

Filed: September 12, 2023

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC,
Petitioner,

v.

BUFFALO PATENTS LLC,
Patent Owner.

Case No. IPR2023-01387
U.S. Patent No. 8,204,737

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 8,204,737**

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I. Precise Relief Requested

Petitioner requests review under 35 U.S.C. § 311 of claims 1-16 and 19 of U.S. Patent No. 8,204,737 (“the ’737 patent”) and cancellation of the challenged claims under pre-AIA 35 U.S.C. § 103.

Exhibit	Prior Art
1005	<i>Ditzik</i> , U.S. Patent No. 6,167,376; issued December 26, 2000, from an application filed December 21, 1998; prior art under at least pre-AIA § 102(e).
1006	<i>Roberts</i> , U.S. Patent No. 5,027,406; published June 25, 1991, from an application filed December 6, 1988; prior art under at least pre-AIA §§ 102(a), (b), (e).
1007	<i>Tchorzewski</i> , Canadian Patent No. 1,335,002; issued March 28, 1995, from an application filed February 9, 1988; prior art under at least pre-AIA §§ 102(a), (b), (e).
1008	<i>Verrier</i> , European Patent Application Publication No. 0 622 724 A2; published November 2, 1994, from an application filed April 15, 1994; prior art under at least pre-AIA §§ 102(a), (b), (e).

Exhibit	Prior Art
1009	<i>Bellegarda</i> , an IEEE publication titled “A Novel Word Clustering Algorithm Based on Latent Semantic Analysis”; published in 1996; prior art under at least pre-AIA §§ 102(a), (b).
1010	<i>Campbell</i> , an IEEE publication titled, “Speaker Recognition: A Tutorial”; published in September 1997; prior art under at least pre-AIA §§ 102(a), (b).
1011	<i>Root</i> , U.S. Patent No. 5,600,781; issued February 4, 1997, from an application filed May 21, 1996; prior art under at least pre-AIA §§ 102(a), (b), (e).
1012	<i>Lewis</i> , U.S. Patent Publication No. 2001/0053978; published December 20, 2001, from an application filed January 28, 1999; prior art under at least pre-AIA § 102(e).

Grounds of Unpatentability	
1	<i>Ditzik</i> , <i>Tchorzewski</i> , and <i>Roberts</i> render obvious claims 1, 4, 12, 13, 15, 16, and 19.

Grounds of Unpatentability	
2	<i>Ditzik, Tchorzewski, Roberts</i> and <i>Verrier</i> render obvious claims 2, 3, 5, 6, 11, and 14.
3	<i>Ditzik, Tchorzewski, Roberts</i> , and <i>Bellegarda</i> render obvious claims 9 and 10.
4	<i>Ditzik, Tchorzewski, Roberts</i> , and <i>Campbell</i> render obvious claims 7 and 8.
5	<i>Root, Roberts</i> , and <i>Lewis</i> render obvious claims 1, 2, 4, 12, 13, 16, and 19.
6	<i>Root, Roberts, Lewis</i> , and <i>Verrier</i> render obvious claims 3, 5, 6, 11, and 14.
7	<i>Root, Roberts, Lewis</i> , and <i>Bellegarda</i> render obvious claims 9 and 10.
8	<i>Root, Roberts, Lewis</i> , and <i>Campbell</i> render obvious claims 7, 8, and 15.

II. The '737 Patent

A. Overview

The '737 patent relates to a system for generating text in response to voice and handwriting inputs. ('737 patent, 5:61-63.) It includes a **microphone that receives voice inputs**, and a **tablet surface** that receives **freehand inputs** from a **stylus**. (*Id.*, 6:2-6.) Voice and handwriting inputs are respectively recognized by the system's speech and handwriting recognizer. (*Id.*, 22:10-13.)

The system contains message models, which are “model[s] used in recognition of a message” like speech or freehand inputs. (*Id.*, 13:1-4.) A message model can be any “algorithm mathematical expression, set of rules” for “defining operation of a message recognizer to provide text data responsive to message input” (*id.*, 22:14-25). A message model “may include a language model as well as an acoustic and/or handwriting model.” (*Id.*, 13:3-4.)

The system comprises **a plurality of user message models** and a **local message model**. A **local message model** is “any message model that is local to a message recognizer” and does not require any “communications outside its local processing environment.” (*Id.*, 23:17-26.) A “**user message model**” is “a message model that is specific to a particular user.” (*Id.*, 12:66-13:4.) A “message model is said to be specific to a particular user when th[at] message model may be adapted

by training input from the user,” such as through “corrections of misrecognized message input.” (*Id.*, 23:31-36, 23:36-25:29.)

B. Earliest Available Priority Date

The application that matured into the ’737 patent was filed March 22, 2005, and claims priority to U.S. Provisional Application No. 60/144,481, filed on July 17, 1999.

III. Level of Ordinary Skill

A person of ordinary skill in the art (“POSITA”) at the time of invention would have at least a bachelor’s degree in computer engineering, computer science, electrical engineering, or a similar field, and approximately three years of industry or academic experience in a field related to acoustics, speech recognition, speech detection, handwriting recognition, or signal processing. (Decl., ¶35.) Work experience can substitute for formal education and additional formal education can substitute for work experience.

IV. Claim Construction

Claims need to be construed only to the extent necessary to resolve a controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). No terms require construction because the claims encompass the prior-art mappings under any reasonable construction consistent

with the *Phillips* standard. 37 C.F.R. § 42.100(b); *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc).

V. Claims 1-16 and 19 Are Unpatentable

A. Ground 1: *Ditzik*, *Tchorzewski*, and *Roberts* Render Obvious Claims 1, 4, 12, 13, 15, 16, 19

1. *Ditzik*

Ditzik discloses a “computer system with speech recognition systems and handwriting recognition systems” that receive speech input through a microphone and handwriting input through a stylus. (*Ditzik*, Abstract.) It converts these inputs “to computer recognizable text” for display “on a display device.” (*Id.*) This is shown in Figure 3:

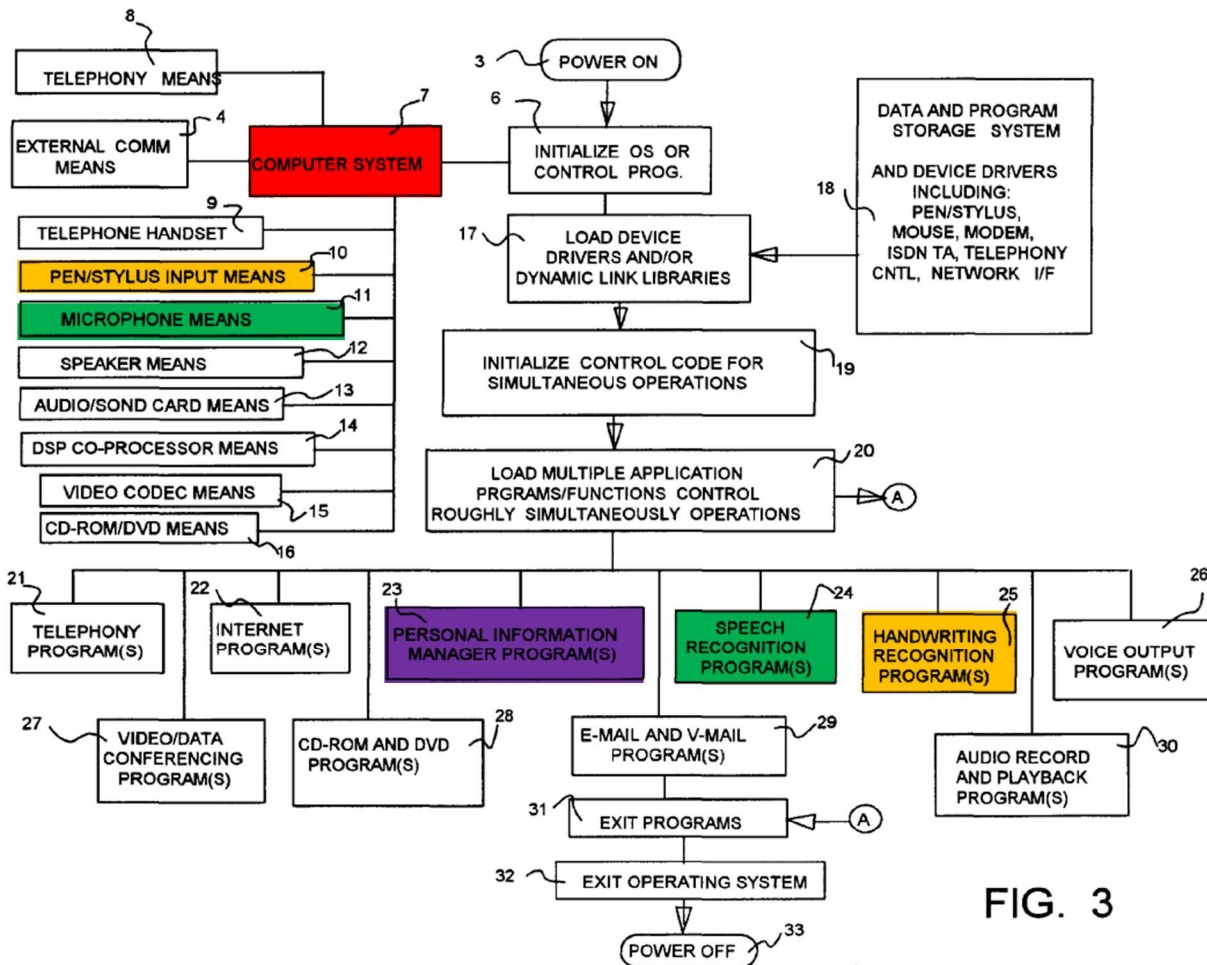


FIG. 3

(*Id.*, FIG. 3 (annotated).) *Ditzik*'s system stores an acoustic model, language model for speech recognition, and handwriting and language models for handwriting recognition (*Id.*, FIGS. 1-2, 3:52-64, 5:28-53), as shown below in Figures 1-2:

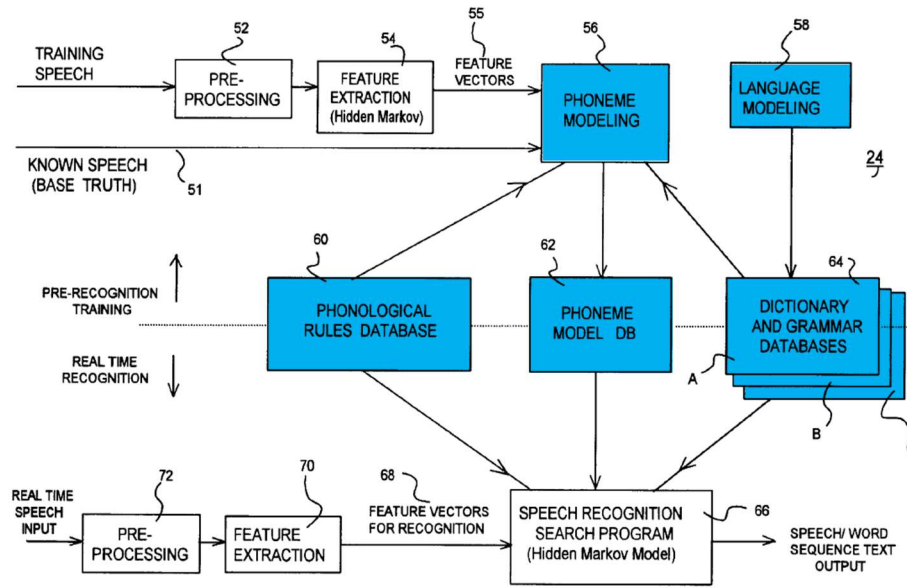


FIG. 1

PRIOR ART

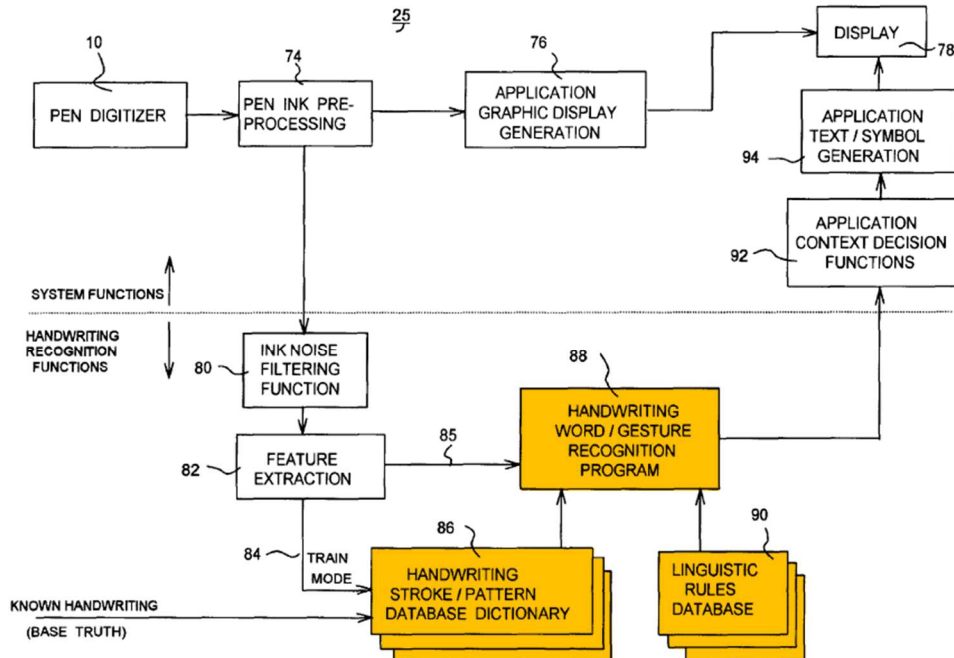


FIG. 2

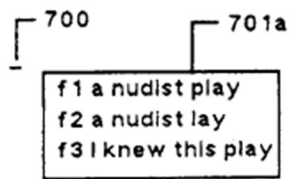
(*Id.*, FIGS. 1-2 (annotated).) (Decl., ¶¶50-51.)

2. *Tchorzewski*

Tchorzewski discloses a speech recognition system for multiple users by training “the recogni[z]er with his or her own voice.” (*Tchorzewski*, 1:1-8.) It discloses using “a common database” “containing the **templates of all the users**,” and sending a user template upon activation of a user terminal. (*Id.*, 2:1-7, 2:23-3:5.) (Decl., ¶¶52.)

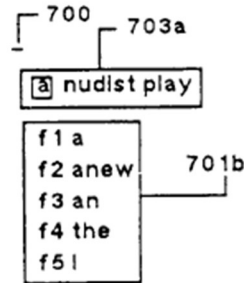
3. *Roberts*

Roberts discloses creating a language model for speech recognition. (*Roberts*, Abstract.) If a user uses a vocabulary not in the database, *Roberts*’s system “displays a list of the words in the active vocabulary which best match the spoken word,” and a user can select a displayed word. (*Id.*) *Roberts*’s “uses the confirmed word . . . to **update the language model used by the recognition system**” (*id.*, 13:44-47), as shown in Figures 29-31:



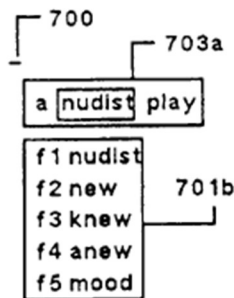
User says "a new display"

FIG. 29



User double-clicks f1

FIG. 30



User presses right arrow

FIG. 31

(*Id.*, FIGS. 29-31.) (Decl., ¶¶53-54.)

4. Claim 1

- a. 1[pre] "A system for generating text responsive to voice and handwriting input, comprising:"

If limiting, *Ditzik* discloses the preamble. (Decl., ¶¶55-56.) For example, *Ditzik* discloses "a computer system with **speech recognition systems** and **handwriting recognition systems** . . . that work closely together to improve the total

recognition accuracy of each system alone.” (*Ditzik*, Abstract.) These systems are shown in Figures 1 and 2:

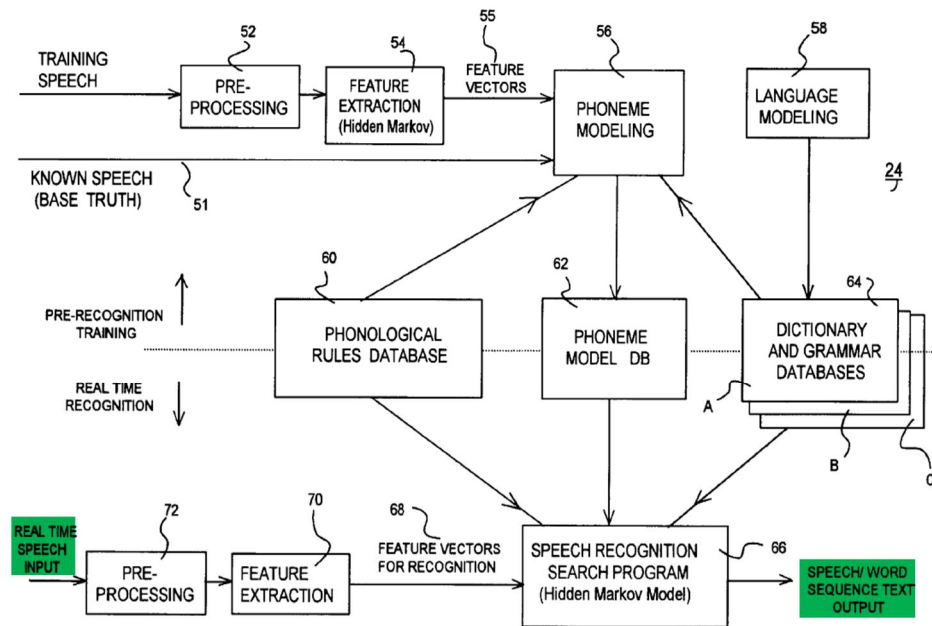


FIG. 1

PRIOR ART

(*Ditzik*, FIG. 1 (annotated).)

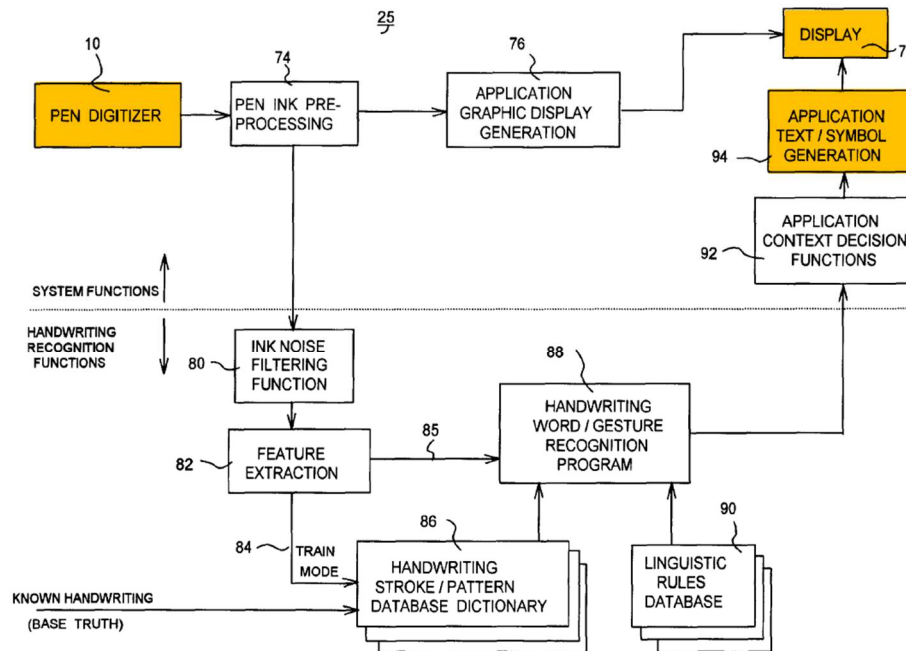


FIG. 2

(*Ditzik*, FIG. 2 (annotated).) *Ditzik* “capture[s] and record[s] **verbal information**” at the speech recognizer and converts that “into text and/or graphic data formats.”

(*Ditzik*, 1:13-14.) So too, its handwriting recognition system “may transform **hand written letters, numbers, punctuation, and symbols** into recognizable computer generated text.” (*Ditzik*, 4:32-35.)

- b. 1[a] “a tablet surface, wherein the system is configured to receive freehand input based at least in part on manipulation of a stylus relative to the tablet surface; and”

Ditzik discloses this limitation. (Decl., ¶57.) *Ditzik* discloses “a pen/stylus input means” including a **stylus** and “opaque graphic **tablet or transparent device, placed over a display screen.**” (*Ditzik*, 6:21-24; FIG. 3.) The tablet “captures a **handwriting or graphic symbols** from a person” when the **pen/stylus** is moved

across its surface and digitizes that “pen stroke data” on its display. (*Id.*, 4:29-41;

FIG. 4.) These features are shown in Figures 3 and 4:

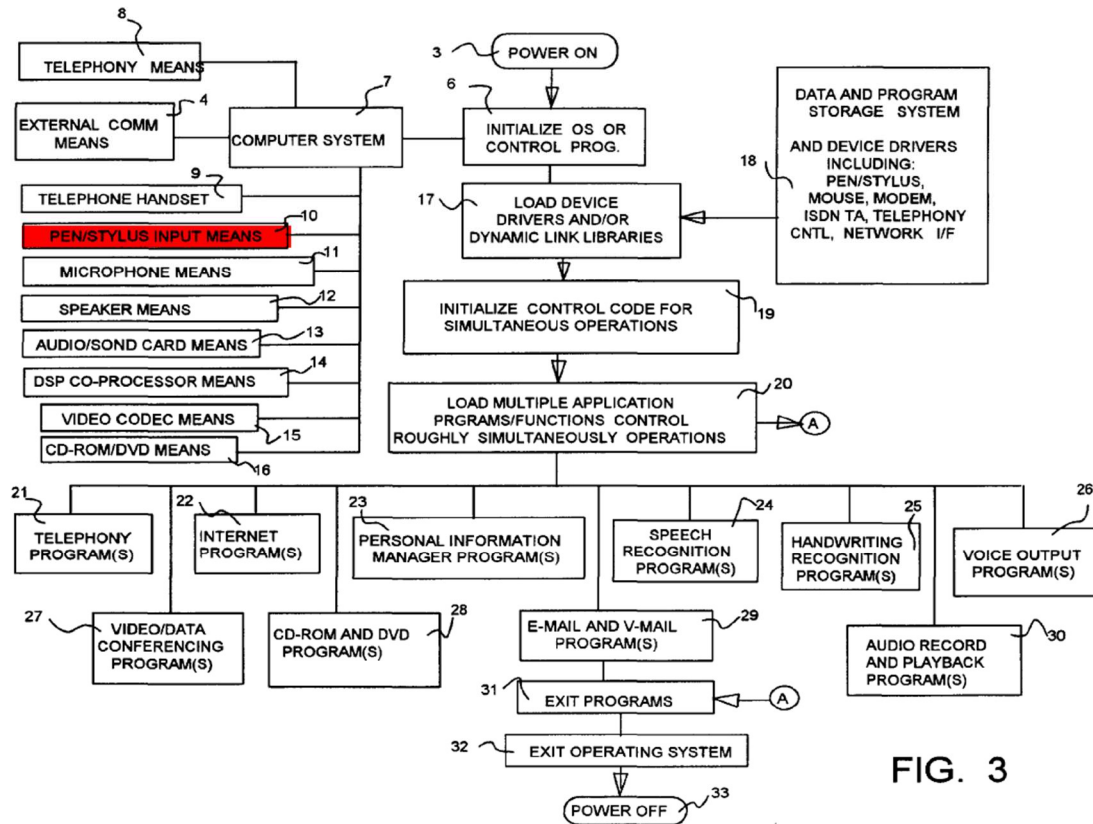


FIG. 3

(Ditzik, FIG. 3 (annotated).)

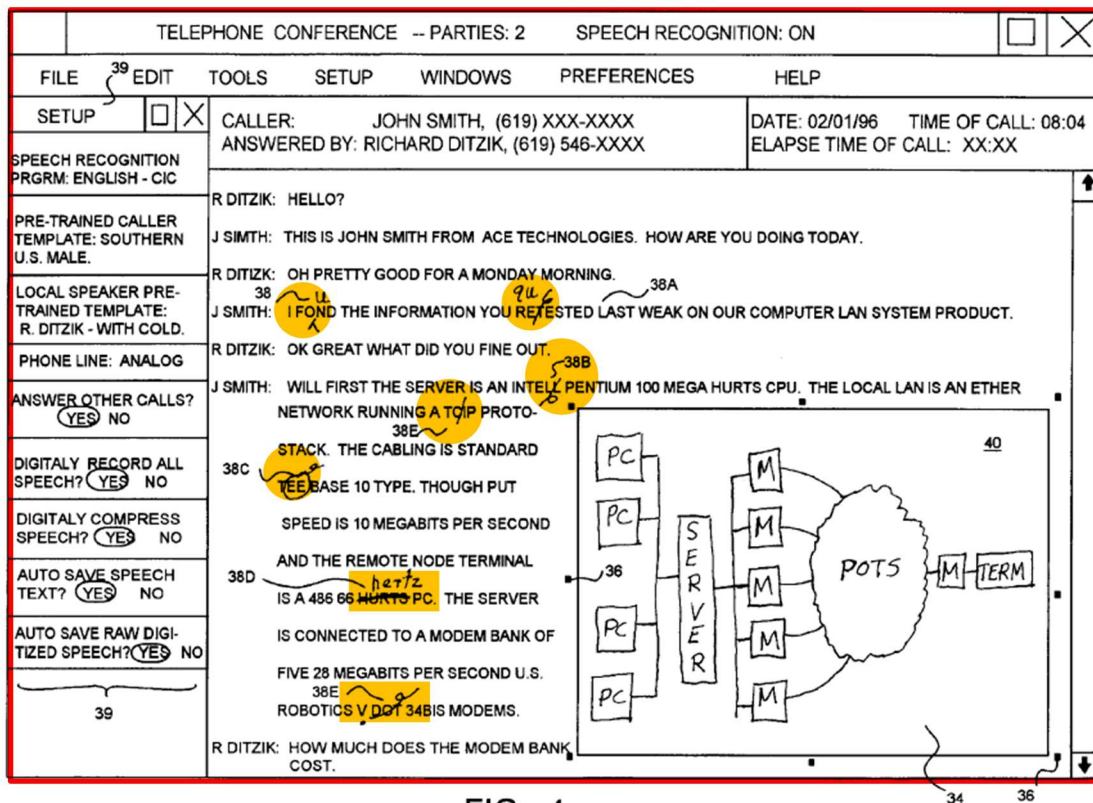


FIG. 4

(*Id.*, FIG. 4 (annotated).)

c. 1[b] “a microphone for receiving voice input;”

Ditzik discloses this limitation. (Decl. ¶58.) *Ditzik* discloses “speech input recognition program/functions 24 and associated hardware” that capture speech “(via microphone or telephone line), digitize data, process data, store raw speech data, and storage of recognized text.” (*Ditzik*, 6:59-63.) *Ditzik*’s “microphone means” receives voice input (*id.*, 6:24-31) as shown in Figure 3:

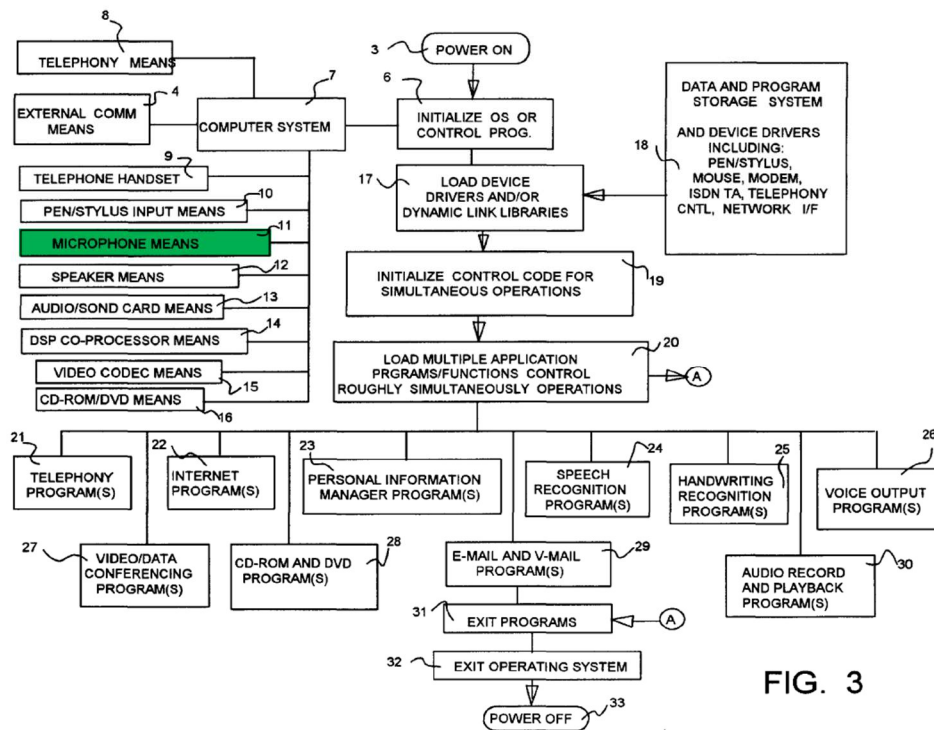


FIG. 3

(Ditzik, FIG. 3 (annotated).)

- d. 1[c] “wherein the system is configured to: select a particular user message model from a plurality of user message models;”

Ditzik and *Tchorzewski* render this limitation obvious. (Decl., ¶59.)

First, *Ditzik* discloses a **user message model**, that is, a model including “a language model as well as an acoustic model and/or handwriting model” that is “specific to a particular user” through training. (’737 patent, 12:66-67, 13:3-4.) (Decl., ¶60.) *Ditzik* discloses a user-specific language model because it discloses a user adaptive recognition system where the computer is “adapted to detect a person’s” speech and handwriting patterns. (*Ditzik*, 3:11-16, 5:28-37; Decl., ¶56.) This includes **language modeling program** that “input[s] data to the word and

grammar dictionary.” (*Ditzik*, 3:59-62.) The word and grammar dictionary contains language models with “rules of allowable word sequences” and “several general or specialized vocabularies,” where specialized sequences are “specialized for several identified speech recognition applications.” (*Ditzik*, 3:52-58.) A POSITA would have understood *Ditzik*’s “specialized vocabularies” are language models trained based on user-specific data and, thus, user-specific. Such models were well known at the time in speech recognition. (*Roberts*, 13:47-50; Decl., ¶60.)

If the claim requires a language model based on handwriting recognition and speech recognition, *Ditzik* also discloses this with its “linguistic rules database” and “multiple rules databases” that include “different rules for different written languages and/or regional subsets” that serve as language models for handwriting recognition. (*Ditzik*, 5:50-53.) The linguistic rules database may be a special rules database with “multiple rules databases, for example, different written languages and/or regional subsets.” (*Ditzik*, 2:51-52, 5:50-53.) *Ditzik* discloses that a user may train the model through “user selection of certain handwriting recognition parameters,” including “handwriting, stroke or pattern dictionaries (databases),” and “selection of general or special linguistic rules databases.” (*Ditzik*, 2:45-52; Decl., ¶61.)

Although not required by the claims, if Patent Owner argues the claimed user-specific language models for speech recognition and handwriting recognition

are shared, a POSITA would have found it obvious to modify language modeling program, word and grammar dictionary 64, and linguistic rules database in *Ditzik* so that they share the same grammatical and linguistic rules to harmonize speech and handwriting recognition. (Decl., ¶62.) A POSITA would have done so with a reasonable expectation of success given that a shared language model was a well-known feature in the art (*Waibel*, 167; *Suhm*, 222; *Manke*, 1098, 1099; *Roberts*, Fig. 1 (103, 111, 104, 180); *Vo*, 3547), and applying it to *Ditzik*'s system would have simply involved combining known elements according to known speech and handwriting recognition methods to ensure consistency between handwriting and speech recognition. (Decl., ¶62.)

Ditzik also discloses a user-specific acoustic model. (Decl., ¶63.) *Ditzik*'s speech recognition system includes “a phonological rules database 60 [that] may also provide data to the phoneme modeling program” 56.¹ (*Ditzik*, 3:59-64.) The phoneme modeling function inputs acoustic data to phoneme model database 62, which stores phoneme models, a type of acoustic model. (*Ditzik*, 3:37-39; Decl., ¶63.) *Ditzik* discloses these acoustic models are user specific because they can be

¹ *Ditzik* calls element 56 a “phoneme modeling function” and “phoneme modeling program” interchangeably. A POSITA would have likewise understood these terms are interchangeable. (Decl., ¶63.)

trained using “[s]peech patterns from one or more persons.” (*Ditzik*, 3:19-24; Decl., ¶63.) This is shown in Figure 1:

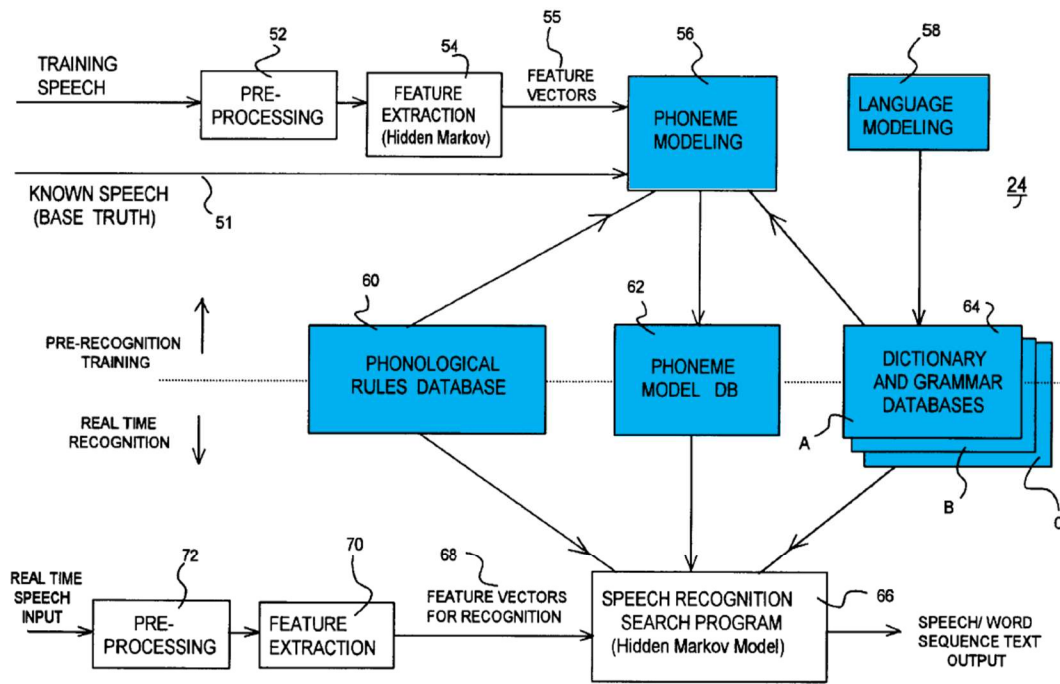


FIG. 1

PRIOR ART

(*Ditzik*, FIG. 1 (annotated).)

Ditzik discloses a user-specific handwriting model. (Decl., ¶64.) When *Ditzik*’s “system is in the training mode,” data is input into “**handwriting stroke and/or pattern database 86**,” containing **handwriting models** including “a plurality of **hand writing/sketch patterns** for one or more languages and/or special symbol applications.” (*Ditzik*, 5:28-53.) *Ditzik* discloses pattern database 86 may “accept **handwriting data** from a known source with known writing samples” (e.g., base truth data). (*Ditzik*, 5:33-35.) Using a handwriting model, like that in pattern

database 86, for handwriting recognition, was well known. (*Lewis*, [0020]-[0022], FIG. 1; *Root*, 3:66-4:3, 5:44-6:22, FIGS. 1-6; Decl., ¶64.) Such a trained handwriting model is user specific because it reflects a user's handwriting and sketch patterns (Decl., ¶64.), as shown in Figure 2:

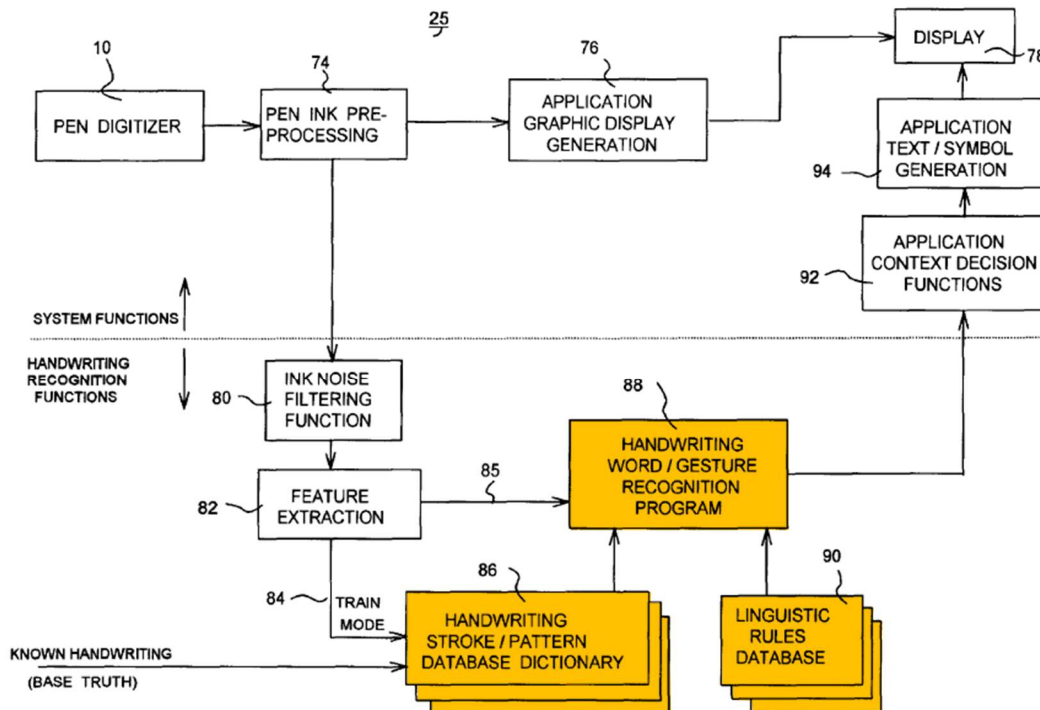


FIG. 2

(*Ditzik*, FIG. 2 (annotated).) Because *Ditzik* discloses a user-specific “language model as well as acoustic model and/or handwriting model,” it discloses a [user message model](#). (Decl., ¶65.)

Tchorzewski discloses a [plurality of user message models](#) and selecting a particular [model](#) from that plurality. (Decl., ¶66.) It discloses a system providing “a speech recognition facility to a multiplicity of user terminals.” (*Tchorzewski*, 2:23-

30.) This facility includes “a database containing respective templates for each of the user terminals.” (*Id.*) Each template includes a user’s “voice patterns” (acoustic models) to “interpret voiced instructions.” (*Id.*, 1:8-14.) When a user terminal is activated, a speech recognizer is assigned to that terminal. (*Id.*, 2:32-3:5.) The speech recognizer sends a request to the database holding the “speaker-dependent templates” to send a template corresponding to the user terminal. (*Id.*, 2:32-3:5.) The database “provide[s] a copy of relevant **speaker-dependent templates** to the assigned recognition means.” (*Id.*, 2:34-3:5, 3a:11-23.)

It would have been obvious to similarly store *Ditzik*’s language, acoustic, and handwriting models as a user template, so the models for each user are stored and retrieved efficiently. (Decl., ¶67.) It would have also been obvious to apply *Tchorzewski*’s selection of one user-specific template from multiple different stored templates to improve speech and handwriting recognition where there are multiple users of the same device. (Decl., ¶67.) It was known to adapt and store a plurality of models including both “an acoustic model and a contextual model” for different users, to have customized, accurate speech and handwriting recognition. (*Mitchell*, 5:46-56.) The more models tailored to specific users, the more likely the system is to accurately recognize user-specific speech and handwriting. (*Roberts*, Abstract; Decl., ¶67).

A POSITA would have been motivated to combine *Ditzik* and *Tchorzewski* because they are in the same field of endeavor as each other and the '737 patent, directed to improving speech and handwriting recognition accuracy. (Decl., ¶68.) And a POSITA would look to *Tchorzewski* when considering ways to improve *Ditzik*'s system. (*Id.*) *Ditzik* discloses training a user message model—training the language model and phoneme model using speech input, and the handwriting model using the handwriting input for a given user. (*Ditzik*, 3:9-48.) It was well understood that a tablet, like that disclosed in *Ditzik*, could be used by multiple users with different speech and handwriting patterns. (Decl., ¶68.) A POSITA would have found it obvious to store different user message models for different users in a database, so that *Ditzik*'s recognition system could efficiently retrieve a specific model for each user and improve handwriting and speech recognition. (*Tchorzewski*, 1:5-19, 1:30-2:22; Decl., ¶69.)

A POSITA would have done so with a reasonable expectation of success. (Decl., ¶69.) A POSITA would have understood *Tchorzewski*'s telephone-based system is compatible with *Ditzik*'s system because *Ditzik* discusses using telephone connections and identifying a user with a telephone switch and extension, akin to identifying a user via a username or password. (*Ditzik*, 6:18-20 6:24-31, 6:49-53, 6:59-63, 7:19-23, 8:19-30.) *Ditzik* discloses storing its user-specific speech and handwriting data in databases. (*Ditzik*, 3:59-64, 5:38-42.) Modifying the databases

to store a plurality of user-specific message models in view of *Tchorzewski* would have simply involved combining known elements according to known speech and handwriting recognition methods to yield the predictable result of improving user-specificity for accurate recognition. (Decl., ¶69.) A POSITA would have understood storing different user message models would offer streamlined costs and efficiency benefits. (*Tchorzewski*, 1:5-19; Decl., ¶69.)

- e. **1[d] “adjust a language model of a local message model based at least in part on the particular user message model, wherein the local message model includes the language model, a handwriting model, and an acoustic model;”**

Ditzik, *Tchorzewski*, and *Roberts* render this limitation obvious. (Decl., ¶70.) *Ditzik* discloses a speaker-independent **local message model** including a language model, handwriting model, and acoustic model. *Ditzik*’s system stores these models and explains they can be trained with a user’s training input. (*Ditzik*, 3:43-48, 5:33-37.) For example, as explained for 1[c], the dictionary and grammar database in the language modeling program contains a speaker-independent language model of “several general . . . vocabularies.” (*Ditzik*, 3:53-56). This is stored in databases 64 and 90 in the tablet. (Decl., ¶¶71-72.) *Ditzik* also discloses phoneme model database, storing an acoustic model based on “a base or ground truth of voice data consisting of known words or speech patterns,” on the tablet. (*Ditzik*, 3:43-48 (installed “during factory setup” for “user independent recognition

systems”). *Ditzik* discloses a handwriting model in the handwriting stroke/pattern database dictionary, based on “handwriting data from a known source with known writing samples” (e.g., base truth data), for “user independent recognition systems.” (*Ditzik*, 5:33-37.) These are stored locally in the handwriting stroke and pattern database dictionary. (*Ditzik*, 5:28-33, 5:40-42; Decl., ¶72.)

Ditzik discloses training message models and adapting to a user’s speech and handwriting patterns. (*Ditzik*, Abstract, 3:14-18; Decl., ¶73.) For example, *Ditzik* discloses user adaptive speech recognition using “a training path,” “to improve the recognition accuracy of the system.” (*Ditzik*, 3:11-65.) Similarly, *Ditzik* discloses a “training mode” where user-specific “user training” data “is input to a handwriting stroke and/or pattern database 86” to adjust the language models for handwriting recognition in linguistic rules database 90. (*Ditzik*, 5:25-37; Decl., ¶73.)

Alternatively, “adjust[ing] a language model of a local message model based at least in part on a particular user message model,” would have been obvious in view of *Roberts*. (Decl., ¶74.) *Roberts* discloses adjusting a language model based on user-specific information. (Decl., ¶74.) *Roberts* discloses a system where a user can correct misrecognized words using a user input (selecting correct word from menu) to train and “update the language model.” (*Roberts*, 13:44-47; *id.*, Abstract, 4:51-62, 14:10-41, 19:32-45, 23:56-24:2, 25:19-46, 26:47-27:2, 27:48-28:19, 29:33-54, 36:26-37, FIGS. 1, 25.) For example, *Roberts* discloses using “the most

recent confirmed word stored in the language context buffer” to update the statistical probability of the word being spoken. (*Roberts*, 13:50-60, 16:7-28.) This aligns with the ’737 patent, which discloses updating a local language model using “manual editing of a tabulation,” where a user purges “from the tabulation of data structure 1200” “[p]rimary text segments known to be poor indicators of context.” (’737 patent, 31:59-32:40, 33:3-25.)

A POSITA would have been motivated to apply *Roberts*’s updating scheme to *Ditzik*’s recognition system (as modified by *Tchorzewski*, §V.A.4.d), such that *Ditzik*’s local language models are adjusted based at least in part on a particular user message model to increase recognition accuracy. (Decl., ¶75.) *Ditzik* and *Roberts* are in the same field of endeavor of recognition systems, where speech recognition is combined with a user input to improve accuracy, and a POSITA would look to *Roberts* when considering ways to improve upon *Ditzik*’s system. (Decl., ¶75.) A POSITA would have found it desirable to adjust (e.g., train) local language models in *Ditzik* based on a particular user message model so they can limit “the recognition vocabulary to such a number of words which the language models considers most likely to occur” for a particular speaker. (*Roberts*, 19:28-31.) It was known “[w]hen recognition is being performed against phonemic[,] as well as against individually trained acoustic models, it is desirable that a language model be used to limit the recognition vocabulary to a number of words which the

recognizer can handle in a response time which the user finds satisfactory.”

(*Roberts*, 19:23-28.) A POSITA would have been motivated to adjust *Ditzik*’s language models for handwriting recognition for the same reasons. (Decl., ¶75.)

A POSITA would have done so with a reasonable expectation of success. (Decl., ¶76.) A POSITA would have understood that *Roberts*’s bigram language model is the same type of model as, and is thus combinable with, *Ditzik*’s language model. (*Id.*) Combining the local message model in *Ditzik*’s system with *Roberts*’s process for adjusting a language model based on user-specific data would have been combining known elements according to known speech and handwriting recognition methods to increase recognition accuracy with personalized speech and handwriting data. (Decl., ¶76.) It would also have been using a known technique for adjusting language models to improve similar speech and handwriting recognition devices in the same way to increase recognition accuracy. (Decl., ¶76.) A POSITA would have found it obvious to try because adjusting the language model would improve recognition accuracy, which is a better option than not adjusting it. (Decl., ¶¶76-77; *Roberts*, 1:65-67.)

- f. **1[e] “generate text data based at least in part on the freehand input, the adjusted language model, and the handwriting model; and”**

Ditzik and *Roberts* render this limitation obvious. (Decl., ¶78.)

Ditzik discloses a handwriting recognition system that “transform[s] hand written letters, numbers, punctuation, and symbols into recognizable computer generated text.” (*Ditzik*, 4:51-53.) *Ditzik*, in view of *Roberts*, uses freehand input, the adjusted language model, and the handwriting model to do so. (Decl., ¶79.) *Ditzik*’s handwriting recognition system extracts “certain features of the raw data” from freehand input. (*Ditzik*, 4:41-46, 5:40-45.) That raw data is compared “to one or more databases, which may be comprised of language dictionaries (lexicons) and writing rules.” (*Id.*) Database 86, for example, has “one or more dictionaries with a plurality of hand writing/sketch patterns for one or more languages and/or special symbol applications.” (*Id.*) As explained in 1[c] and [1d], it would have been obvious in view of *Roberts* for such handwriting language models to be trained with user-specific handwriting data (the “adjusted language model”). (§§V.A.4.d-V.A.4.e; Decl., ¶80). These language models work with handwriting models, like handwriting word/gesture recognition program 88, to generate text data. As *Ditzik* explains, handwriting word/gesture recognition program 88 is “based on HMM techniques, which determines the best match or matches, by comparing the feature vectors to databases 86 and 90.” (*Ditzik*, 5:42-45.) A POSITA would have understood handwriting word/gesture recognition program 88 is a handwriting model because it uses Hidden Markov Model techniques based on data stored in the handwriting stroke/pattern and linguistic rules databases. (*Ditzik*,

5:28-33, 5:49-50; Decl., ¶80.) Once this comparison is done, the information is sent to application text/symbol generation program 94, which then provides text data on display 78. (*Ditzik*, 5:1-14; 5:60-67.) This process of receiving freehand input and using an adjusted language model and handwriting model to generate text data is shown in Figure 2:

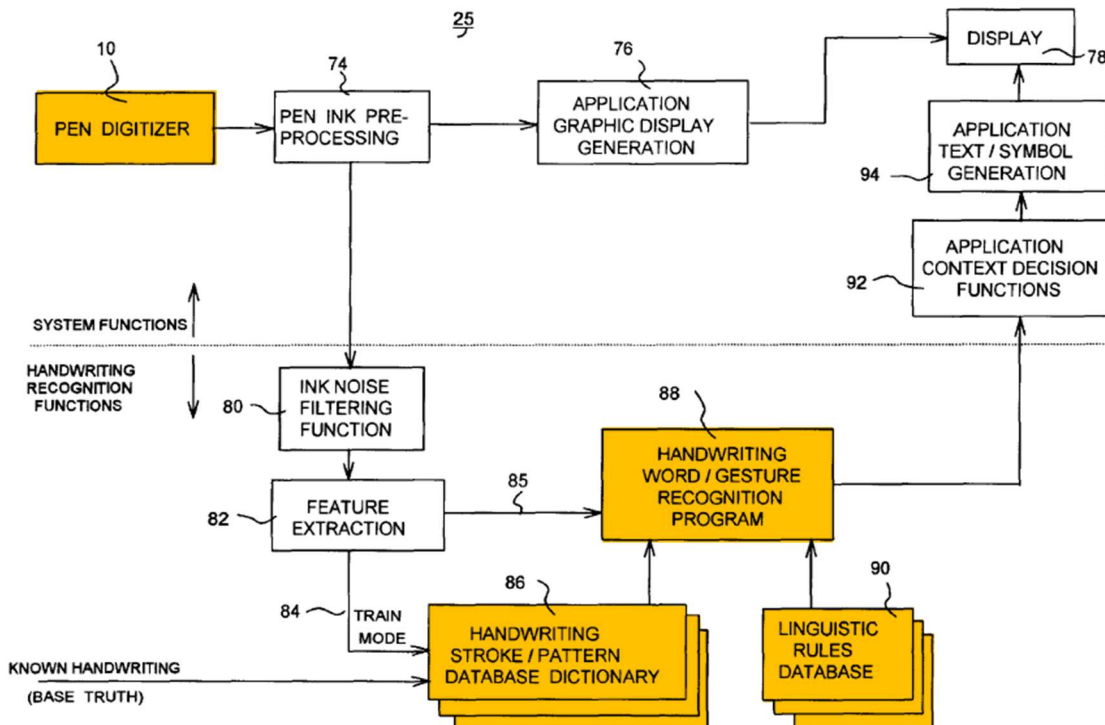


FIG. 2

(*Ditzik*, FIG. 2.) (Decl., ¶81.)

- g. 1[f] “generate text data based at least in part on the voice input, the adjusted language model, and the acoustic model.”

Ditzik and *Roberts* render this limitation obvious. (Decl., ¶82.)

Ditzik discloses its system “convert[s] recognized speech data to computer text at near realtime or delayed.” (*Ditzik*, 8:32-34.) *Ditzik*, in view of *Roberts*, uses voice input, the adjusted language model, and the acoustic model to do so. (Decl., ¶83.) *Ditzik*’s “speech input recognition program/functions 24” performs “several functions including speech capture (via microphone or telephone line), digitize data, process data, store raw speech data, and storage of recognized text.” (*Ditzik*, 6:59-63.) The “[s]peech patterns from one or more persons may be captured and sent to a pre-processing function 52,” (voice input). (*Ditzik*, 3:20-27.) The data from the pre-processing function “is input to a feature extraction function 54, which may be based on the Hidden Markov Model,” a language model “well known to those skilled in the art.” (*Id.*) As explained in 1[c] and 1[d], it would have been obvious in view of *Roberts* for such language models to be trained with user-specific speech data (“adjusted language model”). (§§V.A.4.d-V.A.4.e; Decl., ¶83). The output from the feature extraction function is then “input to a phoneme modeling function,” an acoustic model. (*Ditzik*, 3:27-30.) These steps are shown in Figure 1:

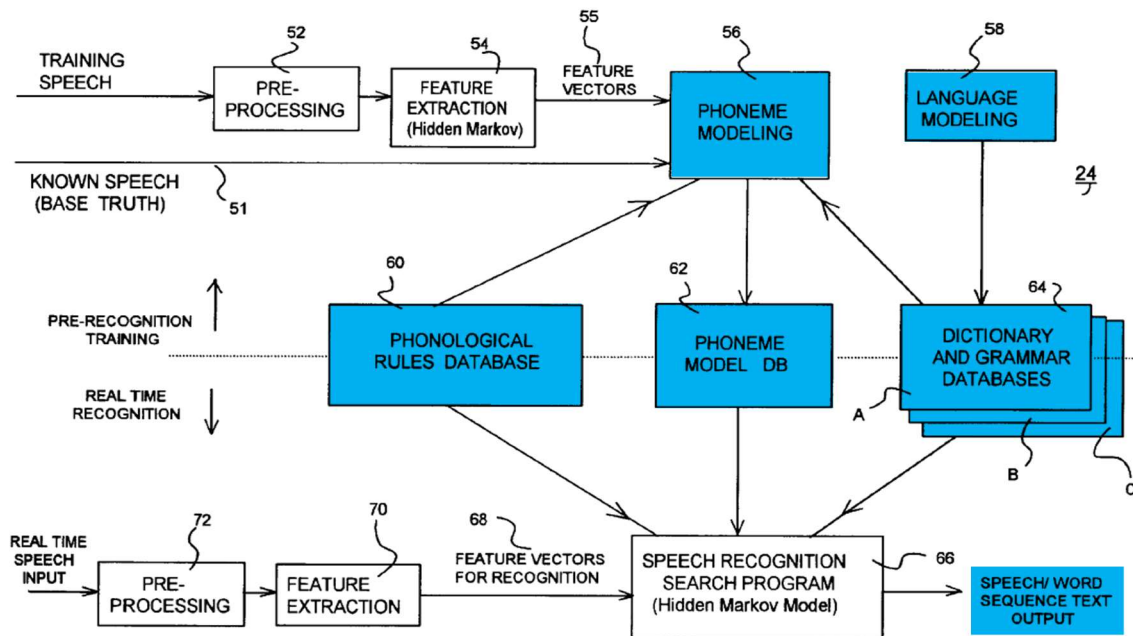


FIG. 1

PRIOR ART

(Ditzik, FIG. 1.) The end result is for the received and processed speech data to be converted “to computer text,” including the “speech/word sequence text output” as shown in Figure 1. (Ditzik, 8:32-34; Decl., ¶84.)

5. Claim 4

- a. **“The system of claim 1, wherein the system is further configured to train the particular user message model by updating the acoustic model.”**

Ditzik, Tchorzewski, and Roberts render obvious this additional limitation.

(Decl., ¶85.) *Roberts* discloses updating acoustic models. “When the correct word is chosen by the user, the speech sample is used to create or update an acoustic model for the word, without further intervention by the user.” (*Roberts*, Abstract.)

“If the system has existing models for the word or phonemes for which a new model is being built,” “the accumulated statistics from previous training are combined with the” updated statistics “to make a combined maximum likelihood estimate of the statistical parameters.” (*Roberts*, 18:3-10.) *Roberts* discloses, “[a]s is well-known to those skilled in the art, this operation will allow adaptive training of the acoustic models” and “zero-based training if no previous model exists.” (*Id.*) Because the user message model in the *Ditzik*, *Roberts*, and *Tchorzewski* system includes a user-specific acoustic model (§§V.A.4.d-V.A.4.e), updating that acoustic model trains the user model. (Decl., ¶86.)

A POSITA would have been motivated to do so, so the user model is continuously trained and refined to maximize recognition accuracy. (Decl., ¶87; §V.A.4.e.) It was known the accuracy of the user model increases with more input training data. (*Roberts*, Abstract; Decl., ¶87.) In fact, updating the acoustic model in the user model was a known concept at the time. (*Mitchell*, 5:48-52.) A POSITA would have had a reasonable expectation of success in doing so, for combining *Ditzik*’s system as modified by *Tchorzewski* with *Roberts*’s process would have involved combining known elements according to known recognition methods to the yield predictable result of increasing recognition accuracy using personalized recognition data. (§V.A.4.e; Decl., ¶87.)

6. Claim 12

- a. “The system of claim 1, wherein the particular user message model includes user-specific acoustic model information and user-specific handwriting model information.”**

Ditzik, Tchorzewski, and Roberts render obvious this additional limitation.

(Decl., ¶88.) As explained for 1[c]-[d], *Ditzik* and *Tchorzewski* render obvious selecting a particular user message model from a plurality of user message models.

(§§V.A.4.d-V.A.4.e; Decl., ¶88.) Those user message models include a language model, acoustic model, and handwriting model. (§§V.A.4.d-V.A.4.e; Decl., ¶88.)

The information in such a user message model would include user-specific acoustic model information and user-specific handwriting model information.

(Decl., ¶88.) Indeed, *Ditzik* discloses capturing “[s]peech patterns from one or more persons,” which are user-specific acoustic model information stored in phoneme model database 62. (*Ditzik*, 3:13-16, 3:19-24.) When *Ditzik*’s “system is in the training mode, data 84 is input to a handwriting stroke and/or pattern database 86,” containing “a plurality of hand writing/sketch patterns for one or more languages and/or special symbol applications.” (*Ditzik*, 5:28-53.) The handwriting and sketch patterns are user-specific handwriting model information, at least because it was a well-known feature in the art. (Decl., ¶88; *Lewis*, [0020]-[0022], FIG. 1; *Root*, 3:66-4:3, 5:44-6:22, FIGS. 1-6.)

7. Claim 13

a. 13[pre] “A method, comprising:”

Independent claim 13 is substantially similar to independent claim 1, except it is directed to a method. *Ditzik, Roberts, and Tchorzewski* render obvious the claimed method for the same reasons discussed for claim 1. (§V.A.4; Decl., ¶90.)

b. 13[a] “receiving, at a device, freehand input based at least in part on manipulation of a stylus;”

Ditzik disclose this limitation as discussed for 1[a], including receiving freehand input at a tablet, which is a device. (§V.A.4.b; Decl., ¶91.)

c. 13[b] “receiving, at the device, audio input based at least in part on information received at a microphone;

Ditzik discloses this limitation as discussed for 1[b], including receiving audio input through a microphone connected to the tablet. (§V.A.4.c; Decl., ¶92.)

d. 13[c] “selecting, via the device, a selected user message model from a plurality of user message models;”

Ditzik and *Tchorzewski* render this limitation obvious as discussed for 1[c], including using user identification information in *Ditzik*’s tablet to select the corresponding user message model from the plurality of user message models for different users. (§V.A.4.d; Decl., ¶93.)

e. 13[d] “adjusting, via the device, a language model of a local message model, wherein the local message model includes the language model, a handwriting model, and an acoustic model, wherein the adjusting the

**language model is based at least in part on the
selected user message model;”**

Ditzik, Tchorzewski, and Roberts render this limitation obvious as discussed for 1[d], including adjusting the language model of a local message model using *Ditzik*’s tablet because the tablet receives acoustic and handwriting inputs used to update (adjust) the language model. (§V.A.4.e; Decl., ¶94.)

**f. 13[e] “generating, by the device, converted
handwriting text data based at least in part on the
freehand input, the adjusted language model, and the
handwriting model;”**

Ditzik and *Roberts* render obvious this limitation as discussed for 1[e], including *Ditzik*’s tablet converts handwriting input into “computer generated text” and displays the text on its display. (§V.A.4.f; *Ditzik*, Abstract, 1:7-16, 2:6-26, 4:32-36, FIG. 2; Decl., ¶95.)

**g. 13[f] “generating, by the device, converted speech text
data based at least in part on the audio input, the
adjusted language model, and the acoustic model.”**

Ditzik and *Roberts* render obvious this limitation as discussed for 1[f], including *Ditzik*’s tablet generates “computer text of the speech input captured” and displays the text on its display. (§V.A.4.g; *Ditzik*, Abstract, 1:7-16, 2:6-26, 4:12-15, FIG. 1; Decl., ¶96.)

8. Claim 15

- a. “The method according to claim 13, further comprising accessing the selected user message model via a network.”**

Ditzik and *Tchorzewski* render this additional limitation obvious. (Decl., ¶97.) *Ditzik* discloses a “computer telephony application program” that uses “telephone-like connections” (“telephone, Internet, and cable networks”) to connect *Ditzik*’s tablet to a network. (*Ditzik*, 7:19-23, Claim 11.) It would have been obvious to use a network to access user message models on the network in view of *Tchorzewski*. (Decl., ¶98.) *Tchorzewski* discloses “a plurality of user terminals connected to a plurality of single-speaker dependent speech recognizers” via a telephone network (*Tchorzewski*, 3:6-10), where the connection of a user terminal prompts a “request for a copy of one of the templates from one of the recogni[z]ers,” “instructing the database to send a complete copy of the requested template without interruption.” (*Tchorzewski*, 3:27-3a:10.) *Ditzik* and *Tchorzewski* render obvious using a network like the Internet to transfer a user message model from a database to a user device. (Decl., ¶98.) A POSITA would have been motivated to do so, so that each message model would be efficiently retrieved from the database. (Decl., ¶99.) A POSITA would have also had a reasonable expectation of success because it would have been applying a known technique (accessing user message models via network) to a known speech and handwriting

recognition device to yield predictable results (efficient retrieval of each user message model). (Decl., ¶99.)

9. Claim 16

- a. “The method according to claim 13, further comprising training the selected user message model.”**

This limitation is substantially identical to claim 4. *Roberts* discloses training a selected user message model as explained for claim 4. (§V.A.5.) *Ditzik* and *Roberts* thus render obvious the additional limitation of claim 16. (§V.A.5; Decl., ¶100.)

10. Claim 19

- a. 19[pre]: “An article of manufacture including a non-transitory computer-readable medium having stored thereon instructions executable by a computing device to cause the computing device to perform operations comprising:”**

Claim 19 is substantially similar to claim 1, but it is directed to “[a]n article of manufacture.” *Ditzik* discloses the preamble as discussed for 1[pre]. (§V.A.4.a; *Ditzik*, 6:1-7:18; FIG. 3; Decl., ¶101.) *Ditzik*’s “computer system,” e.g., a tablet (article of manufacture), includes a “microprocessor” (computing device) and a “main memory” (non-transitory computer-readable medium). (*Ditzik*, 6:1-7:18, Fig. 3, Claims 6, 10, 12-13.) The memory stores instructions the microprocessor uses to perform the operations in 19[a]-19[f]. (*Id.*; §§V.A.10.b-V.A.10.g.) This is shown in Figure 3:

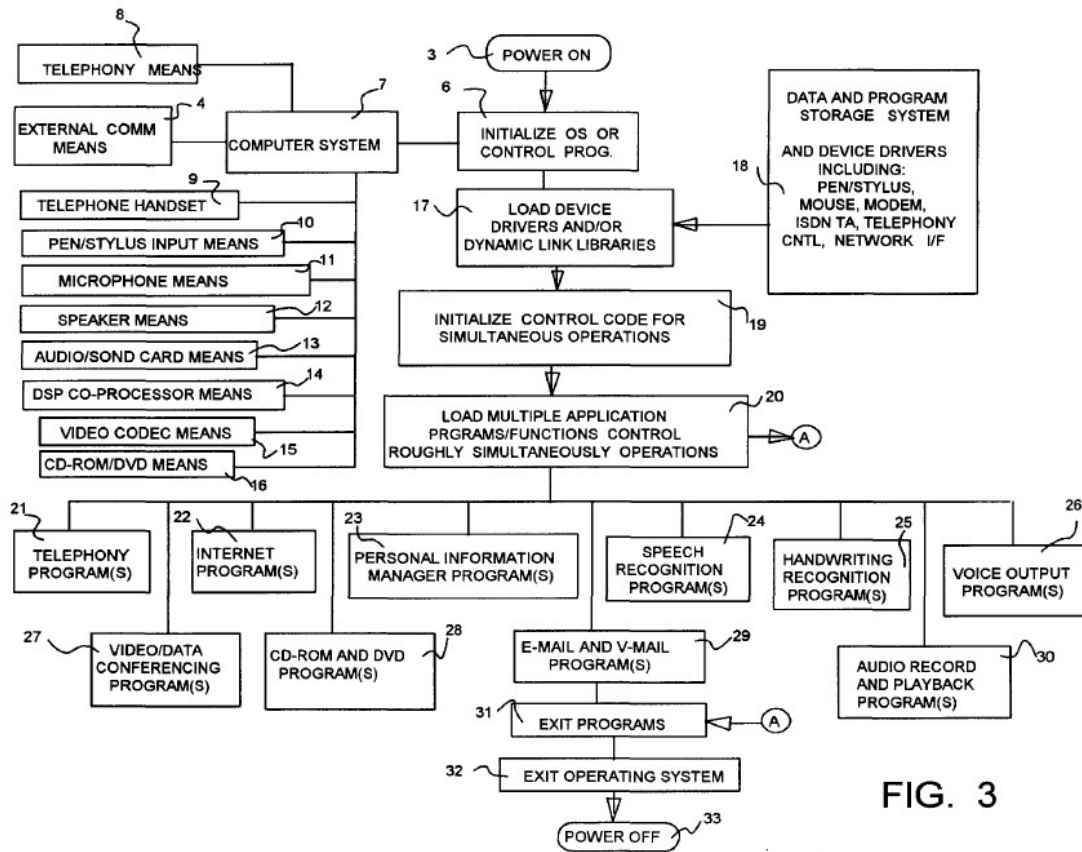


FIG. 3

(Ditzik, Fig. 3.)

- b. 19[a]: “receiving freehand input based at least in part on manipulation of a stylus;”

As discussed for 1[a], *Ditzik* discloses its tablet receiving freehand input based on manipulation of a stylus. (§§V.A.4.b, V.A.7.b Decl., ¶102.)

- c. 19[b]: “receiving audio input based at least in part on information received at a microphone;”

As discussed for 1[b], *Ditzik* discloses this limitation. (§§V.A.4.c, V.A.7.c; Decl., ¶103.)

d. 19[c]: “selecting a particular user message model from a plurality of user message models;”

As discussed for 1[c], *Ditzik* and *Tchorzewski* render obvious this limitation.

(§§V.A.4.d, V.A.7.d; Decl. ¶104.)

e. 19[d]: “adjusting a language model of a local message model based at least in part on the particular user message model, the local message model including the language model, a handwriting model and an acoustic model;”

As discussed for 1[d], *Ditzik*, *Tchorzewski*, and *Roberts* render obvious this limitation. (§§V.A.4.e, V.A.7.e; Decl., ¶105.)

f. 19[e]: “generating converted handwriting text data based at least in part on the freehand input, on the adjusted language model, and on the handwriting model; and”

As discussed for 1[e], *Ditzik* and *Roberts* render obvious this limitation.

(§§V.A.4.f, V.A.7.f; Decl. ¶106.)

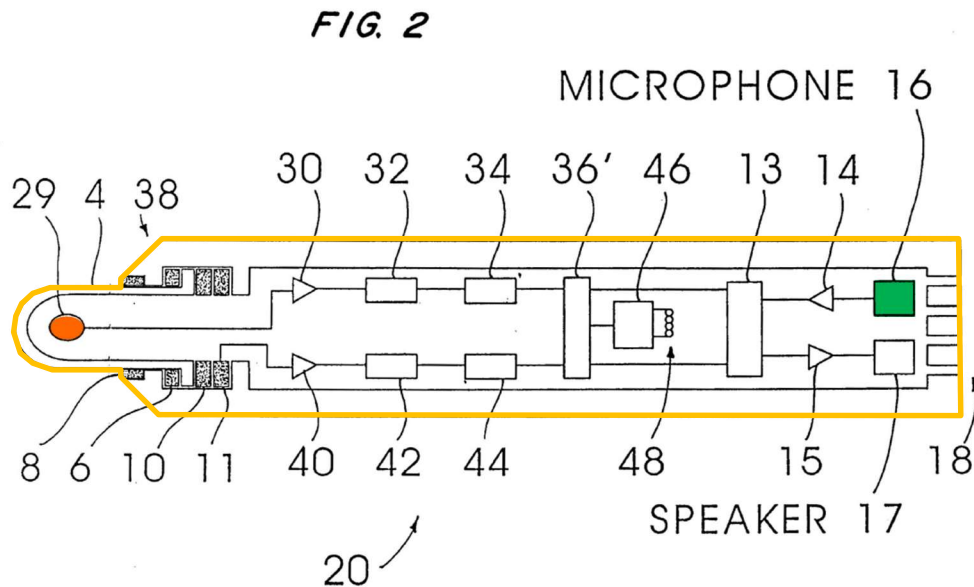
g. 19[f]: “generating converted speech text data based at least in part on the audio input, on the adjusted language model, and on the acoustic model.”

As discussed for 1[f], *Ditzik* and *Roberts* render this limitation. (§§V.A.4.g, V.A.7.g; Decl. ¶107.)

B. Ground 2: *Ditzik, Tchorzewski, Roberts, and Verrier* Render Obvious Claims 2, 3, 5, 6, 11, and 14

1. *Verrier*

Verrier discloses a stylus with “an improved voice communications feature.” (*Verrier*, 3:40-43.) The stylus contains a microphone to receive speech input, and a sensor to detect the proximity of the stylus to a tablet and when the tip touches the tablet (*Verrier*, 4:22-36), as shown in Figure 2:



(*Verrier*, FIG. 2 (annotated).) (Decl., ¶¶108-109.)

2. Motivation to Combine

A POSITA would have been motivated to combine *Ditzik, Tchorzewski, and Roberts* with *Verrier*. (Decl., ¶110.) *Ditzik* discloses a stylus for putting information into the tablet. (§V.A.4.b.) A POSITA would have been motivated to improve *Ditzik*’s stylus in view of *Verrier* in several ways. First, a POSITA would

have been motivated to move the microphone to *Ditzik*'s stylus to minimize receiving inputs from multiple sources and efficiently transition between receiving audio input and handwriting input. (*Verrier*, 3:27-36; Decl., ¶110.) This would lead to improved speech and handwriting recognition, and improved text generation in response to speech and handwriting inputs. (*Id.*) Second, a POSITA would have been motivated to include a proximity sensor to efficiently transition between receiving speech input and handwriting input depending on the location of the stylus relative the tablet. (Decl., ¶110.) This would improve speech and handwriting recognition and improve text generation in response to speech and handwriting inputs. (*Id.*) Third, a POSITA would have been motivated to identify the user upon activation of the stylus, and in turn retrieve a particular user message model (as in *Tchorzewski*) based on that identification. (*Id.*) This would have personalize user experiences and improve the accuracy of any associated speech recognition. (*Id.*)

A POSITA would have made these changes with a reasonable expectation of success. (Decl., ¶111.) Doing so would have been substituting a known element for another to improve accuracy using personalized speech and handwriting data. (*Id.*) It would combine a known tablet with a known stylus according to known methods in the same way to improve speech and handwriting recognition and identification. (*Id.*)

3. Claim 2

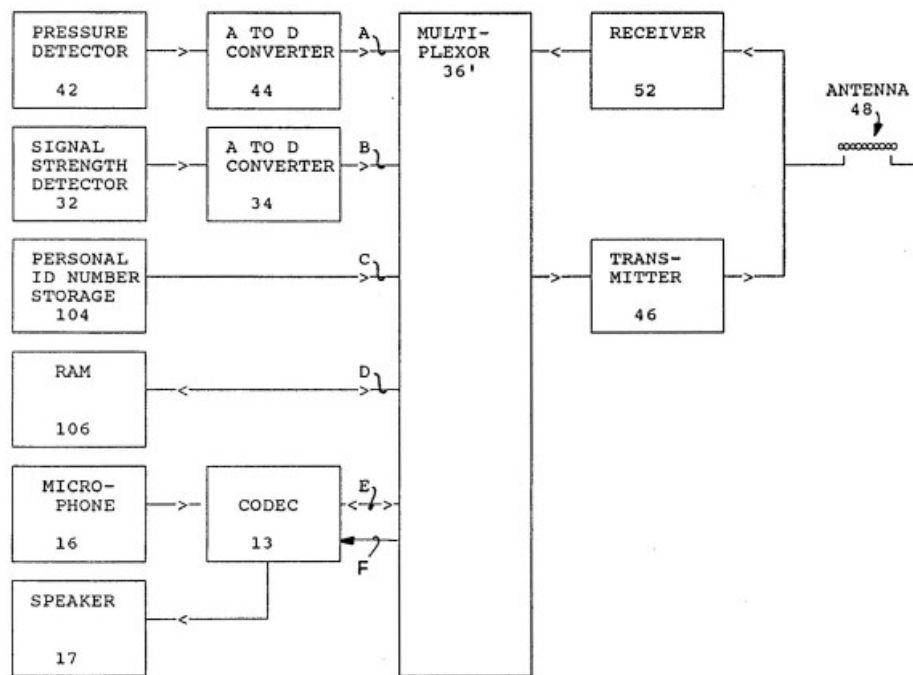
- a. 2[pre]: “The system of claim 1, wherein the system is further configured to:”**

Ditzik, Tchorzewski, and Roberts render claim 1 obvious. (§V.A.4; Decl., ¶112.)

- b. 2[a]: “identify information relating to a particular user;”**

Ditzik, Roberts, Tchorzewski, and Verrier render obvious this limitation. (Decl., ¶113). *Verrier* discloses a “personal stylus” with a “personal identification number storage” that “stores personal identification number of a password or other security information” which can be used “to validate the stylus or the user of the stylus” on the tablet (*Verrier*, Abstract, 8:53-58, 9:11-17, 18:13-20), as shown in Figure 3A:

FIG. 3A



(*Verrier*, FIG. 3A.) A POSITA would have been motivated to modify *Ditzik*'s stylus in a similar way to provide a personalized user experience and improve the accuracy of speech and handwriting recognition with a reasonable expectation of success. (Decl., ¶¶114-115; §V.C.2.)

- c. **2[b]: “wherein the particular user message model is selected based at least in part on the information relating to the particular user; and,”**

Ditzik, *Roberts*, *Tchorzewski* and *Verrier* render this limitation obvious. (Decl., ¶116.) *Ditzik* and *Tchorzewski* render obvious selecting a particular user message model from a plurality of user message models based on which user terminal is activated. (§V.A.4.d.) *Tchorzewski* discloses “speaker-dependent

templates” (e.g., user message model) are transferred from the database to that user terminal. (*Tchorzewski*, 2:32-3:5.) It would have been further obvious in view of *Verrier* to have the identification number in the stylus trigger the selection of the particular user message model, instead of the telephone extension associated with the user terminal, as in *Tchorzewski*. (*Verrier*, 8:56-57, 9:11-15, 18:13-20; Decl., ¶¶116-117.) Doing so would have been the simple substitution of known user devices in a known user identification method to achieve predictable results of identifying the user. (Decl., ¶118; §V.C.2.)

d. 2[c]: “wherein the plurality of user message models includes two or more user message models corresponding to users that are different from the particular user.”

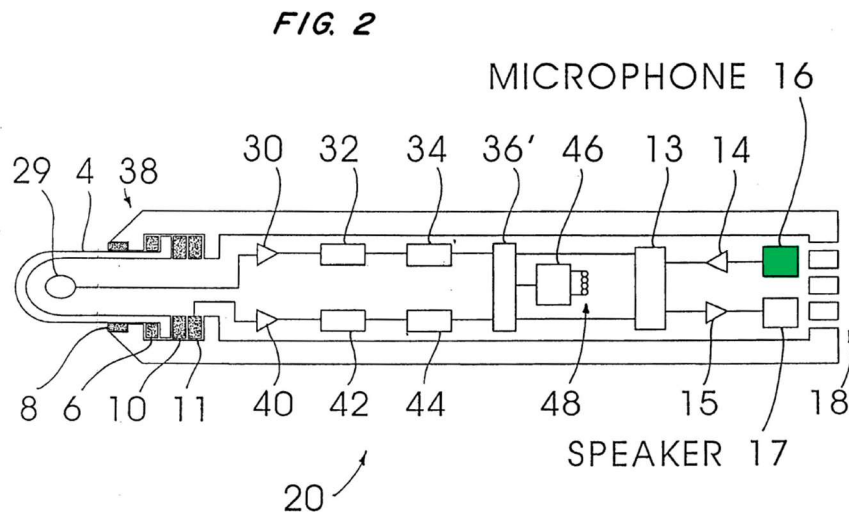
Ditzik and *Tchorzewski* render obvious this limitation. (Decl., ¶119.) *Ditzik* and *Tchorzewski* render obvious a plurality of user message models. (§V.A.4.d.) It would have been obvious to include models for several users, such as at least three: a “particular user” and “two or more” users “different from th[at] particular user.” (Decl., ¶119.) *Tchorzewski* discloses user-trained patterns “stored as ‘templates’ in Random Access Memory,” “a common database . . . containing the *templates of all the users*.” (*Tchorzewski*, 1:8-9, 2:1-2 (emphasis added).) It would have been obvious for such a system to support models for three or more different users. (Decl., ¶120.) It would have been obvious that storing different user message

models for different users maximizes speech and handwriting recognition because one message model may not accurately reflect the speech and handwriting patterns of another user. (Decl., ¶¶120-121; §V.B.2.)

4. Claim 3

a. “The system of claim 2 wherein the microphone is housed in the stylus.”

Ditzik, Tchorzewski, Roberts, and Verrier render obvious this additional limitation. (Decl., ¶122.) *Verrier* discloses a stylus with “a microphone and a speaker” (*Verrier*, Abstract, 4:24-27, 8:57-58, 9:18-20), as shown in Figure 2:



(*Verrier*, FIG. 2 (annotated).) A POSITA would have been motivated to modify *Ditzik*’s stylus in a similar way to provide a personalized user experience and improve the accuracy of speech and handwriting recognition, as discussed above. (Decl., ¶123; §V.B.2.) It would have been obvious to add a microphone to smoothly transition between speech and handwriting input and to avoid clashes

between the two. (*Verrier*, 3:4-36; Decl., ¶124.) A POSITA would have a reasonable expectation of success doing so. (*Id.*)

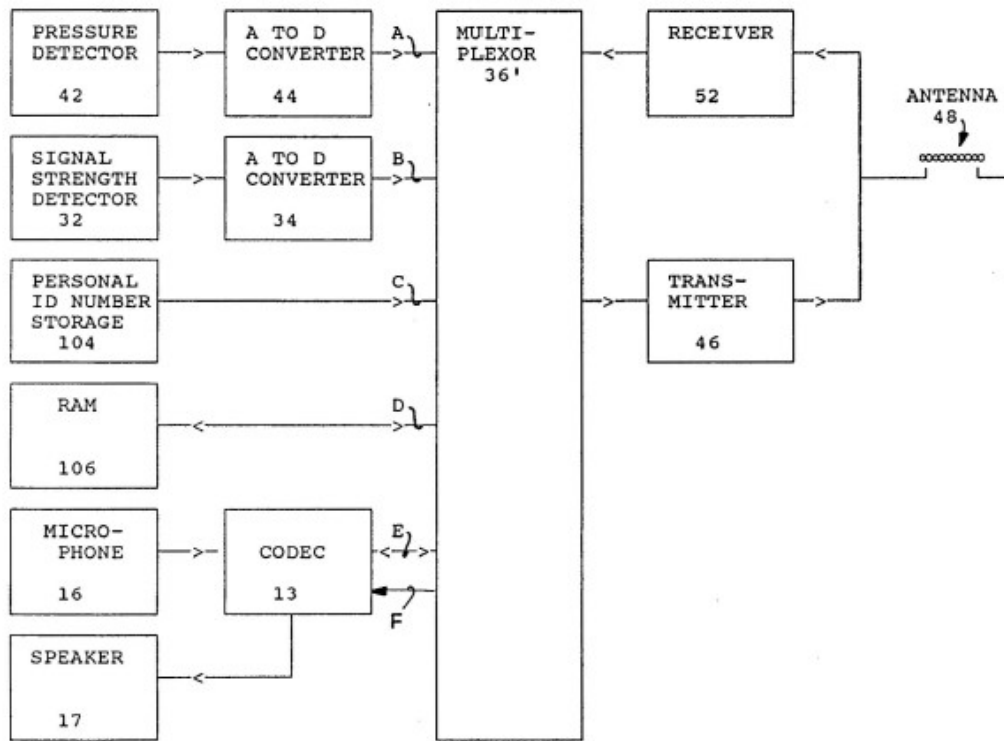
5. Claim 5

- a. “The system of claim 1, further comprising a proximity sensor configured to sense a proximity of a user to the microphone.”**

Ditzik, Tchorzewski, Roberts, and Verrier render obvious this limitation. (Decl., ¶125.) *Verrier* discloses a proximity sensor. (Decl., ¶126.) *Verrier*’s stylus has a sensor “in the tip of the stylus [that] picks up the electromagnetic signals radiated from the display overlay and converts those signals into a suitable form for retransmission back to the pen-based computer system.” (*Verrier*, 2:46-51.) “The relative signal strength of the signals picked up by the stylus is used to infer the relative separation distance Z of the tip of the stylus with respect to the overlay.” (*Verrier*, 2:51-54.) A POSITA would have understood this is a proximity sensor because it detects the strength of a radiative signal to determine whether the “user [has] brought the stylus 20 into a relatively close position with respect to the electromagnetic tablet.” (*Verrier*, 10:34-42.) When the sensor does not detect a signal indicating the stylus is close to the tablet, but instead receives a voice signal, the stylus sensor determines the stylus is close to the speaker and enables the microphone. (*Verrier*, 10:15-30.) It would have been obvious that the sensor

(signal strength detector) in the stylus tip is configured to sense a proximity of a user to the microphone (Decl., ¶126), as shown in Figure 3A:

FIG. 3A



(Verrier, FIG. 3A.) A POSITA would have been motivated to modify Ditzik's stylus in a similar way to improve the accuracy of speech recognition with a reasonable expectation of success, as discussed above. (Decl., ¶127; §V.B.2.)

6. Claim 6

- a. **“The system of claim 1, further comprising an identification circuit configured to identify an owner of the stylus, wherein the system is configured to**

select the particular user message model at least in part in response to the identification circuit.”

Ditzik, Tchorzewski, Roberts, and Verrier render obvious this limitation.

(Decl., ¶128.) *Verrier* discloses its stylus includes an identification circuit.

(§V.B.3; Decl., ¶129.) *Verrier* discloses “personal identification number storage” for storing “a password or other security information” “to validate the stylus or the user of the stylus.” (*Verrier*, Abstract, 8:53-58, 9:11-17, 18:13-20.) A POSITA would have understood *Verrier* contains an identification circuit to use the user identification information and identify and validate that user. (Decl., ¶129.)

Moreover, *Ditzik, Roberts, Tchorzewski and Verrier* render obvious selecting a user message model based in part on information relating to that particular user, and that would have been in response to the identification circuit identifying and validating the specific user. (§V.B.3.c; Decl., ¶130.) A POSITA would have understood that the electronic components in *Verrier* used for identification are in an electronic circuit. (*Verrier*, 18:9-12; Decl., ¶130.)

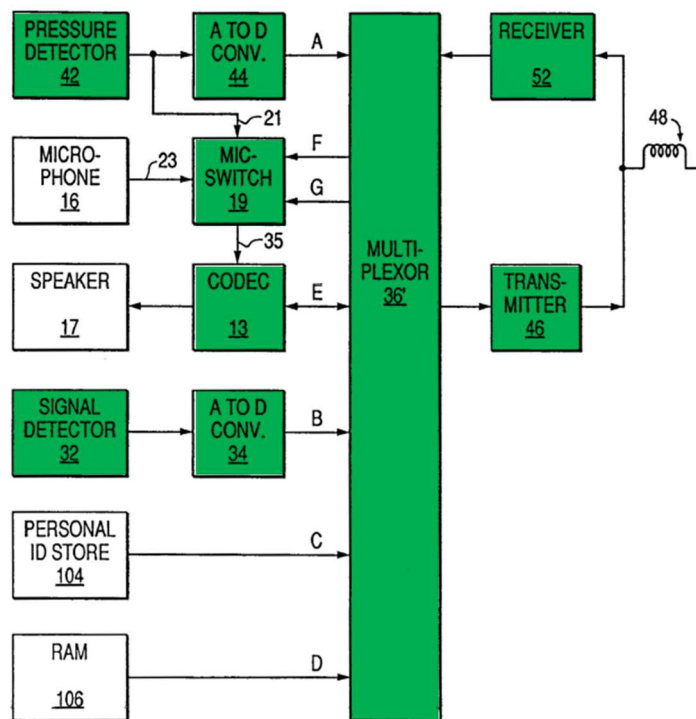
7. Claim 11

- a. “The system of claim 1, further comprising an activation circuit configured to sense movement of the stylus toward the tablet surface, wherein the system is further configured to receive the freehand input in**

response to the activation circuit sensing the movement.”

Ditzik, Tchorzewski, Roberts, and Verrier render obvious this limitation. (Decl., ¶131.) *Verrier* discloses the proximity sensor measures the “relative signal strength of the signals picked up by the stylus . . . to infer the relative separation distance Z of the tip of the stylus with respect to the [tablet] overlay.” (*Verrier*, 2:46-54.) The sensor in *Verrier*’s stylus is connected to a pressure detector 42 and signal strength detector 32, which feed signal strength data to the multiplexor 36. (*Verrier*, 7:43-9:17.) Together, the components act as an **activation circuit** that senses movement of the stylus toward the tablet surface, (Decl., ¶132) as shown in Figure 3B:

FIG. 3B



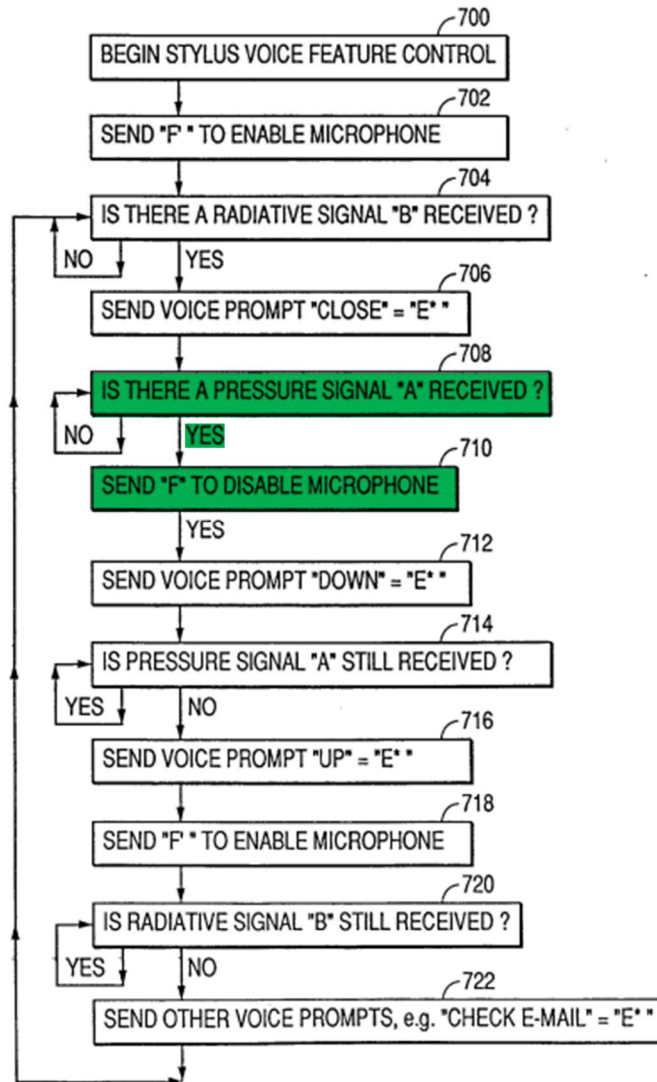
(*Verrier*, FIG. 3B (annotated).) A POSITA would have understood that these components are in an electronic circuit. (*Verrier*, 18:9-12; Decl., ¶133.) In response to detecting a proximity signal and “a mechanical touchdown of the tip 4 of the stylus 20 on the surface of the digitizing display 54,” *Verrier*’s system receives freehand input from the stylus on the tablet. (*Verrier*, 11:5-20, 3:4-26.) A POSITA would have been motivated to modify *Ditzik*’s stylus in a like way to improve the accuracy of handwriting recognition with a reasonable expectation of success, as discussed. (Decl., ¶133.)

8. Claim 14

- a. “The method according to claim 13, further comprising switching from receiving audio input to receiving freehand input in response to detecting movement of the stylus towards a tablet.”**

Ditzik, Tchorzewski, Roberts, and Verrier render obvious this additional limitation. (Decl., ¶134.) When *Verrier*’s system detects a mechanical touchdown of the tip of the stylus on the tablet display, “it sends a F signal to the stylus 20 to disable the microphone” and “decouple the microphone from the transmitter 46 in the stylus, in order to avoid picking up the spurious acoustic noise from the stylus tip 4 as it is rubbed against the surface of the tablet” (*Verrier*, 11:5-4), as shown in Figure 7:

FIG. 7



(Verrier, FIG. 7 (annotated.)) A POSITA would have been motivated to modify Ditzik's stylus in a like way to improve the accuracy of speech and handwriting recognition with a reasonable expectation of success, as discussed above. (Decl., ¶¶135-136.)

**C. Ground 3: Claims 9 and 10 Would Have Been Obvious Over
*Ditzik, Tchorzewski, Roberts, and Bellegarda***

1. *Bellegarda*

Bellegarda discloses “a latent semantic analysis” using clustering of words and context to determine which words are most likely to co-occur. (*Bellegarda*, 172.) (Decl., ¶¶137-138.)

a. *Bellegarda* Is Prior Art

Bellegarda is prior art. (Ex. 1019.) *Bellegarda* includes a Copyright stamp of 1996. (*Id.*, AppxB.) It was included in the 1996 IEEE International Conference, and includes an IEEE catalog number, ISBN numbers, a Library of Congress identification number, and instructions for ordering additional copies. (*Id.*) These indicia establish *Bellegarda* was publicly available as of 1996. *Ericsson Inc. v. Intellectual Ventures I LLC*, IPR2014-00527, Paper 41, at 10-12 (PTAB May 18, 2015).

Persons interested and ordinarily skilled in the art would have located *Bellegarda*. (Ex. 1019.) Based on standard IEEE practices, *Bellegarda* would have been made available to the public no later than the last day of the conference, i.e., May 10, 1996. (Ex. 1019, ¶15.). See *Intel Corp. v. FG SCR LLC*, IPR2020-01449, Paper 53 at 29, 34-36, (PTAB Mar. 1, 2022). *Bellegarda* was received and catalogued at the Library of Congress September 11, 1996, and made accessible to

the public within weeks of that date, as confirmed by the Library of Congress public catalog record and the MARC record. (*Id.*, ¶¶12-19.)

2. Motivation to Combine

A POSITA would have been motivated to combine *Ditzik*, *Tchorzewski*, and *Roberts* with *Bellegarda*. (Decl., ¶138.) *Ditzik*, *Roberts*, and *Tchorzewski* disclose speech recognition systems using a language model, and *Bellegarda* discloses well-known implementation details for language models, including using syntactic and semantic models together. (*Id.*) It was known conventional syntactic language models had drawbacks, such as the lack of contextual analysis and global language constraints. (*'106 patent*, 1:54-61.) Similarly, conventional semantic language models had drawbacks like “inherent lack of tight local word order constraints.” (*Id.*, 2:51-55.) Thus, as *Bellegarda* discloses, it would have been desirable to use a semantic model as a “complement to conventional class-based statistical language modeling” to improve speech recognition, remedying each other’s shortcomings and optimizing accuracy. (*Bellegarda*, 172; *'106 patent*, 2:55-58; Decl., ¶138.) A POSITA would have used such a language model in the *Ditzik*, *Tchorzewski*, *Roberts* combined system with a reasonable expectation of success. (Decl., ¶139.) This would have involved combining known elements according to known speech recognition methods to improve speech recognition accuracy. (*Bellegarda*, 172; Decl., ¶139.)

3. Claim 9

- a. “The system of claim 1, wherein the system adjusting the language model includes adjusting a syntactic model and a semantic model included in the language model.”**

Ditzik, Tchorzewski, Roberts, and Bellegarda render obvious this additional limitation. (Decl., ¶¶140-141.) *Ditzik* and *Roberts* render obvious adjusting the language model. (§V.A.4.e.) It was known that a language model would have included a syntactic model and a semantic model. (Decl., ¶142; *Bellegarda*, 172.) The '737 patent admits as much, explaining a “language model may be of a conventional type, for example consisting of an N-gram syntactic model,” and a semantic model is “disclosed in U.S. Pat. No. 5,828,999.” ('737 patent, 22:57-59, 26:16-19.) A POSITA would have understood that the adjusted language model in the combined *Ditzik, Tchorzewski, Roberts* system would include such well known syntactic and semantic models, and that adjusting the language model would mean adjusting the constituent syntactic and semantic models. (Decl., ¶142.) This would have been obvious over *Bellegarda*, which discloses “conventional class-based modeling techniques” that “rely on short span relationships” and “tend to produce syntactically-oriented clusters.” (*Bellegarda*, 175; Decl., ¶¶143-145.) It discloses a “latent semantic analysis” that “seeks to relate one another those words which are found to be linked from the evidence presented in the training text database.” (*Id.*,

172, 173.) These syntactic and semantic models comprising the language model in *Bellegarda* are adjusted, including by using “the available training data by simply keeping track of which word appeared in the document,” “in marked contrast with *n*-gram modeling,” which “ignores word order.” (*Bellegarda*, 173.)

4. Claim 10

- a. 10[pre]: “The system of claim 9, wherein the semantic model comprises at least one semantic cluster selected from the group consisting of:”**

Ditzik, Roberts, Tchorzewski, and Bellegarda render obvious this additional limitation. (§V.C.3; Decl., ¶146.) *Bellegarda* discloses “a latent semantic analysis” applying “familiar clustering techniques” that are “a complement to conventional class-based statistical language modeling techniques.” (*Bellegarda*, 172.) Although all three semantic clusters are not required, *Bellegarda* discloses all three. (Decl., ¶146.)

- b. 10[a]: “a semantic cluster of a first type that is a mathematically derived group of vectors representing text segments;”**

Bellegarda discloses this limitation. (Decl., ¶147.) *Bellegarda* discloses detailed steps of creating “vector representation” of text segments. (*Bellegarda*, 173-74; Decl., ¶147.) For example, *Bellegarda* discloses its latent semantic analysis uses “a parsimonious vector representation of each word in a suitable vector space, where familiar clustering techniques can be applied.” (*Bellegarda*,

172.) It explains “a singular value decomposition” is performed on “a matrix of co-occurrences between words and documents” to produce “singular vector representations for words and documents.” (*Bellegarda*, 173.) Then, “a distance measure consistent with the SVD formalism is defined on the resulting vector space.” (*Id.*) Thereafter, “the singular vectors are clustered according to this matrix.” (*Id.*)

- c. **10[b]: “a semantic cluster of a second type that is a discrete grouping of text having a particular context; and”**

Bellegarda discloses this limitation. (Decl., ¶148.) *Bellegarda* discloses “group[ing] words into classes and accumulate statistics at the class level rather than the word level” “to better estimate the conditional probability of a word given some context by taking advantage of observations of other words that behave ‘like’ this word in this particular context.” (*Bellegarda*, 172.) *Bellegarda* discloses the equation for clustering,

$$PP = \exp\left(-\frac{1}{Q} \sum_{i=1}^Q \log \Pr(w_i|C, S)\right), \quad (8)$$

where C denotes “context considered,” indicating its semantic clustering uses a discrete grouping of text with a particular context. (*Bellegarda*, 174.) Probability can be expanded as,

$$\Pr(w_i|C, S) = \Pr(w_i|C_i) \Pr(C_i|C), \quad (9)$$

where “ $\Pr(C_i|C)$ can be obtained from the relative frequency of cluster in the context C .” (*Bellegarda*, 174.)

- d. 10[c]: “a semantic cluster of a third type that is defined with respect to an individual reference word that is indicative of a particular context.”**

Bellegarda discloses this limitation. (Decl., ¶149.) *Bellegarda* discloses its framework uses “co-occurrence analysis” that “take[s] place across larger contexts (longer spans) than traditionally considered,” “where two words are said to co-occur if they tend to appear in the same kind of documents, whether or not they actually occur within identical word contexts in those documents.” (*Bellegarda*, 172-173.) A POSITA would have understood co-occurring words serve as an individual reference for each other indicating a specific context. (Decl., ¶149.) For example, the words in “Cluster 1” are words indicative of art, and the words in “Cluster 2” are words indicative of law. (*Bellegarda*, 175.)

D. Ground 4: *Ditzik, Tchorzewski, Roberts, and Campbell* Render Obvious Claims 7 and 8

1. *Campbell*

Campbell is a “tutorial on design and development of automatic speaker recognition system,” which uses “a machine to recognize a person from a spoken phrase” “to identify a particular person or to verify a person’s claimed identity.” (*Campbell*, 1437; Decl., ¶150.)

a. *Campbell* Is Prior Art

Campbell is prior art (Ex. 1020.) *Campbell* was included in the 1996 IEEE International Conference, which includes a Copyright stamp of 1997, ISSN codes, pricing, a date stamp from the Library of Congress showing the library received the publication on September 23, 1997, and instructions for ordering additional copies. (Ex. 1020, ¶¶9-15, AppxA.) These indicia establish *Campbell* was publicly available as of 1997. *Ericsson Inc.*, IPR2014-00527, Paper 41, at 10-12.

Persons interested and ordinarily skilled in the art would have located *Campbell*. (Ex. 1020.) *Campbell* was received and catalogued at the Library of Congress on September 23, 1997, and made accessible to the public within weeks of that date as confirmed by the Library of Congress public catalog record and the MARC record. (Ex. 1020, ¶¶1-21.)

2. Claim 7: “The system of claim 1, wherein the system is configured to select the particular user message model based at least in part on an identifying signal received from the microphone.”

Ditzik, *Roberts*, *Tchorzewski*, and *Campbell* render obvious this limitation. (Decl., ¶151.) *Ditzik* and *Tchorzewski* render obvious selecting a particular user message model from a plurality of user message models. (§V.A.4.d.) It would have been obvious, in view of *Campbell*, to **select the user message model based at least in part on an identifying signal received from the microphone.** (Decl., ¶152.)

Campbell discloses “automatic speaker recognition,” which “recognize[s] a person from a spoken phrase” at a microphone, “to identify a particular person or to verify a person’s claimed identity” (*Campbell*, 1437), as shown in Figure 1:

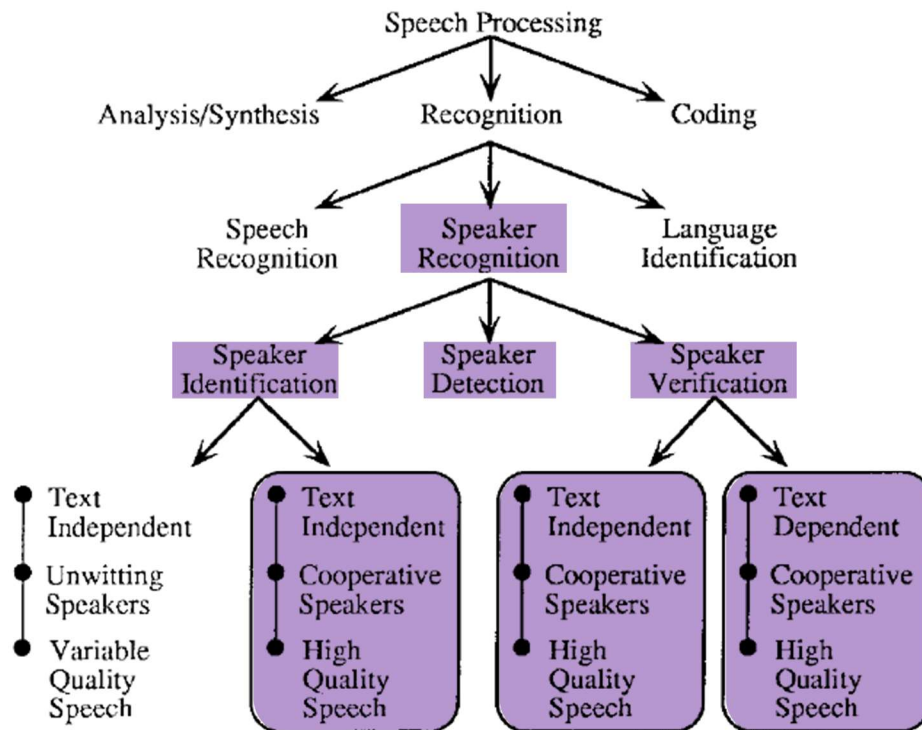


Fig. 1. Speech processing.

(*Campbell*, FIG. 1 (annotated).)

It would have been obvious to use such a speaker recognition system to identify the user at a tablet and use that information to select the user’s message model to improve speech recognition accuracy. (§V.A.4.d; Decl., ¶153.) *Ditzik*, *Roberts*, *Tchorzewski*, and *Campbell* are in the same field of endeavor as each other and the ’737 patent, relating to improving speech recognition. (Decl., ¶153.) A POSITA would have understood adding *Campbell*’s design to the *Ditzik*,

Roberts, Tchorzewski combination would have improved accuracy because *Campbell*'s recognizer "performs with 98.9% correct identification"—far more accurate and secure than pre-existing methods using IDs and passwords. (*Campbell*, 1437-38.) Correct identification is important for training and accurate speech recognition. (Decl., ¶153.) A POSITA would have wanted to use *Campbell*'s automatic speaker recognition to improve convenience and efficiency by obviating the need for any manual input of identification information. (*Id.*)

A POSITA would have done so with a reasonable expectation of success. (Decl., ¶154.) It would have simply involved combining known elements according to known methods to yield the predictable result of improved speech recognition. (*Id.*) *Campbell* states that a "speaker-recognition system using methods presented here is practical to implement in software on a modest personal computer" and a POSITA would have found it combinable with the *Ditzik, Roberts, Tchorzewski* system, which uses standard tablet computer programs. (*Id.*) It also would have been obvious to try, simply choosing from a finite number of identified predictable solutions (e.g., manual speaker identification v. automatic speaker identification) with a reasonable expectation of success. (*Id.*)

3. Claim 8: “The system of claim 7, wherein the system is configured to access the particular user message model via a wide area network.”

As explained for claim 15, *Ditzik*, *Roberts*, and *Tchorzewski* would have rendered this limitation obvious. (§V.A.8.) A POSITA would have understood that the Internet and cable networks disclosed in *Ditzik* are wide area networks, which would be used to access user message models. (Decl., ¶155.)

E. Ground 5: *Root*, *Roberts*, and *Lewis* Render Obvious Claims 1, 2, 4, 12, 13, 16, 19

1. *Root*

Root discloses a computer system with (1) a display that accepts handwriting input and (2) interfaces for accessing a portable personality database with user preferences. (*Root*, Abstract, 1:10-13, 3:44-47.) The interfaces are “adapted to a user’s habits,” for example, “a handwriting recognition type of interface must have information about the user’s handwriting,” and “a voice recognition user interface must have specific information about the user’s voice.” (*Root*, 1:38-45.) This user-specific handwriting and speech information is stored in a database, for example, a PCMCIA card, which can be inserted into a computer to transfer the information. (*Root*, 5:28-42.) (Decl., ¶156.)

2. *Lewis*

Lewis discloses “conventional machine recognition systems” and explains such systems recognize input “by decoding that data using a plurality of trained

models.” (*Lewis*, [0004].) *Lewis* explains “speech recognition systems decode input speech utterances using trained speech models to recognize spoken words,” and “handwriting recognition systems recognize input handwriting data using trained character models to convert the handwriting data to machine printed text.” (*Id.*) (Decl., ¶157.)

3. Claim 1

a. 1[pre]

If limiting, *Root* discloses the preamble. (Decl. ¶158.) *Root* discloses “a personalized computer user interface system” with “a trained voice recognition system” that “recognize[s] the spoken commands and words of a particular user” and translates them “into commands or words” the computer can interpret. (*Root*, 3:66-4:4, 4:9-15, 6:29-31.) It also has a “handwriting recognition” system that “recognize[s] words written by that particular user.” (*Root*, 3:66-4:4, 4:9-15.) In one example, *Root* discloses a personality database of a user’s handwriting where the user’s handwriting pattern is associated with computer-generated text (*Root*, FIG. 3, 5:49-56; Decl., ¶158.), as shown in Figure 3:

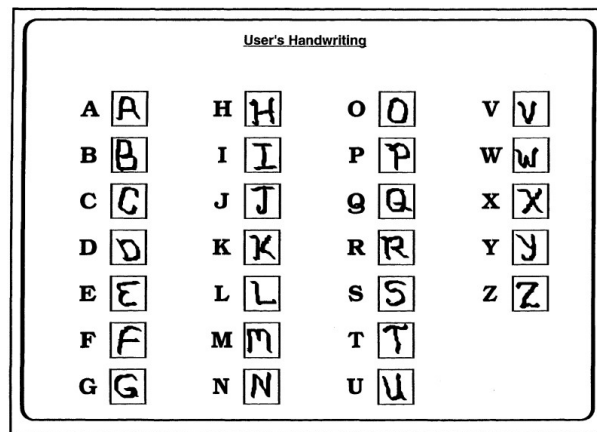


FIG. 3

(*Root*, FIG. 3.)

Generating text in response to handwriting and speech input would have been obvious in view of *Lewis*, which provides specific implementation details for the conventional system used in *Root*. (Decl., ¶159.) *Lewis* teaches conventional “speech recognition systems decode input speech utterances using trained speech models to recognize spoken words” and conventional “handwriting recognition systems recognize input handwriting data using trained character models to convert th[at] handwriting data to machine printed text.” (*Lewis*, [0004].) This would have been an obvious feature to have in *Root*, for *Root*’s system wants to convert speech and handwriting input into computer text. (Decl., ¶159; *Ditzik*, Abstract; *Mitchell*, 5:59-67.) A POSITA would have done so with a reasonable expectation of success, using known systems according to known methods to achieve predictable results. (Decl., ¶159.)

b. 1[a]

Root renders obvious this limitation. (Decl. ¶160.) *Root* discloses pen based systems “allow a user to record information by writing with an **electronic pen** on a **tablet screen**.” (*Root*, 1:24-28.) *Root* discloses a **tablet surface** receiving **freehand input** based on manipulation of “an **electronic pen 120**” relative the **tablet surface**, as shown in Figure 1:

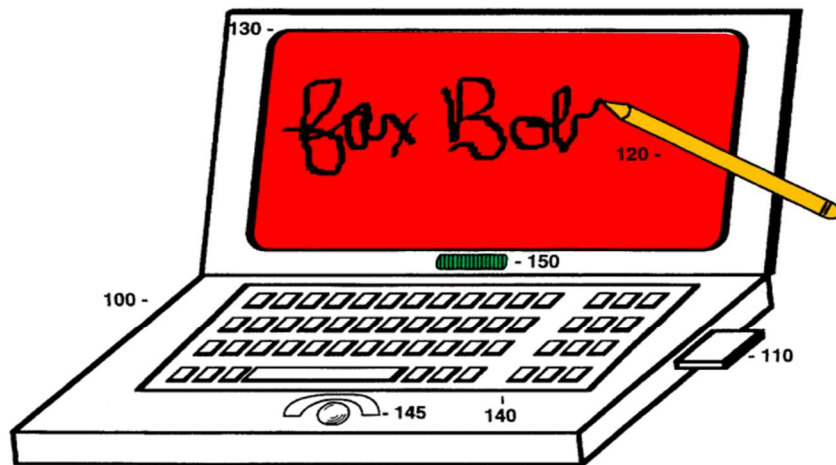


FIG. 1

(*Root*, FIG. 1 (annotated), 3:49-52.)

c. 1[b]

Root discloses this limitation (Decl. ¶161.) *Root* discloses that its portable computer system includes a **microphone** for receiving voice input. (*Root*, 3:49-52.)

d. 1[c]

Root, alone or with *Roberts*, renders obvious this limitation. (Decl. ¶162.)

Root discloses “[i]f more than one user uses a particular computer system, an operating system with the personalized user interface must have a personal user interface database for each and every user”; “if there are several different computer systems that a user may use,” each one “must contain a copy of that user’s personal preferences.” (*Root*, 1:52-60.) To that end, “a handwriting recognition type of interface must have information about the user’s handwriting style” and “a voice recognition user interface must have specific information about the user’s voice.” (*Root*, 1:41-46.) This system “require[s] a comprehensive database containing information about the specific user who will be using the user interface.” (*Root*, 1:46-48.)

Root discloses selecting a particular user message model from the collection for “each and every user” using a “PCMCIA type flash memory card” that stores “personality profiles,” including a user message model, for each user. (*Root*, 4:50-5:42, 6:25-35, FIG. 2.) When a user inserts the PCMCIA card into the computer, the computer reads “the specific handwriting recognition parameters” and “the set of known test words to learn the user’s particular voice characteristics.” (*Root*, 5:28-42, 6:27-35.) When a different user’s card is inserted, the computer reads a different profile. (*Id.*; Decl. ¶163.)

Root explains these personalized models include a handwriting model that “recognize[s] words written by that particular user.” (*Root*, 3:66-4:4, 4:9-15.) *Root*

also discloses a “trained voice recognition system” must “be trained by the user that will use[] the system.” (*Root*, 4:7-13.) “The user trains the system by speaking a series of known example words,” and the system “uses the information obtained during the training to decipher the user’s speech.” (*Root*, 4:13-15.) A POSITA would have understood this training “information” includes user-specific language models and acoustic models. (Decl., ¶164.) It was well known that a speech and handwriting recognition system includes a language model for satisfactory speech and handwriting recognition. (Decl., ¶164.)

Moreover, it would have been obvious to include a language model and an acoustic or handwriting model in view of *Roberts*. (Decl., ¶165.) *Roberts* discloses customizing an acoustic model and a language model for each speaker through training. (*Roberts*, 1:65-67; Decl., ¶165.) The **acoustic model** is made “from one or more utterances of a word” (*Roberts*, 2:37-41) and is updated through user input, e.g., correcting a misrecognized word by picking an alternative word. (*Roberts*, 2:41-47.) *Roberts* discloses a **language model**, which “indicates word probabilities based on the language context of the word.” (*Roberts*, 4:59-62, 19:23-31.) The language model is updated based on user correction. (*Roberts*, 4:51-59, 13:3-60.)

A POSITA would have been motivated to combine *Root* and *Roberts*. (Decl., ¶166.) First, *Root* and *Roberts* are in the same field of endeavor, where speech recognition is combined with some type of user input (e.g., handwriting

input in *Root* and user selection of correct words in *Roberts*) to improve overall recognition accuracy. (Decl., ¶166.) Second, *Root* discloses storing user-specific models, *Roberts* simply provides implementation details and explains that speech recognition systems known at the time used acoustic models and language models. (*Id.*)

A POSITA would have done so with a reasonable expectation of success. (Decl., ¶167.) Combining *Root*'s trainable speech and handwriting recognition with *Roberts*'s user-specific acoustic and language models would have just combined known elements according to known speech and handwriting recognition methods to yield more accurate recognition systems tailored to each user. (*Id.*) It also would have involved using a known speech recognition technique (*Roberts*) to improve similar speech and handwriting recognition system in the same way (*Root*). (*Id.*)

e. 1[d]

Root and *Roberts* render this limitation obvious. (Decl. ¶168.)

First, *Root* and *Roberts* render obvious a local message model including a “language model, a handwriting model, and an acoustic model.” (§V.E.3.d.) *Root* discloses local computer system 200 includes speech and handwriting recognition software that downloads the personality profile from the PCMCIA card inserted into the computer. (*Root*, 5:29-42, 6:25-63.) A POSITA would have understood

that this local computer software includes a local message model for recognizing speech and handwriting without inserting the PCMCIA card, as that was a known feature in the art. (*Ditzik*, 3:43-48, 3:53-56, 5:33-37; *Roberts*, 4:51-62; Decl., ¶169.) A POSITA would have understood that *Root*'s recognizers must be installed with a default message model, into which the user-specific message model is loaded, for the recognizers to read and incorporate them into run-time recognition software. (Decl., ¶169.)

Second, *Root* and *Roberts* render obvious adjusting the language model of that local message model based in part on the user message model selected in 1[c]. (Decl., ¶170.) *Roberts* discloses adjusting “a language model of a local message model based at least in part on the particular user message model” for the reasons explained for 1[d] in Ground 1 (§V.A.4.e.) A POSITA would have been motivated to apply *Roberts*'s language model updating step to *Root*'s system, such that *Root*'s language models are trained to increase recognition accuracy. (Decl., ¶171.) *Root* and *Roberts* are in the same field of endeavor. (Decl., ¶171; §V.E.3.d.) Further, *Root* discloses adapting its recognition user interface “to a user's habits,” including their speech and handwriting habits (e.g., *Root*, 1:38-48). *Roberts* simply discloses implementation details for this process, including adjusting the language model. (Decl., ¶171.) A POSITA would have made such an adjustment with a reasonable expectation of success because doing so would have involved combining known

elements according to known speech and handwriting recognition methods to yield a predictable recognition system trainable using user-specific information. (*Id.*)

f. 1[e]

Root, *Roberts*, and *Lewis* render this limitation obvious. (Decl., ¶172.)

Root discloses generating text data because ““text can be written on the screen with an electronic pen and a computer will decipher what words have been written.” (*Root*, 4:3-6.) A POSITA would have understood “deciphering” to mean recognizing handwriting input and displaying it on the display. (Decl., ¶173.) *Root* Figure 3 discloses “a screen display of handwriting information” displaying a user’s handwriting input in boxes and corresponding computer-generated text on the left of each box. (*Root*, FIG. 3, 5:49-56.)

The generated text is based at least in part on the freehand input (*Root*, FIGS 1, 3, 4, 3:66-4:3, 5:53-56; Decl., ¶174.) and handwriting model (“handwriting information” in *Root*, 5:49-53, 5:57-60.) A POSITA would have understood that the combination of *Root* and *Roberts* outputs text representing the user’s input. (Decl., ¶174.)

As explained for 1[c], *Root* combined with *Roberts* would have rendered the adjusting a language model of a local message model obvious. (§V.E.3.d.) *Root* and *Roberts* in view of *Lewis* render obvious using the adjusted language model to generate text data. (Decl., ¶175.) *Lewis* discloses a handwriting recognition system

with a “writer prototypes store” that “contains one or more writer prototypes” and a “word list/grammar store” that contains “a plurality of word lists and associated grammars which may be applied to the recognition engine.” (*Lewis*, [0019]-[0020].) A POSITA would have understood the writer prototypes, and the word list and associated grammars, are the language model. (Decl., ¶175.) “In the default recognition mode, the recognition engine 22 will decode the user’s handwriting data using the writer-dependent prototype 26” “associated with the user, as well as the relevant default word lists/grammars 24.” (*Lewis*, [0021].)

A POSITA would have been motivated in view of *Lewis* to use an adjusted language model in the *Root, Roberts* system to improve handwriting recognition accuracy. (Decl., ¶176.) First, *Lewis* is in the same field of endeavor as *Root* and *Roberts*: a trainable system with user-specific information. (*Id.*) Second, *Root* and *Roberts* already render obvious a user-trainable handwriting recognition system, *Lewis* simply provides implementation details for using adjusted language models in such a handwriting recognition system. (*Id.*) Third, a POSITA would have found it desirable to use *Lewis*’s trainable language models to customize based on the user’s handwriting information, such as grammatical habits, to improve accuracy. (*Id.*)

A POSITA would have done so with a reasonable expectation of success. (Decl., ¶177.) It would have involved combining prior art elements according to

known handwriting recognition techniques to achieve a trainable handwriting recognition system with improved accuracy. (*Id.*)

g. 1[f]

Root and *Roberts* render obvious this limitation. (Decl., ¶178.)

Root discloses generating text data based in part on the voice input because it “uses the information obtained during the training to decipher the user’s speech” into “words that the computer system can interpret.” (*Root*, 4:13-15, 6:28-33.) *Root* and *Roberts* disclose a speech recognition system that uses the adjusted language model and acoustic model to generate text data. (§§V.E.3.d-V.E.3.e.) A POSITA would have been motivated to generate text based on *Roberts*’s acoustic model and language model for personalized speech recognition with improved accuracy with a reasonable expectation of success. (Decl., ¶178; §§V.E.3.d-V.E.3.e.)

4. Claim 2

a. 2[pre]

Root, *Roberts*, and *Lewis* render obvious claim 1. (§V.E.3; Decl., ¶179.)

b. 2[a]

Root discloses this limitation. (Decl., ¶180.) *Root* discloses “personalized user interfaces require a comprehensive database containing information about the specific user who will be using the user interface,” using user interface software that contains “information that uniquely identifies and describes the user.” (*Root*,

1:38-48.) *Root* uses a “PCMCIA card” to identify a user (*Root*, 5:28-42, 6:38-63), as in Figure 6:

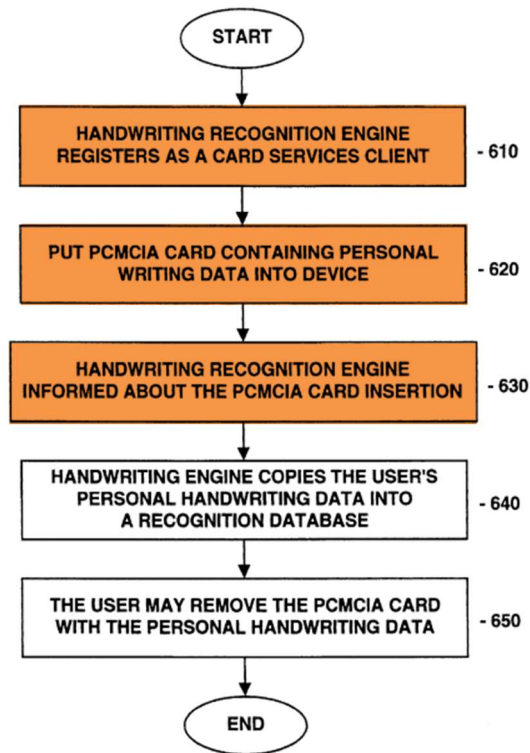


FIG. 6

(*Root*, FIG. 6 (annotated).)

c. 2[b]

Root and *Roberts* render obvious this limitation. (Decl., ¶181.)

Root discloses when a PCMCIA card for a user is inserted into the computer, *Root*’s “operating system and/or application programs . . . will register as a card services client as mentioned in step 610 of FIG. 6.” (*Root*, 6:39-43.) *Root* discloses “any client that need[s] information from the personality profile database can read

that information from the personality profile database stored on the PCMCIA card.” (*Root*, 6:53-58.) The personality profile database includes a user message model (comprising a language model, acoustic model, and handwriting model in view of *Roberts*). (§V.E.3.d; Decl., ¶181.) Thus, *Root*’s system uses the PCMCIA card to select a particular user message model based on identification information stored in the card. (*Id.*)

d. 2[c]

Root and *Roberts* render obvious this limitation. (Decl., ¶182.)

Root discloses “[i]f more than one user uses a particular computer system, an operating system with the personalized user interface must have a personal user interface database for each and every user that may use the computer system.” (*Root*, 1:52-56.) Further, *Root*’s system has access to two or more user message models (comprising a language model, acoustic model, and handwriting model in view of *Roberts*) corresponding to different users because it can receive two or more PCMCIA cards, each of which is user specific and carries a particular user’s personality profile for speech and handwriting recognition. (*Root*, 5:18-42, 6:25-35; Decl., ¶183.)

5. Claim 4

Root, *Roberts*, and *Lewis* render obvious the system of claim 1. (§V.E.3; Decl., ¶184.) As explained for claim 4 in Ground 1, *Roberts* discloses the

additional limitation. (Decl., ¶184; §V.A.5.) A POSITA would have been motivated to use *Roberts*'s process for updating the acoustic model with *Root*'s system, so the user model is continuously trained and refined to maximize recognition accuracy. (§V.E.3.e; Decl., ¶185.) A POSITA would have understood that the accuracy of the user model increases with more training data, for example, for the acoustic model. (*Roberts*, Abstract; Decl., ¶185.) A POSITA would have also had a reasonable expectation of success doing so. Updating the acoustic model was a known concept at the time. (*Mitchell*, 5:48-52.) Combining *Root*'s system *Roberts*'s process would have been combining known elements according to known recognition methods to yield the predictable result of increasing recognition accuracy. (Decl., ¶185.)

6. Claim 12

Root, *Roberts*, and *Lewis* render the system of claim 1 obvious. (§V.E.3; Decl., ¶186.) As explained for 1[c] in Ground 5, *Root* discloses the additional limitation of claim 12. (Decl., ¶186; §V.E.3.d.) *Root* discloses “a trained voice recognition system” that “recognize[s] the spoken commands and words of a particular user” and “uses the information obtained during the training to decipher the user's speech” (user-specific acoustic model information). (*Root*, 4:7-15; Decl., ¶187.) *Root* discloses “storing personalized handwriting information,” for example,

as shown in Figure 3, “to decipher handwriting” (user-specific handwriting model information). (*Root*, 5:46-56; Decl., ¶187.)

7. Claim 13

a. 13[pre]

Claim 13 is substantially similar to claim 1, except it is directed to a method. *Root*, *Roberts*, and *Lewis* render obvious the claimed method for the same reasons discussed above for claim 1. (§V.E.3; Decl., ¶188.)

b. 13[a]

For 13[a], *Root* discloses this limitation. *Root* discloses receiving freehand input at a laptop, which is a device. (§V.E.3.b; Decl., ¶189.)

c. 13[b]

For 13[b], *Root* discloses receiving audio input through a microphone connected to the laptop. (§V.E.3.c; Decl., ¶190.)

d. 13[c]

For 13[c], *Root* and *Roberts* render obvious this limitation. A POSITA would have understood *Root* uses user identification information obtained from a PCMCIA card via the laptop device to select the corresponding user’s user message model from a plurality of user message models for different users. (§V.E.3.d; Decl., ¶191.)

e. 13[d]

For 13[d], a POSITA would have understood *Root*, as modified by *Roberts*, adjusts a language model of a local message model via *Root*'s laptop because the laptop receives acoustic and handwriting inputs, which are used to update (adjust) the language model. (§V.E.3.e; Decl., ¶192.)

f. 13[e]

For 13[e], *Root*, *Roberts*, and *Lewis* render obvious this limitation. *Root*'s laptop device converts handwriting input into computer generated text and displays the text on its display. (§V.E.3.f; *Root*, 6:28-31; Decl., ¶193.)

g. 13[f]

For 13[f], *Root* and *Roberts* render obvious this limitation. *Root*'s laptop device “recognize[s] the spoken commands and words of a particular user” and “uses the information obtained during the training to decipher the user’s speech” and generate text. (§V.E.3.g; *Root*, 4:9-15; Decl., ¶194.)

8. Claim 16

This limitation is substantially identical to claim 4. (§V.E.5; Decl., ¶195.) *Roberts* discloses training a selected user message model as explained for claim 4. (*Id.*) As such, *Root* and *Roberts* render obvious the additional limitation of claim 16. (*Id.*)

9. Claim 19

a. 19[pre]

Independent claim 19 is substantially similar to claim 1. (§V.E.3.) *Root* discloses the preamble as noted for 1[pre]. (§V.E.3.a.) *Root*'s portable computer system (e.g., tablet, *Root*, 1:24-28) includes a “processor” (a computing device) and a “memory” (a non-transitory computer-readable medium). (*Root*, Abstract, 3:44-52, Claims 1, 8; Decl., ¶196.) The memory stores instructions for the processor to perform the instructions for the operations, as explained in 19[a]-19[f] below. (§§V.E.9.b-V.E.9.g.)

b. 19[a]

Root discloses this limitation. (§§V.E.3.b, V.E.7.b; Decl., ¶197.)

c. 19[b]

Root discloses this limitation. (§§V.E.3.c; V.E.7.c; Decl., ¶198.)

d. 19[c]

Root and *Roberts* render obvious this limitation. (§§V.E.3.d, V.E.7.d; Decl. ¶199.)

e. 19[d]

Root and *Roberts* render obvious this limitation. (§§V.E.3.e, V.E.7.e; Decl., ¶200.)

f. 19[e]

Root, Roberts, and Lewis render obvious this limitation (§§ V.E.3.f, V.E.7.f; Decl. ¶201.)

g. 19[f]

Root and Roberts render obvious this limitation. (§§ V.E.3.g, V.E.7.g; Decl. ¶202.)

F. Ground 6: *Root, Roberts, Lewis, and Verrier* Render Obvious Claims 3, 5, 6, 11, and 14

1. Motivation to Combine

A POSITA would have been motivated to combine *Root, Roberts, and Lewis* with *Verrier*. (Decl., ¶204.) Each discloses receiving user input. (*Id.*) *Root* discloses a stylus for inputting information to the computer. (§V.E.3.b.) It was known that a stylus could be used to input information, like user identifying information or voice and handwriting information. (Decl., ¶204.) It would have been obvious to add a microphone to *Root*'s stylus to more smoothly transition between speech and handwriting input and avoid clashes between the two inputs. (*Verrier*, 3:4-36; Decl., ¶204.) A POSITA would have done so with a reasonable expectation of success. (Decl., ¶204.) *Root* uses a stylus (§V.E.3.b; Decl., ¶204); thus, replacing that stylus with *Verrier*'s would have merely involved a simple substitution of one known element for another to improve recognition accuracy using personalized speech and handwriting data. (Decl., ¶204.) It would have

involved combining prior art tablet and personalized stylus elements according to known methods to yield predictable results, adding a known stylus in *Verrier* to a known device in *Root* in the same way. (*Id.*) It would have been obvious to add a microphone to smoothly transition between speech and handwriting input and avoid clashes between the two types of inputs. (*Verrier*, 3:4-36; Decl., ¶204.)

2. Claim 3

Root, *Roberts*, *Lewis*, and *Verrier* render obvious claim 3. (Decl., ¶203.) As discussed in Ground 2, *Verrier* discloses the additional limitation of claim 3. (§V.B.4; Decl., ¶203.)

3. Claim 5

Root, *Roberts*, *Lewis*, and *Verrier* render claim 5 obvious. (§V.B.5; Decl., ¶205.)

4. Claim 6

Root, *Roberts*, *Lewis*, and *Verrier* render claim 6 obvious. (§V.B.6; Decl., ¶206.) *Root* and *Roberts* render obvious selecting the particular user message model based in part on the information relating to the particular user in response to the identification circuit. (Decl., ¶206; §V.E.4.c.) Using an identification circuit in the stylus would have been an obvious modification a POSITA would implement with a reasonable expectation of success, as noted for claim 6 in Ground 2. (§V.B.6; Decl., ¶206.)

5. Claim 11

Root, Roberts, Lewis, and Verrier render claim 11 obvious. (§V.B.7; Decl., ¶207.)

6. Claim 14

Root, Roberts, Lewis, and Verrier render claim 14 obvious. (§V.B.8; Decl., ¶208.)

G. Ground 7: *Root, Roberts, Lewis, and Bellegarda* Render Obvious Claims 9 and 10

1. Claim 9

Root, Roberts, Lewis, and Bellegarda render claim 9 obvious. (§V.C.3; Decl., ¶209.) A POSITA would have been motivated to combine these disclosures with a reasonable expectation of success for the same reasons explained in Ground 3. (*Id.*) *Bellegarda* discloses known implementation details for language models used in the *Root/Roberts/Lewis* system. (*Id.*)

2. Claim 10

Root, Roberts, Lewis, and Bellegarda render claim 10 obvious. (§V.C.4; Decl., ¶210.) A POSITA would have been motivated to combine these disclosures with a reasonable expectation of success for the same reasons explained in Ground 3. (*Id.*)

H. Ground 8: *Root, Roberts, Lewis, and Campbell* Render Obvious Claims 7, 8, and 15

1. Claim 7

Root, Roberts, and Lewis render the system of claim 1 obvious. (§V.E.3; Decl., ¶211.) As explained for 1[c], *Root* alone or with *Roberts* renders obvious selecting a particular user message model from a plurality of user message models. (§V.E.3.d; Decl., ¶212.) A POSITA would have further combined *Root, Roberts, and Lewis*, with *Campbell* with a reasonable expectation of success. (§V.D; Decl., ¶212.) *Campbell* provides a known method to improve accuracy of the *Root/Roberts/Lewis* system. (*Id.*)

2. Claim 8

As explained for 1[c], *Root* alone or with *Roberts* renders obvious accessing a particular message model. (§V.E.3.d; Decl., ¶213.) *Root* discloses its invention may “comprise a general purpose computer,” (*Root* 3:21-23), which was known to include network interfaces and access remote servers, filesystems, and databases. (Decl., ¶213.) If *Root* does not expressly disclose accessing the particular message model via a wide area network, it would have been obvious in view of *Campbell*. (*Id.*) *Campbell* discloses “ubiquitous telephone network and microphones bundled with computers.” (*Campbell*, 1438.) A POSITA would have understood that the “telephone network” is a wide area network allowing Internet access (Decl., ¶214.)

A POSITA would have found it obvious use the Internet to access the user message models. (Decl., ¶215.) *Root* discloses “sophisticated personalized user interfaces require a comprehensive database containing information about the specific user who will be using the user interface.” (*Root*, 1:46-48.) A POSITA would have preferred to store a large amount of data (e.g., user message models for different users) on a server, for example, a centralized server, which can be queried for a specific model. (*Tchorzewski*, 2:1-7; *Mitchell*, 12:23-28; Decl., ¶215.) It would have been obvious and desirable that a client device, such as *Root*’s computer, can access the message models on the server using the Internet in case the PCMCIA card is lost or damaged. (Decl., ¶215.)

A POSITA would have done so with a reasonable expectation of success. (Decl., ¶216.) Making such an adjustment would have involved combining prior art elements according to known computer networking methods to yield a speech recognition system that can efficiently access a large database of user message models. (*Id.*) It would also have been obvious to try given that the user message models can be stored either locally or elsewhere, and a POSITA would have understood it would be more efficient to store a large amount of user message model data on a server rather than on a multitude of PCMCIA cards. (*Id.*)

3. Claim 15

Root, Roberts, and Lewis render the method of claim 13 obvious. (§V.E.7; Decl., ¶217.) This limitation would have further been obvious in view of *Campbell*. (§V.H.2; Decl., ¶217.)

VI. Denial Under 35 U.S.C. § 314 Would Be Improper

Non-institution would be improper under *Fintiv*. The '737 patent has been asserted in four litigations, three of which settled as of the filing of this Petition. (§VIII.B.) While Google is not a named party in any, products incorporating its Gboard application were accused in the fourth litigation against Motorola in the Northern District of Illinois ("NDIL"). As of the filing of this Petition, NDIL had not entered a scheduling order, discovery had not yet started, and the case had been stayed since December 2022. (Ex. 1027.) Yesterday, the Court ruled on Motorola's motion to dismiss. In NDIL, the median time to trial is under 50 months and stays pending IPRs are granted over 70% of the time. (Ex. 1028.) These factors, and the strength of the arguments in this Petition, show a denial under Section 314 would be improper.

VII. Denial Under 35 U.S.C. § 325(d) Would Be Improper

Discretionary denial under § 325(d) is improper under *Advanced Bionics, LLC v. MedEl Elektromedizinische Geräte GMBH*, IPR2019-01469, Paper 6 (PTAB Feb. 13, 2020).

Grounds 1-4: None of *Roberts*, *Tchorzewski*, *Bellegarda*, and *Campbell* were before the PTO during prosecution and therefore never applied or evaluated by the Examiner. ('737 patent, References cited; Ex. 1002.) Though *Verrier* was before the PTO, it was only cited in an IDS and never substantively considered by the Examiner in any grounds of rejection. (Ex. 1002.) As such, *Verrier* does not present a § 325(d) concern. *Amgen Inc. v. Alexion Pharm., Inc.*, IPR2019-00739, Paper 15 at 62 (PTAB Aug. 30, 2019).

Although the Examiner evaluated *Ditzik* during prosecution, the Examiner did not consider the same or substantially the same arguments as presented herein. Also, the Examiner erred in a manner material to patentability when assessing *Ditzik*. *Ditzik* does not present a § 325(d) concern. *Advanced Bionics*, IPR2019-01469, Paper 6, at 8-9; *Arrows Up, LLC v. Oren Techs., LLC*, IPR2018-01231, Paper 7, at 10-12 (PTAB Jan. 14, 2019.)

First, the combinations with *Ditzik* presented herein are based on secondary references not before the PTO, not considered or applied by the Examiner, nor cumulative of the references reviewed by the Examiner. Thus, the Examiner did

not consider the obviousness combinations and arguments in this Petition. For example, in the Notice of Allowance, the Examiner noted the claims are allowed because the “prior art fails to teach an adjusted language model.” (Ex. 1002, 41-42.) But, as explained for limitation 1[d] in Ground 1, *Roberts* discloses adjusting the language model, and a POSITA would have found it obvious to combine *Ditzik* and *Roberts* with a reasonable expectation of success. (§V.A.4.e.) The Examiner did not consider the same or substantially the same arguments and art, for *Roberts* was never before the Examiner. *Versa Prods. v. Varidesk, LLC*, IPR2020-00387, Paper 13, at 17-18 (PTAB July 10, 2020.)

Second, the Examiner erred in a manner material to patentability by misconstruing claim terms and overlooking relevant teachings. For example, the Examiner misconstrued the terms “user message model” and “language model.” *Advanced Bionics*, IPR2019-01469, Paper 6, at 8-9, n.9. The Examiner noted that *Bellegarda* '785 is the “closest reference” but fails to teach a “user message model.” (Ex. 1002, 42.) Then, the Examiner held it would not have been obvious to combine *Bellegarda* '785 and *Besling* because “no user model that exists independent of the language models and HMM’s” is disclosed in *Bellegarda* '785. (*Id.*) (emphasis added). But nothing in the claims requires the user model to be “independent of the language models and HMMs.” Rather, the '737 specification defines a “user message model” as “a message model that is specific to a particular

user,” where the “message model may include a language model.” (’737 patent, 12:66-13:4.) (emphasis added). When the claims are construed properly, *Ditzik* discloses the claimed user message model as explained for limitation 1[c] in Ground 1. (§V.A.4.d.)

The Examiner also misapprehended and overlooked the teachings of *Ditzik* as applied to the issued claims. *Advanced Bionics*, IPR2019-01469, Paper 6, at 8-9, n.9; *Arrows Up*, IPR2018-01231, at 10-12. The application that issued as the ’737 patent went through eight rejections. (Ex. 1002.) After the sixth rejection, the applicant rewrote the entirety of, what is now, claim 1, and in turn significantly changed its scope. (Ex. 1002, 164.) For example, when rewriting current claim 1, the applicant removed the following claim limitations:

- “a message recognizer”;
- “a speech recognizer”;
- “a shared language model having: a present context based on words in the provided text data of the memory, and an acoustic model”;
- “to obtain a user input indicative of a user context when a text segment of received user input is outside of the present context”; and
- “the handwriting recognizer . . . provide text data in accordance with both the shared language model and a handwriting model.”

(*Id.*) None of these are in the issued claims. (*See, e.g.,* '737 patent, Claim 1.) After these amendments, the Examiner issued a seventh rejection over U.S. Patent No. 6,285,785 (*Bellegarda* '785), in view of U.S. Patent No. 6,363,348 (*Besling*), and others. (Ex. 1002, 68-114.) But the Examiner used *Ditzik* as a secondary reference against newly amended pending claim 89 (issued claim 8) for teaching “a WAN such as the internet via a browser implemented via Fig. 4.” (Ex. 1002, 108.) *Ditzik* was not applied for any other limitation in the now-issued claims. The Examiner misapprehended and overlooked the teachings of *Ditzik* that impact patentability. *Unified Patents, LLC v. Sovereign Peak Ventures, LLC*, IPR2021-00852, Paper 9, at 37-39 (PTAB Nov. 9, 2021.)

Grounds 5-8: None of *Root*, *Roberts*, *Lewis*, and *Bellegarda* were before the PTO during prosecution and therefore never applied or evaluated by the Examiner. ('737 patent, References Cited, Ex. 1002.) Although *Verrier* was before the PTO, it was only cited in an IDS and never substantively considered by the Examiner in any grounds of rejection. (Ex. 1002.) Thus, non-institution of Grounds 5-8 under §325(d) would be improper.

VIII. Mandatory Notices

A. Real Party-in-Interest

Google LLC is the real party-in-interest for this petition.²

Out of an abundance of caution and without conceding it is a real party in interest, Google discloses that Motorola Mobility LLC was named as a defendant in a litigation based, in part, on alleged activities relating to products incorporating Google's Gboard application. Whether such a third party is a real party in interest need not be resolved here because it has no impact on this proceeding, including because even a determination that it is a real party in interest would not result in the application of any estoppel or time-bar under 35 U.S.C. § 315. *Unified Patents, LLC v. MemoryWeb, LLC*, Decision Granting Director Review Vacating-in-part the Final Written Decision and Vacating Board Order, IPR2021-01413, Paper 76 at 5 (PTAB May 22, 2023) (citing *SharkNinja Operating LLC v. iRobot Corp.*, IPR2020-00734, Paper 11 at 18 (PTAB Oct. 6, 2020) (precedential)); Ex. 1029 (Motorola was served on September 12, 2022).

² Google LLC is a subsidiary of XXVI Holdings Inc., which is a subsidiary of Alphabet Inc. XXVI Holdings Inc. and Alphabet Inc. are not real parties in interest to this proceeding.

B. Related Matters

To Petitioner's best knowledge, the '737 patent is or has been involved in the following district court litigations:

Na me	Number	Court	Filed
<i>Buffalo Patents, LLC v. ZTE Corp.</i>	6-22-cv-00423	W.D. Tex.	April 27, 2022
<i>Buffalo Patents, LLC v. TCL Tech. Grp. Corp.</i>	6-22-cv-00422	W.D. Tex.	April 27, 2022
<i>Buffalo Patents, LLC v. OnePlus Tech. (Shenzhen) Co.</i>	6-22-cv-00421	W.D. Tex.	April 27, 2022
<i>Buffalo Patents, LLC v. Motorola Mobility LLC</i>	1-22-cv-04540	N.D. Ill.	August 25, 2022

C. Lead and Back-Up Counsel, and Service Information

Lead Counsel	Back-Up Counsel
Erika H. Arner, Reg. No. 57,540 Finnegan, Henderson, Farabow, Garrett, & Dunner LLP 1875 Explorer Street Reston, VA 20190-5675 Tel: 571-203-2754 Fax: 202-408-4400 erika.arner@finnegan.com	Sydney R. Kestle, Reg. No. 78,725 sydney.kestle@finnegan.com Christina Ji-Hye Yang, Reg. No. 79,103 christina.yang@finnegan.com Finnegan, Henderson, Farabow, Garrett & Dunner, LLP 901 New York Avenue, NW Washington, DC 20001-4413 Tel: 202-408-4000 Fax: 202-408-4400

Please address all correspondence to lead and back-up counsel at the addresses shown above. Petitioner also consents to electronic service by email.

IX. Grounds for Standing

Petitioner certifies the '737 patent is available for IPR and Petitioner is not barred or estopped from requesting an IPR challenging the claims on the grounds identified herein.

X. Conclusion

The Board should institute and cancel each challenged claim. The Office may charge any required fees to Deposit Account No. 06-0916.

Date: September 12, 2023

Respectfully submitted,

/Erika H. Arner/

Erika H. Arner, Lead Counsel

Reg. No. 57,540

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(a)(1)(i), the undersigned hereby certifies that the foregoing PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 8,204,737 contains 13,979 words, excluding parts of this Petition exempted under § 42.24(a), as measured by the word-processing system used to prepare this paper.

/Erika H. Arner/
Erika H. Arner, Lead Counsel
Reg. No. 57,540

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the above PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 8,204,737 and accompanying EXHIBITS 1001-1029 and power of attorney were served September 12, 2023, via FedEx Priority Overnight on the following address of record for the subject patent:

Dean Munyon
KOWERT, HOOD, MUNYON, RANKIN & GOETZEL P.C.
1120 S. Capital of Texas Hwy
Building 2, Suite 300
Austin, TX 78746

A courtesy copy has been mailed to litigation counsel at the following:

Matthew James Antonelli
Antonelli, Harrington & Thompson LLP
4306 Yoakum Blvd, Suite 450
Houston, TX 77006

Date: September 12, 2023

By: /Lisa C. Hines/
Lisa C. Hines
Senior Litigation Legal Assistant
FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, LLP