Paper No. 21

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte J.P. STEINER and DANIEL J. ROCKWELL

Appeal No. 2002-0496
Application No. 09/182,542

ON BRIEF

Before THOMAS, KRASS, and BARRY, *Administrative Patent Judges*.
BARRY, *Administrative Patent Judge*.

DECISION ON APPEAL

A patent examiner rejected claims 1-36. The appellants appeal therefrom under 35 U.S.C. § 134(a). We affirm-in-part.

BACKGROUND

The invention at issue on appeal locates faults in an underground residential (power) distribution ("URD") system. A typical URD system is configured as a loop with an open point along it. Sections of cables connect transformers that supply power to customers. The system is fed from both ends of the loop via overhead power lines. Because of the open point, each half of the loop is fed independently. (Spec. at 1.)

When a section of cable fails, it causes a blackout. To return power to customers, a repair crew must find the failed section of cable and reconnect the transformers on either side thereof with a working section of cable. Conventionally, explain the appellants, a faulted circuit indicator ("FCI") is installed on the cable at each transformer enclosure to assist the repair crew as follows. Power is supplied to the cable from one end only, viz., the "feed point." The other end is left open, viz., the "open point". When a cable fails, a large over current passes through the cable from the feed point into the fault. The over current trips each FCI located between the feed point and the fault. The FCIs in the transformer enclosures between the open point and the fault do not trip because no over current flows through these cable sections. The repair crew examines each FCI until it locates the last tripped FCI and the first "untripped" FCI; the failed cable section lies therebetween. (*Id.* at 1-2.)

Unfortunately, the larger the URD, the larger the number of FCIs needed to monitor the system. The appellants also add that "traditional FCIs . . . are expensive to install, time consuming to operate and somewhat unreliable." (*Id.* at 2.)

Accordingly, the appellants' use a fault distance indicator ("FDI") to determine the location of a fault on each half of a URD loop. For each half, an FDI is placed at the junction between two of sections of cable. After a fault occurs in a half, the associated

FDI provide a direction and a distance thereto. A repair crew uses these data to determine where to dig to find the faulty portion of the failed cable section.

The appellants invention comprises two embodiments. (Wharton Decl. at 4.) The first embodiment of the FDI includes a microprocessor, a delay element, a digital memory, and a phase monitor. When a section of cable breaks down, the microprocessor detects radio frequency ("RF") signals generated by resultant electrical arcing. Upon breakdown, the data stored in the delay element represent the RF signals on the cable immediately before, during, and immediately after the occurrence of fault. The microprocessor loads these data into the digital memory. The microprocessor or an external fault analyzer then generates a function that approximates the response of the cable to a short circuit. The function is defined by an equation having parameters that may be adjusted to simulate the position of the fault on the cable system. The parameters are adjusted until the values produced by the equation most closely match the stored values. The parameters of the equation are then used to specify the distance from the FDI to the fault. (*Id.*)

The phase monitor monitors the instantaneous phase of the alternating current ("AC") power signal in the loop. The phase of the AC power signal and the relative polarization of the particular sequence of pulses resulting from the fault determine the propagation direction of the RF signals, and thus, the direction of the fault from the FDI. Accordingly, the first embodiment locates the fault by specifying the distance from the FDI to the fault and the direction along the loop from the FDI to the fault. (*Id.* at 5.)

The second embodiment injects an impulse signal into the URD system and records the RF response thereto at an FDI to measure the impulse response of the unfaulted cable. The embodiment then converts this impulse response into an impedance transfer function. After a fault occurs, the impedance transfer function of the faulted cable is also determined. Using the transfer function of the unfaulted cable system and the impedance function of the cable, the embodiment generates a model having parameters that can be adjusted to model the impedance transfer function with the fault (either an open-circuit or a short-circuit) at any location along the cable. These parameters are adjusted until the model matches the measured impedance transfer function of the faulted cable. The parameters of the model then indicate the direction and distance of the fault from the FDI. (*Id.*)

A further understanding of the invention can be achieved by reading the following claim.

> 1. A fault locator system for an underground residential distribution power cable system which includes a distribution loop having first and second ends the distribution loop including sections of cable connected in series, the junction between any two of the cable sections being coupled

to a transformer, at least one end of the distribution loop being coupled to receive a power system signal, the fault locator system comprising:

a fault signature detector coupled to the distribution loop at one of the junctions between two of the cable sections to detect a transient signal representing a fault; and

a power supply, coupled to receive operational power from the transformer which is coupled to the junction of the two cable sections.

Claims 1-36 stand rejected under 35 U.S.C. § 112, ¶ 1, as non-enabled.

OPINION

We have considered the positions of the examiner and the appellants *in toto.* Being persuaded by most of the reasons expressed in the declaration of Robert C. Wharton (Paper No. 15), we reverse the non-enablement rejection of claims 1-15 and 17-36. We now turn to the non-enablement rejection of claim 16. The examiner asserts, "[c]laim 16 lacks enablement as it is unclear how successive pulses of the transient signal is used to determine the velocity of the signal in the distribution loop." (Examiner's Answer at 7.) The appellants argue, "[t]his means is described in the specification at step 618 of Fig. 6 and at page 18, line 32 through page 19, line 2. From the description of the pulses at page 13, lines 10-13, one of ordinary skill in the art at the time the invention was made could readily determine an approximate velocity of the traveling wave because the distance from the FDI to both ends of the cable system is known and the sampling frequency of the samples stored in the memory is also known." (Wharton Decl. at 20.) To address the non-enablement rejection, the Board conducts a two-step analysis. First, we construe the claims to determine their scope. Second, we determine whether the claims as construed would have been enabled.

1. Claim Construction

"Analysis begins with a key legal question -- *what* is the invention *claimed*?" *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1567, 1 USPQ2d 1593, 1597 (Fed. Cir. 1987). "Claims in dependent form shall be construed to include all the limitations of the claim incorporated by reference into the dependent claim." 37 C.F.R. § 1.75.

Here, claim 16 specifies in pertinent part the following limitations: "means for determining a time interval between successive pulses of the transient signal to determine a velocity of the transient signal in the distribution loop." The claim ultimately depend from independent claim 1. For its part, the independent claim specifies in pertinent part "an underground residential distribution power cable system which includes a distribution loop" and "a transient signal representing a fault. . . ." Construing claim 16 to include the limitations of claim 1, the limitations requires a means for determining a time between successive pulses of a transient signal, which represents a fault, to determine a velocity of the transient signal in a distribution loop of a URD system.

2. Enablement Determination

Having determined what subject matter is being claimed, the next inquiry is whether the subject matter is enabled. "To be enabling under §112, a patent must contain a description that enables one skilled in the art to make and use the claimed invention." *Atlas Powder Co. v. E. I. DuPont de Nemours & Co.*, 750 F.2d 1569, 1576, 224 USPQ 409, 413 (Fed. Cir. 1984) (citing *Raytheon Co. v. Roper Corp.*, 724 F.2d 951, 960, 220 USPQ 592, 599 (Fed. Cir. 1983)). "That some experimentation is necessary does not preclude enablement; the amount of experimentation, however, must not be unduly extensive." *Id.* at 1576, 224 USPQ at 413.

Here, Figure 6 of the appellants' specification "is a flow-chart diagram which illustrates the operation of the[ir] fault analyzer." (Spec. at 18.) Step 618 of the Figure is labeled "[s]earch pulse regions for min and max, determine preliminary delays." The first passage referenced by the appellants explains that "the analyzer, at step 618, searches each region of interest for minimum and maximum values to determine a preliminary estimate of the propagation delay of the transient pulse through the cable." (*Id.* at 18-19.) Neither the step nor the passage, however, mentions determining a time between successive pulses of a transient signal to determine a velocity of the transient signal in a distribution loop of a URD system.

The other passage referenced by the appellants generally describes "[a] typical current transient signal received by a fault distance indicator (FDI) according to the present invention [a]s shown in Figure 3." (*Id.* at 13.) The specific passage follows.

> To understand the waveform, each pulse in Figure 3 is labeled numerically. Pulse 1 is the initial breakdown transient that first passes the antenna. Pulse 2 is the first reflection from the end of the cable. Pulse 3 is the first reflection from the fault. Pulse 4 is the second reflection from the end of the cable and pulse 5 is the second reflection from the fault.

(*Id.*) The second passage, however, fails to mention, determining a time between successive pulses of the transient signal to determine a velocity of the transient signal in a distribution loop of a URD system.

In summary, the step and the first passage merely disclose estimating the propagation delay of a transient pulse through a cable; the second passage merely discloses that a current transient signal typically includes an initial breakdown transient, reflections from the end of a cable, and reflections from the fault. We are not persuaded that these disclosures would have enabled one skilled in the art to make and use the claimed means for determining a time between successive pulses of a transient signal, which represents a fault, to determine a velocity of the transient signal in a distribution loop of a URD system without undue experimentation. Therefore, we affirm the non-enablement rejection of claim 16.

CONCLUSION

In summary, the rejection of claims 1-15 and 17-36 under § 112, ¶ 1, is reversed. The rejection of claim 16 under § 112, ¶ 1, however, is affirmed. "Any arguments or authorities not included in the brief will be refused consideration by the Board of Patent Appeals and Interferences. . . ." 37 C.F.R. § 1.192(a). Accordingly, our affirmance is based only on the arguments made in the briefs. Any arguments or authorities not included therein are neither before us nor at issue but are considered waived. No time for taking any action connected with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED-IN-PART

JAMES D. THOMAS Administrative Patent Judge	) BOARD OF PATENT
ERROL A. KRASS Administrative Patent Judge	) APPEALS AND
LANCE LEONARD BARRY Administrative Patent Judge	) INTERFERENCES

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