IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF DELAWARE

KONINKLIJKE PHILIPS N.V. and U.S. PHILIPS CORPORATION, Plaintiffs, v. ASUSTEK COMPUTER INC. and ASUS COMPUTER INTERNATIONAL, Defendants.	C.A. No. 15-1125-GMS
MICROSOFT CORPORATION, Intervenor-Plaintiff, v. KONINKLIJKE PHILIPS N.V. and U.S. PHILIPS CORPORATION, Intervenor-Defendants.	
KONINKLIJKE PHILIPS N.V. and U.S. PHILIPS CORPORATION, Intervenor-Defendants/Counterclaim Plaintiffs in Intervention, v. MICROSOFT CORPORATION, Intervenor-Plaintiff/Counterclaim Defendant in Intervention, AND MICROSOFT MOBILE INC., Counterclaim Defendant in Intervention.	

KONINKLIJKE PHILIPS N.V. and U.S. PHILIPS CORPORATION, Plaintiffs, v. HTC CORP. and HTC AMERICA, INC., Defendants.	C.A. No. 15-1126-GMS
KONINKLIJKE PHILIPS N.V. and U.S. PHILIPS CORPORATION, Plaintiffs, v. VISUAL LAND, INC., Defendants.	C.A. No. 15-1127-GMS
MICROSOFT CORPORATION, Intervenor-Plaintiff, v. KONINKLIJKE PHILIPS N.V. and U.S. PHILIPS CORPORATION, Intervenor-Defendants.	

KONINKLIJKE PHILIPS N.V. and U.S. PHILIPS CORPORATION, Intervenor-Defendants/Counterclaim Plaintiffs in Intervention, v. MICROSOFT CORPORATION, Intervenor-Plaintiff/Counterclaim Defendant in Intervention, AND MICROSOFT MOBILE INC., Counterclaim Defendant in Intervention.	)	
KONINKLIJKE PHILIPS N.V. and U.S. PHILIPS CORPORATION, Plaintiffs, v. SOUTHERN TELECOM, INC., Defendant.	)	C.A. No. 15-1128-GMS
KONINKLIJKE PHILIPS N.V. and U.S. PHILIPS CORPORATION, Plaintiffs, v. DOUBLE POWER TECHNOLOGY, INC., ZOWEE MARKETING CO., LTD., and SHENZEN ZOWEE TECHNOLOGY CO., LTD., Defendants.	)	C.A. No. 15-1130-GMS

MICROSOFT CORPORATION, Intervenor-Plaintiff, v. KONINKLIJKE PHILIPS N.V. and U.S. PHILIPS CORPORATION, Intervenor-Defendants.	)	
KONINKLIJKE PHILIPS N.V. and U.S. PHILIPS CORPORATION, Intervenor-Defendants/Counterclaim Plaintiffs in Intervention, v. MICROSOFT CORPORATION, Intervenor-Plaintiff/Counterclaim Defendant in Intervention, AND MICROSOFT MOBILE INC., Counterclaim Defendant in Intervention.	)	
KONINKLIJKE PHILIPS N.V. and U.S. PHILIPS CORPORATION, Plaintiffs, v. YIFANG USA, INC. D/B/A E-FUN, INC., Defendants.	)	C.A. No. 15-1131-GMS

MICROSOFT CORPORATION,

Intervenor-Plaintiff,

v.

KONINKLIJKE PHILIPS N.V. and
U.S. PHILIPS CORPORATION,

Intervenor-Defendants.

KONINKLIJKE PHILIPS N.V. and
U.S. PHILIPS CORPORATION,

Intervenor-Defendants/Counterclaim Plaintiffs in Intervention,

v.

MICROSOFT CORPORATION,
Intervenor-Plaintiff/Counterclaim Defendant in Intervention,

AND

MICROSOFT MOBILE INC.,

Counterclaim Defendant in Intervention.

KONINKLIJKE PHILIPS N.V. and
U.S. PHILIPS CORPORATION,

Plaintiffs,

v.

ACER INC. and
ACER AMERICA CORPORATION,

Defendants.

C.A. No. 15-1170-GMS

MICROSOFT CORPORATION, Intervenor-Plaintiff, v. KONINKLIJKE PHILIPS N.V. and U.S. PHILIPS CORPORATION, Intervenor-Defendants.	)
KONINKLIJKE PHILIPS N.V. and U.S. PHILIPS CORPORATION, Intervenor-Defendants/Counterclaim Plaintiffs in Intervention, v. MICROSOFT CORPORATION, Intervenor-Plaintiff/Counterclaim Defendant in Intervention, AND MICROSOFT MOBILE INC., Counterclaim Defendant in Intervention.	)

DECLARATION OF DR. LOREN G. TERVEEN IN SUPPORT OF DEFENDANTS' ANSWERING CLAIM CONSTRUCTION BRIEF

I, Loren G. Terveen, declare as follows:

1. My name is Loren G. Terveen. I am currently a full Professor of Computer Science & Engineering at The University of Minnesota, and hold the title of Distinguished McKnight University Professor.

2. I have been engaged by Microsoft Corporation and Microsoft Mobile Inc. (collectively, "Microsoft") in connection with the above captioned litigation, including to provide my expert opinion regarding the meaning of certain claim terns in U.S. Patent No. RE44,913 (the "'913 patent") to a person of ordinary skill in the art. I am submitting this declaration in support of Defendants' Answering Claim Construction Brief.

Background and Qualifications

3. I received a B.A. in Computer Science, Mathematics, and History from the University of South Dakota in 1984, a M.S. in Computer Science from the University of Texas in 1988, and a Ph.D. from the University of Texas in Computer Science in 1991.

4. I am a member of the Association for Computing Machinery (ACM), the oldest, largest, and most prestigious computing society in the world. I am the President of ACM's Special Interest Group on Computer-Human Interaction, one of its largest and most active special interest groups. I also am a member of the ACM Council, the highest governing body of the ACM. I received the ACM for Distinguished Scientist Award in 2009.

5. My research and teaching focus on human-computer interaction, user interface design, and social computing. I have several decades of experience in these specialties of computer science in both industry and academia. I worked for AT&T Laboratories from 1991 through 2002, during which time I conducted research and developed systems that solved problems in software engineering, web information seeking and organization, and recommender

systems. In all my research, I designed, implemented, and tested graphical user interfaces. I have been employed full-time as a professor at the University of Minnesota since 2002, during which time I have taught classes in computer science, human-computer interaction and social computing, and have conducted, supervised, and published research in the field. My research has been published in numerous journal and conference papers, as well as in a book I co-authored entitled "Foundational Issues in Artificial Intelligence and Cognitive Science: Impasse and Solution." I have served on the editorial board of ACM's Transactions on Human-Computer Interaction and the Communications of the ACM, and have served as a reviewer for numerous journals, including ACM Computing Surveys, IEEE Transactions on Data and Knowledge Engineering, the International Journal of Human-Computer Studies, and the Journal of Computer-Supported Cooperative Work.

6. I am a listed inventor on nine patents, including those related to the computer graphical environment (U.S. Patent No. 5,680,530).

7. I have consulted on over 10 intellectual property cases that have dealt with topics in user interface design, recommender systems, web information systems, and set top boxes. During these cases, I have testified before judges, been deposed, and written multiple expert reports.

8. My compensation in this matter is not dependent upon the outcome of this case, any claim construction determination, or on any opinions that I express.

Legal Principles

9. I understand that patent claims may be written in a "means-plus-function" format, where the claims recite a "means for" performing a stated function. I further understand that a claim term written in means-plus-function is limited to the structure or structures disclosed by

the specification that is clearly linked or associated with recited function. I further understand that if a claim is implemented by a computer, the structure must be the algorithm disclosed in the specification for performing the recited function.

Person of Ordinary Skill in the Art

10. I understand that patent claims are generally to be given the plain meaning they would have to a person of ordinary skill in the relevant art, taking into account the patent specification and prosecution history. I understand that Philips contends that the '913 patent relates to a graphical user interface for entering characters on electronic devices. Based on my background and experience, I am a person of at least ordinary skill in the relevant art for the '913 patent.

Meaning of the Disputed Claim Terms

11. I understand the parties dispute the meaning of the term "keypad," as recited in claims 1, 3, 4, 5, 8, 9, 12, 13, and 16 of the '913 patent. The parties' competing constructions are as follows:

Term	Philips' Construction	Defendants' Construction
keypad (Claims 1, 3, 4, 5, 8, 9, 12, 13, and 16)	Plain meaning.	a plurality of keys arranged to resemble a numeric entry or phone dialing interface

12. I understand that Philips has taken the position that the plain meaning of the term "keypad" includes a "keyboard." I disagree. Having read the '913 patent, it is my opinion that Defendants' construction is correct because it accurately captures the disclosed embodiments in the specification. A person of ordinary skill in the art would have understood the term "keypad" as used in the '913 patent to cover a numeric entry or phone dialing interface, but not a typical QWERTY keyboard.

13. Rather, in view of the intrinsic evidence, one of ordinary skill in the art would have understood that "keypad" at the time of the'913 patent ordinarily referred to a numeric entry interface—and in the context of mobile phones, it referred to the phone dialing interface shown in Figure 1, which is labelled as "a keypad for use with the present invention." '913 pat. Fig. 1, 3:11–12. The patent refers to this keypad as requiring "multitap" to enter alphabetical characters—one needed to repeatedly tap on one of the numeric keys, e.g., "[t]o select the character 'b' the '2' key is press[ed] twice." *Id.* at 1:45–62. The patent states that multitap keypads were "almost ubiquitous on mobile phones" at the time, and I agree that this is what one of ordinary skill in the art would have understood "keypad" to be referring to in the mobile phone context. The claimed invention of the '913 patent attempts to improve upon the "multitap" interface of the familiar mobile-phone keypad.

14. My understanding is further confirmed by the patent's statement that the claimed keypad must be "consistent with a keypad with which mobile phone users are familiar." *Id.* at 2:20–24. As noted above, the only keypad capable of character-entry that users would have been familiar with at the time of the '913 patent, was the numeric dialing keypad that was "almost ubiquitous" on phones. QWERTY keyboards were very uncommon on mobile phones when the '913 patent was filed, and so would not have been familiar to mobile phone users of the day.

15. I understand the parties dispute the meaning of the terms "means for switching to a second state" and "means for returning the keypad to the default state," as recited in claims 4, 5, and 8 of the '913 patent. The parties' competing constructions are as follows:

Term	Philips' Construction	Defendants' Construction
means for switching to a second	Function (agreed): switching to a second state responsive to a first key selection of the at least one key for a period longer than the predetermined time period	
	Structure: a touchscreen and either:	Structure: A microprocessor that

Term	Philips' Construction	Defendants' Construction
state … (Claims 4, 5, and 8)	(1) a microprocessor in conjunction with a computer readable storage medium running a computer program to perform the function, such as the algorithm disclosed at 4:45-6:6, Figs. 4, 5; or (2) dedicated logic circuits, PICmicro chips, or application specific integrated circuits (ASIC) that works with or without such a computer program to perform the function, such as the algorithm disclosed at 4:45-6:6, Figs. 4, 5.	performs the algorithm consisting of the steps of: 1) detecting a selection of at least one key for a period longer than a predetermined time period; 2) based on the selected key, retrieving from a key character table a set of secondary characters to be displayed; and 3) changing the appearance of the keys in the keypad to display the secondary characters
means for returning the keypad to the default state (Claims 4, 5, and 8)	Function (agreed): returning the keypad to its default state	
	Structure: a touchscreen and either: (1) a microprocessor in conjunction with a computer readable storage medium running a computer program to perform the function, such as the algorithm disclosed at 4:45-5:14, 5:48-67, Fig. 5; or (2) dedicated logic circuits, PICmicro chips, or application specific integrated circuits (ASIC) that works with or without such a computer program to perform the function, such as the algorithm disclosed at 4:45-5:14, 5:48-67, Fig. 5.	Structure: A microprocessor that performs the algorithm consisting of the steps of: 1) retrieving from a key character table the default characters to be displayed on each keypad key; and 2) changing the appearance of the keys in the keypad to display the retrieved primary characters

16. I understand that both parties agree that these terms are controlled by 35 U.S.C. § 112 ¶ 6 and that the correct recited functions are "switching to a second state responsive to a first key selection of the at least one key for a period longer than the predetermined time period" and "returning the keypad to its default state." I also understand that both parties agree that the corresponding structure for this term should be a processor that performs the algorithm for performing those functions that is disclosed in the specification.

17. Based on the specification of the ’913 patent, I agree that a person of ordinary skill would understand the disclosed algorithms for performing the recited functions to be what Defendants propose: for “switching to a second state,” an algorithm consisting of the steps of 1) detecting a selection of at least one key for a period longer than a predetermined time period, 2) based on the selected key, retrieving from a key character table a set of secondary characters to be displayed; and 3) changing the appearance of the keys in the keypad to display the secondary characters; and for “returning the keypad to its default state,” an algorithm consisting of the steps of retrieving from a key character table the default characters to be displayed on each keypad key; and 2) changing the appearance of the keys in the keypad to display the retrieved primary characters.

18. The ’913 patent discloses that the keypad “switch[es] to a second state responsive to a first key selection” by modifying the appearance of the keypad to display secondary instead of primary characters. First, the keypad is displayed in a “default” state, in which “a primary character 104 [is] displayed on each key 102.” ’913 pat. at 3:28-29; *id*., Fig. 1 (keypad 100 in a default state). A stored “key character table” (“KCT”) identifies the primary and secondary characters associated with each keypad key. *Id*. at 4:50-55, Table 2. The KCT is accessed to identify the appropriate secondary characters to be displayed when a user touches a displayed key for a pre-determined time period. *Id*. at 5:41-44, 6:1-3. The appearance of the keypad is modified and secondary characters are displayed in the place of primary characters. *Id*. at 5:42-46; *id*. at 5:60-61; Fig. 2. When a user returns a secondary character as input (see Fig. 5, step 510, RET CHAR), the keypad “[l]oop[s] back to display the default keypad (DIS DEF KP) 502,” where each key displays a primary character. *Id*. at 5:67; *id*. at 3:60-62. I agree that these disclosed algorithms are accurately summarized in Defendants’ proposal.

19. I understand that Philips contends that the algorithms for performing the functions of "switching to a second state" and "returning the keypad to the default state" end with the step of providing retrieved characters to a touchscreen. I disagree. First, this contention is inconsistent with the algorithms described in the '913 disclosure. The very sections of the specification that Philips relies on as disclosing algorithms for performing the functions speak of precisely one type of state, a *display* state. See for example 5:10-16; 5-33-35: "Table 1 thereby provides primary and secondary characters to the microprocessor which, under the guidance of PRG instructs the touchscreen to display these characters in the appropriate locations to build up a default keypad **display state** corresponding to FIG. 1 and Table 1. Similarly a KCT relating to a first key selection of key 5 is shown below in Table 2. This KCT provides the characters displayed upon a first key selection corresponding to key 5 thereby providing a second keypad **display state** as shown in FIG. 2" (emphasis added). A state **is** a display state, and it corresponds directly to a display, as indicated by the references to Figures 1 and 2, which show keypad displays. The only change of state described in the specification is changing the display of keys on the keypad to show different characters; '913 patent at 5:41-46 ("The touchscreen is sampled repeatedly until a first key selection is detected, following which the appropriate characters to be displayed are retrieved from an appropriate stored KCT (e.g. Table 2) by the microprocessor and provided to the touchscreen which updates the keypad 100 displayed."); *id*. at col. 5:50-52 ("Upon detection of a second key selection the microprocessor 400 compares the key selected with the displayed KCT (Table 2 for example) and returns the input character for display . . . . Finally, the microprocessor instructs the touchscreen to display the default keypad and awaits further user interaction.").

20. Moreover, by ending the algorithm with information being provided to a touchscreen, Philips' construction fails to actually describe how the state of the keypad is changed from a default state to a second state, and back again. Further, any algorithm singularly directed to displaying characters would be different from an algorithm for changing display state. It would need to specify the rendering process by which data is converted into signals that cause pixels to visually depict different information. For example, in the touchscreen embodiment disclosed by the '913 patent, a display algorithm would need to identify the steps involved in converting data to be displayed into control signals specific to each pixel of the screen.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 29th day of March 2017 in Minneapolis, MN

Loren G. Terveen Ph.D.