argument by contending that the argument is not directed to claimed subject matter. While we agree with the examiner that the claims say nothing about fuel "already under pressure," we believe appellant is merely attempting to draw a distinction between the operation of a reciprocating pump, as claimed, and the valve opening and closure taught by Suquet and Takahashi.

That is, the instant claims are specifically directed to a reciprocating pump used as a fuel injection device and that pump comprises an excitation circuit for supplying current pulses to an excitation coil and the excitation coil is controlled by both the duration and amplitude of the reference signal to the comparator. If we understand appellant's position, it is that the reciprocating pump would create the pressure which the fuel is under when it flows into the combustion chamber whereas the opening and closure of a solenoid valve, as in Suquet and Takahashi, allows the fuel, which is already under pressure, to flow into the combustion chamber. Therefore, the reciprocating pump to which the instant claims are directed would be upstream of the solenoid valves to which Suquet and Takahashi are directed. As such, appellant argues, it would not have been obvious to substitute a solenoid operated pump for the solenoid valve in Suquet and then substitute the valve-controlled circuit of Takahashi for the valve-control circuit of Suquet and then modify those circuits as required by claims 2 and 3. Appellant states, at page 8 of the principal brief, "Such a substitution is neither

logical nor plausible, given the different purposes and operation of a solenoid valve vs. a solenoid pump."

The examiner's response is merely to state that the type of inductive load is "immaterial" and that it would have been obvious to substitute a reciprocating pump for the inductive load, 1, of Suquet. While there may be some reason, of which we are unaware, for substituting a reciprocal pump for the inductive load of Suquet, the examiner's rationale that it would have been obvious to substitute a reciprocal pump for the inductive load of Suquet merely because reciprocal pumps were known is not sufficient in view of appellant's argument that the examiner's substitution is illogical in view of the different purposes and operation of a solenoid valve and a reciprocating pump. The examiner has not sufficiently responded to appellant's apparently reasonable argument. As such, weighing the evidence before us on this record, we are constrained to find for appellant. That evidence indicates a strong argument by appellant as to why reciprocating pumps are different than solenoid valves and that it would not have been obvious to substitute one for the other, versus the examiner's unsupported contention that it would have been obvious to

substitute a reciprocating pump for the inductive load taught by the prior art. The instant claims explicitly call for a reciprocating pump used as a fuel injection device comprising the remaining claimed elements. The examiner's argument that it would have been obvious to employ the circuitry of Suquet and Takahashi with a reciprocating pump because of a mere substitution of a pump for the inductive device shown by Suquet is overcome by appellant's argument that the different purposes and operation of a reciprocating pump would not have led the skilled artisan to make such a substitution.

The examiner's decision rejecting claims 2 and 3 under 35 U.S.C. § 103 is reversed.

REVERSED

KENNETH W. HAIRSTON Administrative Patent Judge	)	
ERROL A. KRASS Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES

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JOSEPH F. RUGGIERO)
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