

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TCL CORPORATION, TCL COMMUNICATION TECHNOLOGY HOLDINGS,
LTD., TCT MOBILE LIMITED; TCT MOBILE INC.; AND TCT MOBILE (US)
INC.,

Petitioners

v.

TELEFONAKTIEBOLAGET LM ERICSSON,

Patent Owner

Cases IPR2015-01674, IPR2015-01676, IPR2015-01761, IPR2015-01806

U.S. Patent No. RE43,931

DECLARATION OF ANDREW WOLFE, PH.D.

IN SUPPORT OF
PETITIONERS' REPLY TO PATENT OWNER'S RESPONSE TO PETITION
FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. RE43,931

REPLY DECLARATION OF ANDREW WOLFE, PH.D.
Cases IPR2015-01674, -1676, -1761, -1806
U.S. Patent No. RE43,931

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REPLY DECLARATION OF ANDREW WOLFE, PH.D.
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I, Andrew Wolfe, Ph.D., declare as follows:

I. INTRODUCTION

1. My name is Andrew Wolfe. I am currently an independent consultant, corporate board member, and Adjunct Professor.

2. I have been retained by TCL Communication Technology Holdings LTD.; TCT Mobile Limited, and TCT Mobile (US), Inc. (“Petitioners”) in connection with this *inter partes* review proceeding of U.S. Patent No. RE43,931 (“the ’931 patent”). I submit this declaration in support of Petitioners’ reply to patent owner’s response to petition for *inter partes* review of the ’931 patent.

3. I am being compensated for my work in this matter. My compensation in no way depends upon the outcome of this proceeding.

4. I previously provided declarations dated August 12, 2015 in support of petition for *inter partes* review of claims 1-12, 15-26, 29-31, 33-41, and 45-69 of the ’931 patent (the “Declarations”, Exs. 1205, 1206, 1207, and 1208). My qualifications are set forth in my curriculum vitae, which is attached as Appendix A to my prior Declarations.

5. Since submitting my Declarations, I have reviewed the following documents in this proceeding:

- Patent Owner’s Response (Paper No. 19)

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- Declaration of Jean Renard Ward (Ex. 2057)
- July 14, 2016 Deposition transcripts of Jean Renard Ward Yang (Exs. 1205 and 1206)
- 8XC552/562 Overview (Ex. 1213)
- TLC1541 Datasheet (Ex. 1212)
- MPLC004A Datasheet (Ex. 1214)
- 80C552/83C552 Datasheet (Ex. 1215)
- Interface Circuits Data Book, Texas Instruments Inc. (1987) (Ex. 1216)

II. EXPERIENCE DESIGNING MOBILE PHONE DISPLAYS AND TOUCH SENSITIVE INPUT DEVICES PRIOR TO 1997

6. I have been asked to review Patent Owner's Response in the IPR2015-01674, -01676, -01761, and -01806 ("POR") matters as well as the accompanying declaration of Mr. Ward ("Ward Declaration"). In the POR and Ward Declaration, Patent Owner and Mr. Ward argue that it would not have been obvious to combine Palatsi with Moore and Tiilikainen. However, I have actual experience working on the design of this type of phone and the input devices used therein (including touch sensitive screens and touch strips) prior to the filing date of the '931 patent and I respectfully disagree.

7. In 1985, I earned a B.S.E.E. degree in Electrical Engineering and Computer Science from the Johns Hopkins University. In 1987, I received an M.S.

degree in Electrical and Computer Engineering from Carnegie Mellon University.

In 1992, I received a Ph.D. in Computer Engineering from Carnegie Mellon University.

8. In 1983, I began designing touch sensors, microprocessor-based computer systems, and I/O (input/output) cards for personal computers as a senior design engineer for Touch Technology, Inc. During the course of my design projects with Touch Technology, I designed I/O cards for PC-compatible computer systems, including the IBM PC-AT, to interface with interactive touch-based computer terminals that I designed for use in public information systems. I continued designing and developing related technology as a consultant to the Carroll Touch division of AMP, Inc., where in 1986 I designed one of the first integrated circuits for custom touch-screen. I designed the touch/pen input system for Linus WriteTop, which I consider to be the first commercial tablet computer.

9. In the latter part of 1989, I worked as a senior design engineer for ESL-TRW Advanced Technology Division. While at ESL-TRW, I designed and built a bus interface and memory controller for a workstation-based computer system and also worked on the design of a multiprocessor system.

10. At the end of 1989, I (along with some partners) reacquired the rights to The Graphics Technology Company. Over the next seven years, as an officer

and a consultant for The Graphics Technology Company, I managed the company's engineering and development activities and personally developed dozens of touch screen sensors, controllers, and interactive touch-based computer systems, both the hardware and circuitry (and operating software?).

11. While at The Graphics Technology Company I personally developed touchscreen prototypes for the IBM/BellSouth Simon mobile phone ("Simon"). The Simon used a touchscreen over an LCD and was first shown in 1992. In developing the touchscreen prototypes, I borrowed heavily from my knowledge of prior work on tablets and workstations when designing the touchscreen prototype.

12. The Simon is considered to be one of the first smart phones and had a touch screen capable of detecting swiping motion on the touch screen. In addition, the Simon was among the first mobile phones to allow a user to scroll an image on a screen using a touchscreen.

13. The development and demonstration of the technology in the Simon would have made the subsequent use of a contact-sensitive transducer in a radiotelephone well within the skill of a POSITA.

III. COMBINATION OF MOORE, PALATSI, AND TIILIKAINEN WOULD HAVE BEEN OBVIOUS TO A POSITA

14. As I previously opined in my prior Declarations, all of the elements of the instituted claims are disclosed in the combination of U.S. Patent Nos.

5,892,475 (Ex. 1087) (“Palatsi”); 4,566,001 (Ex. 1012) (“Moore”); and European Patent Application EP0721272 (Ex. 1088) (“Tiilikainen”).

15. Moreover, as discussed below, it is my opinion that Moore discloses the claimed second mode element and it would have been obvious to combine Palatsi with Moore, and Palatsi with Moore and Tiilikainen to arrive at the alleged claimed inventions of the instituted claims of the ’931 patent.

A. Disclosure Related to a First Mode and a Second Mode

16. Palatsi teaches a telephony display that requires control of scrolling and selection and suggests touch sensors as a solution. Ex. 1087, 1:5-6; 2:40-46; 4:19.

17. Moore also teaches a telephone device that controls scrolling and selection using touch sensors. Ex. 1012, 1:15-26, 4:20-28.

18. Claim 2 of Moore recites “wherein in response to a selectable output from the selector, the control program defines both a plurality of individually energizable discrete lengths within the touch strip, and a corresponding plurality of regions of the display screen.” Ex. 1012, claim 2. A POSITA would understand this claim language to mean that the controller can be programmed to only allow certain touch strips or certain portions of touch strips to produce an output signal. Claim 3 further recites “wherein the control program functions to preclude input

data originating when the touch strip is touched other than at positions within said discrete lengths.” Ex. 1012, claim 3. Based on these disclosures, it is my opinion that Moore is teaching the claimed second mode of the ’931 patent. Specifically, Moore teaches that a user can program the controller whether or not the controller is going to be responsive to contact with certain touch strips or certain segments of touch strips (i.e., two different modes that are entered by the user).

B. Motivation to Combine is not Based on Hindsight

19. I understand that Patent Owner has suggested the motivation to combine Moore with Palatsi is based on hindsight. POR, 30. I have thoroughly reviewed both Moore and Palatsi and I disagree.

20. Moore teaches that it is beneficial to avoid unintended contacts. Specifically, Moore teaches a “filter circuit [which] is appropriately set so as to register most strip actuations which are deliberate and so as not to register most of the touch strip contacts which are unintentional.” Ex. 1012, 2:57-68. Claims 2 and 3 of Moore disclose selectively energizing portions of the touch-sensitive devices such that some touch sensors within these devices are not energized and thus nonresponsive. Moore clearly recognized that unintentional contacts were a problem and taught solutions to such unintended contacts including making all or a portion of a touch sensor nonresponsive.

21. Moore teaches that the controller can disable the touch strips when needed. For example, Moore teaches activating and deactivating touch strips. Specifically, with respect to one embodiment, Moore describes using “keys associated with [a] functional keyboard” to “switch[] between different [] banks of touch strips.” Ex 1012, 4:33-36. Thus, Moore teaches a controller that provides for user input to be used to switch between modes of operation, whereby different banks of touch strips are enabled or disabled. *Id.* 3:22-25, 4:33-36. A POSITA would also have recognized this as a method of avoiding responding to unintentional contacts.

22. A POSITA at the time of filing of the '931 patent would have understood that Moore teaches that unintended contacts are a problem when its touch strips are used. Ex 1012, 2:59-68; 4:28-36. Directly from the teaching in the prior art patents, a POSITA would also have recognized the benefits of being able to avoid unintended contacts, that would be available, when Moore's touch strips are incorporated into Palatsi as touch sensors.

C. Combination of Palatsi and Moore Would Have Yielded Predictable Results

23. I also understand that Patent Owner has asserted that “[a] POSITA would not have been motivated to incorporate Moore's dedicated hardware

required to implement the touch strips into the handheld Palatsi device.” POR, 32.

I disagree.

24. Touch strips and other forms of contact-sensitive transducers were well known to a POSITA in 1997. In fact, based on at least my own experience, it was well known to a POSITA to use a contact-sensitive transducer to save space because they could be configured to have a very low profile. In addition, this is acknowledged in the Background of the Invention section of the '931 patent. Ex. 1001, 2:29-33. Therefore, the more buttons that could be replaced by the functionality of contact-sensitive transducers, the greater the potential for phones with a lower profile. This is exactly what the designer of the Simon did by replacing almost all buttons in a normal phone with a touch sensitive user interface. Ex. 1021. Numerous other contemporaneous handheld devices used a similar approach such as the Apple Newton, the Palm Pilot, and the Psion 5.

25. Also, the touch strips taught by Moore did not require their own power supply to establish a voltage gradient along the resistive substrate. In fact, it was exceedingly commonplace to use a single power supply for providing voltage to multiple components.

26. Integrated circuits, even in 1997, routinely combined multiple components on a single chip. In my personal experience, the CMOS technology

that was in widespread use by 1997 regularly included the clock, select/control logic, and any required filter/buffer into each A/D converter and/or microprocessor, as one chip rather than discrete components.

27. For example, the TLC1541 analog-to-digital converter integrated an 11-input A/D converter, clock, select/control logic, and filter/butter all on one chip. Ex. 1212. The TLC1541 consumed an average of about 6mW of power in full operation (and less with power management incorporated) and occupied an area of only 1 cm², making it well-suited to mobile phone use. Ex. 1212, 1 (TLC1541 datasheet from 1996, listing maximum power dissipation of 6mW and FN package option); Ex. 1214, 1 (providing mechanical data for a 20-pin FN package, including a size of ~10mm per side).¹ The TLC1541 has been commercially available in substantially the same form since at least 1996, when I became familiar with the component. The TLC1541 appears in databooks as early as 1987 (See, Ex. 1216 pages 1-8 and 2-197 to 2-204).² This representative technology would have easily enabled adding four touch strips from Moore to the phone in

¹ I obtained Ex. 1212 from mouser.com on 7/11/16. I obtained Ex. 1214 from http://www.ti.com/lsds/ti/packaging/packaging_tools/find_packages.page on 9/13/16. I obtained Ex. 1215 from <http://www.datasheet39.com/> on 7/11/16. I owned paper copies of these component datasheets and package drawings in the 1990s and recalled them, thus searched for copies when preparing my analysis of these patents.

² I obtained Ex. 1216 from bitsaver.org on 7/11/16.

Palatsi without the need for four separate A/D converters and other components.

Instead, all of these components could have been performed by this one chip.

28. Additionally, I have reviewed a technical overview for an 8XC552/562 microcontroller, Ex. 1213.³ The 8XC552/562 microcontroller was available prior to the date of the '931 patent filing and was suitable for mobile phones. This controller included an eight-input analog-to-digital converter and would have easily enabled adding four touch strips from Moore to the phone in Palatsi without the need of a separate A/D converter. Ex. 1213, 50. Instead, the microcontroller itself, with four of its eight A/D inputs, would have been capable of handling the inputs from the four touch strips of Moore.

29. Using the 8XC552/562 microcontroller as an example, the A/D converter and other components that Patent Owner argued would need to be reproduced four times (Ex. 1206, 318:21-320:5) could have been incorporated into a single microcontroller that would have been suitable for use as a mobile-phone controller supporting many input/output functions, requiring about 0.75 in² of board space and supporting low-power operation. Ex. 1213, 52-53; Ex. 1215, 8 (describing technical specifications and functions of the 80C552/83C552 microcontroller, including idle mode), 22 (showing QFP80 package with surface

³ I obtained Ex. 1213 from <http://www.datasheetspdf.com/> on 9/13/2016.

area of about 0.75in^2). These parameters would have easily allowed the Palatsi phone, with the addition of the touch strips from Moore, to “be held in a user’s hand such that the rear surface confronts the user’s palm,” which is the only size requirement of the ’931 patent. *See, e.g.*, Ex. 1001, claim 1. In fact, I used this microcontroller chip for touch sensor measurement in numerous handheld applications between 1989 and 1997. As such, not only would the circuitry from Moore, when added to Palatsi, have been easily combinable, the combination would have been predictable. This is because the A/D converter, clock, select/control logic, and filter/buffer did not need to be discrete integrated circuits each reproduced four times. Rather, they could have been and, as shown by the 8XC552/562 microcontroller, often were included in a single chip along with other commonly used functions. As I stated previously, this technology was in widespread use by 1997.

30. For the reasons set forth in my Declarations and as discussed above, it is my opinion that the proposed combination of Palatsi and Moore would have resulted in a radiotelephone with the claimed first and second modes being capable of being held in a user’s hand such that the rear surface confronts the user’s palm as claimed in each of the independent claims of the ’931 patent. It is also my opinion that this combination would have been obvious and the results predictable.

IV. DECLARATION

31. I declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

32. I executed this declaration on September 19, 2016, in Monroeville, Pennsylvania.

A handwritten signature in black ink, appearing to read 'AW', is written above a horizontal line.

Andrew Wolfe, Ph.D.