

DECISION OF THE COMMISSIONER

STATUTORY: Section 2(d) Measuring moisture content

INEXPLICIT: Claims are incomplete.

Rejection under Section 2(d) was in conformance with Patent Office guidelines at the time the action was written. This is now withdrawn due to a change in directed policy.

A capacitor probe measuring arrangement will measure the moisture content of a material independent of the mass, provided the probe voltage is balanced. Three claims not showing any balancing means are incomplete as they fail to recite an essential feature for the proper operation of the invention.

FINAL ACTION: Modified.

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IN THE MATTER OF a request for a review by the Commissioner of Patents of the Examiner's Final Action under Section 46 of the Patent Rules.

AND

IN THE MATTER OF a patent application serial number 923,991 filed February 23, 1965 for an invention entitled:

MOISTURE MEASURING SYSTEM EMPLOYING PHASE COMPARISON

Agent for Applicant

Messrs. Alex E. MacRae & Co.,  
Ottawa, Ontario.

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This decision deals with a request for review by the Commissioner of Patents of the Examiner's Final Action dated August 20, 1971 on application 923,991. This application was filed in the name of Alan Norwich and refers to "Moisture Measuring System Employing Phase Comparison".

In the prosecution terminated by the Final Action the examiner rejected claims 1 to 4 and 10. The reasons for such rejection are that claims 1 to 3 define a method outside the statutory field of invention and that claims 1, 4 and 10 do not explicitly define a patentable invention over the prior art.

**In the Final Action the examiner stated: (in part)**

The Chun et al patent relates to a modification of electrical resistivity well logging in which a further electrode is provided to pick up a capacitively induced signal varying in amplitude and phase with the characteristics of the formation being surveyed. Applicant's attention is brought to Chun et al's use of tubes 18 and 18' (figure 1) the grids of which are biased by the "C" battery 25 so as to operate the tubes as grid controlled rectifiers. This arrangement produces, in fact, the same effect as the diode arrangement of applicant's claim 10, Chun et al are not concerned with the effects of the mass of the sample and, in fact, are concerned with a sample of infinite extent. Consequently the step of comparing the phase of the output signal with the phase of the applied signal, as followed by Chun et al does not produce a resultant signal which is independent of the mass of the material as set out in the rejected claims.

The remaining claims, distinguish over the cited reference by reciting means to balance out "from said output signal any effect of the capacitance between said material", in the determination of the property of a dielectric material "independent of its mass".

Claims 1 to 3, inclusive, are further rejected since it is held that these claims are outside the statutory field of invention as defined by Section 2(d) of the Patent Act. These claims are held to be directed to an unpatentable non-manufacturing method, that is a method for determining a property of a dielectric material, and, specifically, for measuring the moisture content of an article.

In applicant's response of November 17, 1971 he stated:

(in part)

It is believed to be a fair statement of the Examiner's position that while claim 1 distinguishes over U.S. patent 2,446,527 in reciting that the resultant signal is "indicative of said property independently of the mass of said material", the Examiner considers this distinction is insufficient to support the patentability of the claim. The Examiner also considers the similar recitations in claims 4 and 10 to be insufficient to render the claims patentable over the Chun et al reference.

This application discloses a method and apparatus for measuring the moisture content of a continually moving sheet, such as paper, which has a variable mass per unit area in addition to a variable moisture content. The material is positioned adjacent to a capacitor probe and the phase shift in the signal from the probe is indicative of the moisture content of the material and substantially independent of the mass of the material. This is because the shift in phase is occasioned by a time delay dependent upon the product of the equivalent resistance and equivalent capacitance added by the introduction of material to the probe. When the relative moisture content changes, the resistance and hence the product changes, but when the mass changes, the resistance and capacitance change in opposite directions, leaving the product substantially unchanged. For example, doubling the material at the probe will cut the resistance substantially in half while substantially doubling the added capacitance.

The applicant also objected to the refusal of claims 1-3 as nonstatutory in that, "the method produced a beneficial result which is of commercial or economic value, or of practical significance and is related to a form of manufacture."

Having considered the ground of rejection, "Claims 1-3 define a method outside the statutory field of invention", I find that this stand was generally in conformance with guidelines at the time the Final Action was written. However, in the present circumstance it has since been decided that this is not a proper ground of rejection and the rejection based on this ground will be withdrawn.

The second ground of rejection is based on the examiner's contention that claims 1, 4 and 10 do not explicitly define a patentable invention over the following prior art, namely: United States Patent, 2,446,527, August 10, 1948 Cl. 175-182, Chun et al.

This patent relates to a modification of electrical resistivity well logging in which a further electrode is provided to pick up a capacitively induced signal varying in amplitude and phase with the characteristics of the formation being surveyed.

In accordance with the present invention, a single measurement at a single frequency is used to measure moisture content. It has been discovered that when the dielectric material to be measured is placed in a capacitance probe and the effect of the empty probe is eliminated, the phase shift of an applied signal as produced by the material is independent of variations in the mass of the material and is a measure of

relative moisture content independent of the mass. Claim 1 reads as follows:

A method for the quantitative determination of a property of a dielectric material independent of its mass, said method comprising applying an alternating current electrical signal to at least a portion of the material, deriving an output alternating signal resulting from the applied signal as this applied signal is influenced by the mass of said material and the dielectric properties of said material, and comparing the phase of said output signal with the phase of said applied signal independently of the magnitudes of said output and applied signals to produce a resultant signal indicative of the difference in phase occasioned by said material and so correlated and calibrated with respect to said applied and output signals that it is indicative of said property independently of the mass of said material.

On considering the question of whether Claims 1, 4 and 10 do not explicitly define a patentable invention, I note certain observations set out in the disclosure and more particularly at page 3 line 24 to the effect that:

The balancing capacitor 26 is adjusted so that the phase inverted signal through the capacitor 26 just balances the direct signal through the probe 12 in the absence of material at the probe. This balances out from the output signal the effect of no load capacitance of the probe, i.e. the capacitance of the probe in the absence of material. Under such circumstances, when material is placed in the probe, the phase of the signal developed on the bridge output terminal 22 is shifted from the phase of the input signal from oscillator 10 by an amount related to the relative moisture content of the material and substantially independently of the mass of the material. This is because the shift in phase is occasioned by a time delay dependent upon the product of the equivalent resistance and equivalent capacitance added by the introduction of material to the probe. When the relative moisture content changes the resistance and hence the product changes, but when the mass changes, the resistance and capacitance change in opposite directions, leaving the product substantially unchanged. For example, doubling the material at the probe will cut the resistance substantially in half while substantially doubling the added capacitance.

Vector diagrams may be drawn by the well known methods of electrical engineering to illustrate the effect of the change in the phase angle as the conditions change. It is understood that

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is without the voltage drop being considered; or the same result is obtained when the probe voltage is balanced out as the disclosure teaches. The phase angle will change due to the presence of the probe and also that phase angle changes will result from both the probe and the change in mass. Therefore, unless the capacitance of the probe is eliminated by balancing out this voltage, the dielectric property cannot be determined independent of the mass of the material being tested.

I also quote from the applicant's response of December 21, 1966, "...one could not say that the system is inoperative if the probe-balance feature is omitted. Such omission results in the device being sensitive to mass variations", rather than independent of its mass variations.

It is noted that the remaining claims either recite a method or means to balance out "from said output signal any effect of the capacitance between said material", in the determination of a property of a dielectric material "independent of its mass".

It is clear that the elimination of the effect of the empty probe is part of the overall concept of the invention. Therefore, I find that the objection of the examiner on the grounds that claims 1, 4 and 10 are "inexplicit" is correct to the extent that the claims are incomplete. As I see it, applicant cannot state at the end of these claims, "... independent of the mass", unless he recites an essential feature to obtain such a result; i.e. "the balancing out from said output signal the effect of the capacitance from said probe means in the absence of said material."

I am, therefore, satisfied that claims 1, 4 and 10 do not claim the invention disclosed in distinct and explicit terms by failing to recite an essential feature for its operation. I recommend that this ground of rejection be upheld and further that the ground of rejection with respect to unstatutory subject matter be withdrawn.

R. E. Thomas,  
Chairman, Patent Appeal Board.

I concur with the decision of the Patent Appeal Board and confirm the rejection of claims 1, 4 and 10 on the grounds of being inexplicit and I withdraw the rejection under Section 2(d) of the Patent Act. Applicant has six months in which to appeal this decision in accordance with Section 44 of the Patent Act.

Decision accordingly,

A.M. Laidlaw,  
Commissioner of Patents.

Dated at Ottawa, Ontario,  
this 4th day of January, 1972