

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD. and
SAMSUNG ELECTRONICS, AMERICA, INC.,

Petitioners

v.

CERENCE OPERATING COMPANY,

Patent Owner

Case IPR2025-00457

U.S. Patent No. 7,680,334

**DECLARATION OF DR. HOMAYOON BEIGI IN SUPPORT
OF PETITION FOR INTER PARTES REVIEW
OF U.S. PATENT NO. 7,680,334**

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I, Homayoon Beigi, declare that:

I. INTRODUCTION

1. I have been retained by the Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (“Samsung” or “Petitioners”) as an independent expert consultant in this proceeding before the United States Patent and Trademark Office (“PTO”).

2. I am being compensated at a rate of \$450/hour for my services in this proceeding, which is my regular and customary rate.

3. My compensation is in no way contingent on the nature of my finding, the presentation of my findings in testimony or this declaration, or the outcome of this or any other proceeding. I have no other interest in this proceeding.

4. I have been asked to consider whether certain references disclose and/or suggest the features recited in claims 1-4, 8-10, 15-16, 19-22, and 26-28 of U.S. Patent No. 7,680,334 (“the ’334 patent”) (EX1001).¹ My opinions are set forth below.

¹ Where appropriate, I refer to exhibits which I understand will be attached to the petition for *inter partes* review of the ’334 patent (the “Petition”).

II. BACKGROUND AND QUALIFICATIONS

5. I am an independent consultant. All of my opinions stated in this declaration are based on my own personal knowledge and professional judgment. In forming my opinions, I have relied on my knowledge and extensive experience in the field of Machine Learning and Pattern Recognition, and specifically, the field of Online Handwriting Recognition.

6. I am over 18 years of age and, if I am called upon to do so, I am competent to testify as to the matters set forth herein. A copy of my current curriculum vitae, which details my education and professional experience, is included as EX1003 in this proceeding. The following provides an overview of some of my experience that is relevant to the matters set forth in this declaration.

7. I have extensive experience with online handwriting recognition algorithms which provides me with an understanding of the subject matter described and claimed in the '334 patent. Further, I generally have extensive experience in the field of handwriting recognition technology and related fields of machine learning and pattern recognition.

8. As set forth in my CV, I have over 34 years of experience in the field of interactive computing devices, initially with International Business Machines (IBM) during development of its earliest online handwriting, speaker, and speech recognition engines, and later with Recognition Technologies to develop

proprietary and advanced recognition engines for performing speaker, speech, and face recognition.

9. My academic background provides a technical foundation for my work in handwriting, speech, biometric, and pattern recognition research, as well as my work in the design and implementation of various transcription, access, and biometric systems. I earned a Bachelor of Science Degree in Mechanical Engineering from Columbia University in 1984. I earned a Master of Science in Mechanical Engineering from Columbia University in 1985, with a focus on Kinematics, Dynamics, and Control Systems. I earned my Doctor of Engineering Science in Mechanical Engineering from Columbia University in 1991. My thesis was titled, "Neural Network Learning and Learning Control Through Optimization Techniques."

10. While at Columbia, I was a research assistant for multiple different professors. In Columbia's Center for Telecommunication Research, I assisted in the research of digital image coding and image data compression and transmission. In the Department of Mechanical Engineering, I assisted with researching several different scientific areas, including learning-adaptive control and neural network learning, fault detection of mechanical systems and machine health prognosis, generalization theory on kinematic analysis of commonly used linkages, and digital

image processing applied to fluid mechanics for the analysis of lubricant behavior in zero gravity.

11. I have 30 years of experience, teaching several graduate-level courses as an adjunct Professor in the Computer Science, Mechanical Engineering, and Electrical Engineering departments at Columbia University, including courses on speech recognition, speaker recognition, handwriting recognition, digital control systems, applied signal recognition, and mathematics of machine learning. In the spring of 2023, I was chosen as one of 11 finalists for the Columbia University Presidential Awards in Teaching Excellence, across the faculty body of over 3000 throughout the University. I have also been advising several Master's and Ph.D. students and have been a member of many Ph.D. defense committees at Columbia University.

12. Furthermore, I have a joint appointment in both departments of electrical engineering and mechanical engineering of Columbia University as a Professor of Professional Practice, as of January 1, 2025, where I teach and advise PostDoc, PhD, and Masters students.

13. From 1991 to 2001, I was a postdoctoral research fellow and later a Research Staff member at IBM T.J. Watson Research Center. While at IBM, I engaged in numerous research activities directly related to handwriting and speech processing. For example, from 1991-1997, I developed online handwriting

algorithms using a Hidden Markov Model (HMM) framework. And from 1997-2001, I conducted research in speaker recognition (verification and identification) and speech recognition as part of the development of the IBM Research Speaker Verification and Identification Engine, which is still being used in an array of different products at IBM. In this capacity, I worked directly on speech, speaker, image, and face recognition engines and their fusion for handling full diarization of multimedia segments, including full transcription and searching of content.

14. Beginning in 2000, I became fully involved in Internet Server Connections, Inc., of which I am the Vice President and Chief Technology Officer. In 2003, I began a second company, Recognition Technologies, Inc. I am the Head of Research and Development of Recognition Technologies, Inc. since January 1, 2025 and was the Chief Executive Officer and President of Recognition Technologies from 2023 to the end of 2024. During my time with Recognition Technologies, and extending before its inception, I developed the algorithms and code for an interactive voice response system and several recognition engines for pattern recognition, culminating over 5 Million lines of C++ code. This collection of engines, called RecoMadeEasy® includes full speech transcription capabilities in several languages, speaker segmentation and recognition, emotion detection, and face detection and recognition. All engines are capable of client/server as well as standalone operation. These engines provide a websocket interface, a streaming

interface, a full C++ API and provide services on servers, standalone computers, embedded Linux and Android devices, as well as a command-line access.

15. I have been awarded 13 patents as an inventor, many of which relate to pattern recognition involving speaker, face, and speech recognition. I also have over 100 publications and 3 best paper awards. In addition, I am the author of the first and only textbook on speaker recognition (1000+ pages of fundamentals), titled “Fundamentals of Speaker Recognition,” published by Springer-Verlag, which is the primary textbook used for my courses on “Fundamentals of Speech Recognition” and “Mathematics of Machine Learning and Signal Recognition.” It is also used by other researchers in the field, with over 100,000 electronic copies sold, plus many hard copies.

16. I was also voted into and served as the biometrics and speaker recognition expert for the “Voice Identification Policy Group,” which was formed by the U.S. Embassy in Mexico to help provide policy for surveillance efforts of the 600,000+ Mexican Federal Police. In that role, my responsibilities primarily centered around speaker biometrics.

17. I also served as the keynote speaker for the Mexican government’s “Primera Reunión Nacional de Usuarios AVIS,” which was a conference for the users of the Federal police voice surveillance system, and was held in November of 2011 in Mexicali, Baja California, Mexico.

18. In 2009, I served as an Interoperability Panelist in the U.S. Government Interagency Symposium for Investigatory Biometrics, and from 2009 to 2010, I was an Interoperability Committee Member for the Federal Bureau of Investigation.

19. Finally, I served as an Active Liaison in the ISO/SC 37 JTC WG3 group formed to create International Biometrics standards for the “Common Biometric Exchange Format (CBEF).” I also served as an active liaison and driving force for the speaker recognition standards development, from 2003 to 2010, in the ANSI/INCITS standards development for Biometric Data Interchange Formats in which I defined an ANSI standard for media interchange. I also had a similar role in the VoiceXML 3.0 standards development effort.

20. Over the course of my academic and professional career, I have received several awards relating to my work in pattern, handwriting, speech and speaker recognition, which are detailed in my attached Curriculum Vitae.

III. MATERIALS REVIEWED

21. The opinions contained in this declaration are based on the documents I reviewed, my professional judgment, as well as my education, experience, and knowledge regarding implementation of online handwriting recognition algorithms.

22. In forming my opinions expressed in this declaration, I reviewed the following materials:

- U.S. Patent 7,680,334 (“’334*Pat.*”) (EX1001);
- File History of U.S. Patent 7,680,334 (EX1004);
- U.S. Patent 5,333,209 (“*Sinden*”) (EX1005);
- U.S. Patent 5,315,667 (“*Fujisaki*”) (EX1006);
- U.S. Patent 5,926,567 (“*Collins*”) (EX1007);
- U.S. Patent 6,212,297 (“*Sklarew*”) (EX1008);
- U.S. Patent 5,303,312 (“*Comerford*”) (EX1009);
- U.S. Patent 5,666,438 (“*Beernink ’438*”) (EX1010);
- U.S. Patent 5,682,439 (“*Beernink ’439*”) (EX1011);
- U.S. Patent 5,970,170 (“*Kadashevich*”) (EX1012);
- European Publication No. 0254561B1 (“*Sklarew ’56I*”) (EX1013);
- U.S. Publication 2001/0026262A1 (“*Van Gestel*”) (EX1014);
- Charles C. Tappert et al., The State of the Art in On-Line Handwriting Recognition, 12 IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE 8, 787 (1990) (“*Tappert I*”) (EX1015);
- U.S. Patent 3,133,266 (“*Frishkopf*”) (EX1016);
- U.S. Patent 5,319,721 (“*Chefalas ’72I*”) (EX1017);
- U.S. Patent 5,710,832 (“*Berman*”) (EX1018);

- U.S. Patent 5,729,629 (“*Dai*”) (EX1019);
- U.S. Patent 6,215,476 (“*Depew*”) (EX1020);
- Microsoft Computer Dictionary (5th Ed, 2002) (EX1021);
- Charles C. Tappert et al., Speed, Accuracy, and Flexibility Trade-Offs in On-Line Character Recognition, 5 Int’l Journal of Pattern Recognition and Artificial Intelligence 1 & 2, 79-95 (1991) (“*Tappert 2*”) (EX1022);
- U.S. Patent 7,158,678 (“*Nagel*”) (EX1024);
- J.R. Parker, “Vector Templates and Handprinted Digit Recognition”. IEEE, vol. 2, pp. 457-459, 1994 (“*Parker*”) (EX1025);
- WIPO Publication WO1998033141A1 (“*Gay*”) (EX1026);

and any other materials I refer to in this declaration in support of my opinions.

23. My opinions have also been guided by my appreciation of how a person of ordinary skill in the art would have understood the claims and the specification of the ’334 patent at the time of the alleged invention, which I have been asked to initially consider as early as August 16, 2002. My opinions reflect how one of ordinary skill in the art would have understood the ’334 patent, the prior art to the patent, and the state of the art at the time of the alleged invention.

24. It is my opinion that certain references disclose and/or suggest all the features recited in claims 1-4, 8-10, 15-16, 19-22, and 26-28 (“Challenged Claims”) of the ’334 patent, as I discuss in detail below.

IV. RELEVANT LEGAL STANDARDS

25. I am not an attorney and offer no legal opinions, but in the course of my work, I have had experience studying and analyzing patents and patent claims from the perspective of a person skilled in the art.

26. For the purposes of this declaration, I have been informed about certain aspects of the law that are relevant to forming my opinions. My understanding of the law is as follows.

27. Petitioners' counsel has informed me that for the prior art to inherently disclose a claimed limitation, the prior art need not expressly disclose the limitation, so long as the claimed limitation necessarily flows from a disclosure in the prior art. I also understand that it is acceptable to examine evidence outside the prior art reference (extrinsic evidence) in determining whether a feature, while not expressly discussed in the reference, is necessarily present in that reference.

28. Petitioners' counsel has informed me that a patent claim can be considered to have been obvious to a person having ordinary skill in the art at the time the application was filed. I am informed that this means that, even if all of the requirements of a claim are not found in a single prior art reference, the claim is not patentable if the differences between the subject matter in the prior art and the subject matter in the claim would have been obvious to a person having ordinary skill in the art at the time of the invention.

29. I have been informed by Petitioners' counsel that a determination of whether a claim would have been obvious should be based upon several factors, including, among others:

- the level of ordinary skill in the art at the time the application was filed;
- the scope and content of the prior art;
- what differences, if any, existed between the claimed invention and the prior art; and
- any "secondary indicia" of non-obviousness, if they are of record.

30. I have been informed by Petitioners' counsel that a single reference can render a patent claim obvious if any differences between that reference and the claims would have been obvious to a person having ordinary skill in the art.

Alternatively, I understand that the teachings of two or more references may be combined in the same way as disclosed in the claims, if such a combination would have been obvious to one having ordinary skill in the art. In determining whether a combination based on either a single reference or multiple references would have been obvious, the following are examples of approaches and rationales that may be considered:

- whether the teachings of the prior art references disclose known concepts combined in familiar ways, and when combined, would yield predictable results;
- whether a person of ordinary skill in the art could implement a predictable variation, and would see the benefit of doing so;
- whether the claimed elements represent one of a limited number of known design choices, and would have a reasonable expectation of success by those skilled in the art;
- whether a person of ordinary skill would have recognized a reason to combine known elements in the manner described in the claim;
- whether there is some teaching or suggestion in the prior art to make the modification or combination of elements claimed in the patent; and
- whether the innovation applies a known technique that had been used to improve a similar device or method in a similar way.

31. I understand that “secondary indicia” of non-obviousness may include certain objective factors, such as: commercial success of products practicing the claimed invention; long-felt but unsolved need; teaching away; unexpected results; copying; and praise by others in the field. These factors are generally referred to as “secondary considerations” or “objective indicia” of non-obviousness. I

understand, however, that for such objective evidence to be relevant to the (non)obviousness of a claim, there must be a causal relationship (called a “nexus”) between the claim and the evidence and that this nexus must be based on a novel element of the claim rather than something in the prior art. I also understand that even when they are present, secondary considerations may be unable to overcome primary evidence of obviousness (such as motivation to combine with predictable results) that is sufficiently strong.

32. I have been informed by Petitioners’ counsel that one of ordinary skill in the art has ordinary creativity and is not an automaton. Petitioners’ counsel has also informed me that in considering obviousness, obviousness may not be determined using the benefit of hindsight, including hindsight derived from the patent being considered.

V. SUMMARY OF OPINIONS

33. For the reasons I discuss below, it is my opinion that claims 1-4, 8-10, 15, 16, 19-22, and 26-28 of the ’334 patent are rendered obvious by the prior art.

VI. OVERVIEW OF THE ’334 PATENT

34. The ’334 patent is titled “Presenting Recognised Handwritten Symbols.” EX1001, (54).

35. The ’334 patent generally relates to “[a] method for presenting recognized handwritten symbols”:

A method for presenting recognized handwritten symbols includes recognizing a detected handwritten pattern. Recognizing may include comparing the handwritten pattern to templates representing ways of writing symbols and returning a best interpretation of the handwritten pattern. The best interpretation may be based on the pattern of a best template. At least two templates may include different patterns which represent different ways of writing a single symbol, and the patterns of the at least two templates may return different best interpretations when being most similar to the handwritten pattern. The method further includes presenting the pattern of the best template on a screen. A device for implementing the method may also be provided.

EX1001, Abstract.

36. The '334 patent describes a “first aspect” of the alleged invention including a method and device including a step for “returning a best template” and “presenting the pattern of the best template”:

Thus, according to a first aspect, the invention provides a method for presenting a recognised handwritten symbol, which method comprises the steps of detecting a handwritten pattern that is entered by a user, and recognising the detected handwritten pattern. The step of recognising comprises comparing the handwritten pattern to templates representing ways of writing symbols. The step of recognising also comprises returning a best template that represents a pattern which, according to a predefined rule, is most similar to the handwritten pattern, wherein at least two templates represent

different patterns which represent different ways of writing a single symbol. Further, the method comprises presenting the pattern of the best template on a screen.

Id., 2:17-29

Further, according to the first aspect of the invention, a device for recognition of a handwritten symbol is provided. The device comprises a screen, means for detecting a handwritten pattern, and a database comprising templates that comprise patterns representing ways of writing symbols, wherein at least two templates comprise different patterns which represent different ways of writing a single symbol. Further, the device comprises means for recognising the detected handwritten pattern and returning the pattern of a best template of the handwritten pattern, said best template pattern being most similar to the handwritten pattern. The device is arranged to present the pattern of the best template on the screen.

Id., 2:49-61.

37. The '334 patent also describes a “second aspect” of the alleged invention including a method and device including a step for returning a “best interpretation” and presenting the best interpretation:

According to a second aspect of the invention, a method for sequentially presenting a plurality of recognised handwritten symbols comprises for each handwritten pattern the steps of detecting the handwritten pattern that is entered by a user, and recognising the detected handwritten pattern. The step of recognising comprises comparing the handwritten pattern to templates

representing ways of writing symbols. The step of recognising further comprises returning a best interpretation of the handwritten pattern, the best interpretation being based on the pattern of a best template that, according to a predefined rule, is most similar to the handwritten pattern, wherein at least two templates represent different patterns which represent different ways of writing a single symbol. The best interpretation returned when one of the patterns of the at least two templates is being most similar to the handwritten pattern differs from the best interpretation returned when the other of the patterns is most similar to the handwritten pattern. The method also comprises presenting the best interpretation on a screen.

Id., 2:30-48,

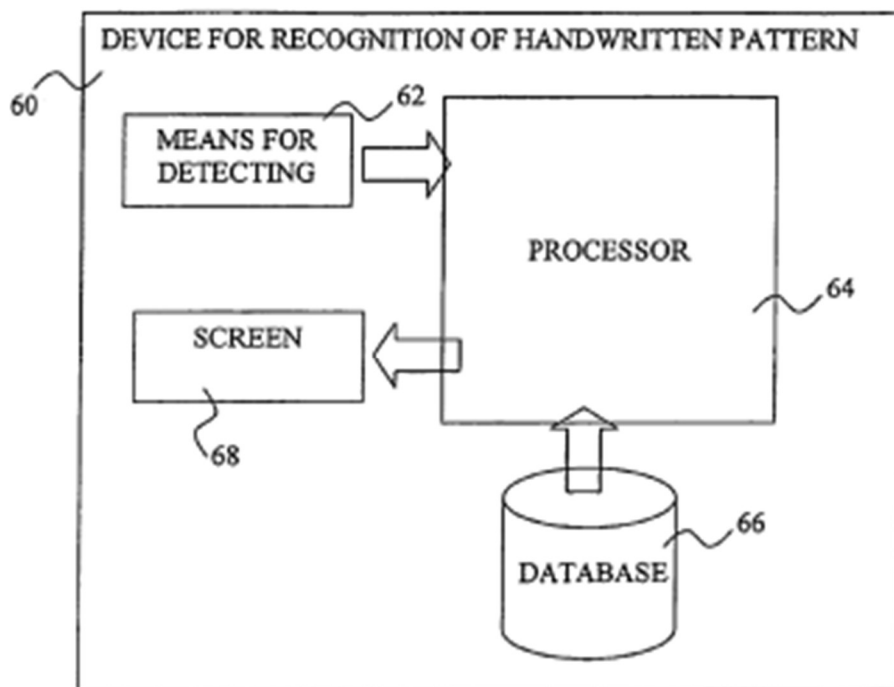
Also, according to the second aspect of the invention, a device for recognition of a plurality of handwritten symbols is provided. The device comprises a screen and a means for detecting handwritten pattern. The device further comprises a database comprising templates that comprise patterns representing ways of writing symbols, wherein at least two templates comprise different patterns which represent different ways of writing a single symbol. The device also comprises means for recognising the detected handwritten patterns and individually returning for each handwritten pattern a best interpretation of the handwritten pattern, said best interpretation being based on the pattern of a best template that is most similar to the handwritten pattern. The patterns of the at least two templates return different best interpretations when being most

similar to the handwritten pattern. The device is arranged to present the best interpretation on the screen.

Id., 2:62-3:10.

38. The “best interpretation” is “based on the pattern of a best template” and may be “the pattern of a best template” itself or an “allograph that is associated with the pattern of the best template.” *Id.*, 4:5-20, 4:35-43; 7:56-60 (“The best interpretation intended for presentation may be retrieved from a database of allographs. The best template will return a pointer to the allograph that is to be retrieved. The allographs may be prepared for being presented.”).

39. Figure 6 illustrates a device of the alleged invention including “a means 62 for detecting a handwritten pattern, e.g. a pressure-sensitive screen,” “a processor 64 for recognition of the detected handwritten pattern,” a “database 66 of templates for comparison to the handwritten pattern,” and a “screen 68.” *Id.*, 8:45-58.



'334 patent (EX1001), FIG. 6

VII. PROSECUTION HISTORY

40. The '334 patent issued from U.S. Appl. No. 10/524,430. During prosecution, the Patent Office issued three Non-Final Rejections and one Final Rejection in which the applicant and the examiner discussed U.S. 5,303,312 ("Comerford"), U.S. 5,666,438 ("Beernink '438"), 5,682,439 ("Beernink '439"), and U.S. 5,970,170 ("Kadashevich").

41. The Patent Office mailed a Notice of Allowance on October 28, 2009.



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EXAMINER	
RASHID, DAVID	
ART UNIT	PAPER NUMBER
2624	
DATE MAILED: 10/28/2009	

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,430	08/09/2005	Erika Prymus	ZICO0006	6160
TITLE OF INVENTION: PRESENTING RECOGNISED HANDWRITTEN SYMBOLS				

EX1004 at 582 (annotated)²

42. On October 9, 2009, before the Notice of Allowance, the applicant mailed a Request for Continued Examination.

Doc code: RCEX
Doc description: Request for Continued Examination (RCE)
PTO/SB/30EFS (07-09)
Approved for use through 07/31/2012. OMB 0551-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL (Submitted Only via EFS-Web)							
Application Number	10524430	Filing Date	2005-08-09	Docket Number (if applicable)	ZICO0006	Art Unit	2624
First Named Inventor	Erika PRYMUS			Examiner Name	David Rashid		
This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application. Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV							

EX1004 at 559

43. The Request for Continued Examination included an amendment to independent claims 1 and 15, shown below.

² All emphases/annotations/color are added unless noted otherwise.

1. (Currently Amended) A method performed by a handwriting recognition device for presenting a recognized handwritten symbol, the recognition device having a processor and detection means for detecting entry of a handwritten symbol, the method comprising the steps of:

detecting, by the detection means, a handwritten pattern that is entered by a user,

recognizing, by the processor, the detected handwritten pattern, wherein said step of recognizing comprises:

comparing the handwritten pattern to a plurality of templates, wherein each of the plurality of templates represents at least one of a plurality of handwriting symbol patterns of handwritten ways of hand writing symbols, and

returning a best template selected from the plurality of templates that represents one of the plurality of handwriting symbol patterns as a best handwriting symbol pattern which, according to a predefined rule, is most similar to the handwritten pattern, wherein at least two of the plurality of templates comprise different ones of the plurality of handwriting symbol patterns which represent different handwritten ways of handwriting a single symbol; and

presenting the best handwriting symbol pattern of the best template.

EX1004 at 562

15. (Currently Amended) A method performed by a handwriting recognition device for sequentially presenting a plurality of recognized handwritten symbols, the recognition device having a processor and detection means for detecting entry of a handwritten symbol, the method comprising for each handwritten pattern the steps of:

detecting, by the detection means, the handwritten pattern,
recognizing, by the processor, the detected handwritten pattern, wherein said step of recognizing comprises:

comparing the handwritten pattern to a plurality of templates, wherein each of the plurality of templates represents at least one of a plurality of handwriting symbol patterns of handwritten ways of hand writing symbols and

returning a best interpretation of the handwritten pattern, said best interpretation being based on one of the plurality of handwriting symbol patterns as a best handwriting symbol pattern of a best template selected from the plurality of templates that, according to a predefined rule, is most similar to the handwritten pattern, wherein at least two of the plurality of templates comprise different ones of the plurality of handwriting symbol patterns which represent different handwritten ways of handwriting a single symbol, and wherein the different ones of the plurality of handwriting symbol patterns of said at least two of the plurality of templates return different best interpretations when being most similar to the handwritten pattern; and
presenting the best interpretation.

EX1004 at 564-565

44. In the Notice of Allowance, the Examiner provided certain “Reasons for Allowance,” shown below.

Reasons for Allowance

[5] The following is an examiner's statement of reasons for allowance:

Regarding **Claim 1**, while the prior art of record teaches Claim 1, Apr. 22, 2009 (see Office Action at p. 6-7, Jul. 14, 2009), the prior art of record does not teach wherein at least two of the plurality of templates comprise different ones of the plurality of handwriting symbol patterns which represent different handwritten ways of handwriting a single symbol.

The prior art of record compares users' handwritten symbol patterns to either standard template font or one user's personal template handwriting, but does not compare the users' handwritten symbol patterns to a plurality of templates comprising different ones of the plurality of handwriting symbol patterns which represent different handwritten ways of handwriting a single symbol.

In addition, the prior art of record then does not teach presenting/displaying the best handwriting symbol pattern of the best template (a feature of Claims 1 and 33).

Claims 15, 33, and 34 allowable by analogy. Claims 2-14 and 16-32 allowable by dependency.

EX1004 at 587

VIII. OVERVIEW OF THE PRIOR ART

A. Background of certain aspects of handwriting recognition technology

1. Hardware used in handwriting recognition devices

45. Before the earliest alleged priority date, it was known to construct handwriting recognition devices with a pressure-sensitive screen to detect the user's input with a pen or stylus. This is corroborated, for example, by a paper authored by Charles Tappert and others titled "The State of the Art in On-Line Handwriting Recognition" published in August 1990 (EX1015, "*Tappert I*").

46. As background, *Tappert I* explains that handwriting recognition research dates back to the 1960s. This is confirmed, for example, by U.S. Patent No. 3,133,266 to Lawrence S. Frishkopf, filed on June 14, 1960, which describes an early on-line handwriting recognition device:

The invention in one of its principal forms is realized by generating real time signals $X(t)$ and $Y(t)$ proportional to the coordinates of position of a writing instrument as it is moved over the writing surface of a transducer, such as a telewriter or the like, to produce script formations representing full words. The continuous coordinate signal information from the telewriter is analyzed to detect both X and Y extremals, and indicia of the extremals is normalized to a standard reference level, and recorded in binary form in a suitable storage medium. Advantageously, information characteristic of the relative orientation of successive extremals, such as the sign of the slope of a line joining them, is detected and recorded. A correlation comparison of the ordered extremal listing, in binary symbol form, of the words to be identified with an ordered extremal listing of each of the plurality of dictionary words is performed and the highest correlation figure is employed to produce a manifestation of word identity.

Frishkopf at 2:46-65.

47. *Tappert I* explains that “[o]n-line handwriting recognition means that the machine recognizes the writing while the user writes.” EX1015 at 787. “On-line handwriting recognition requires a transducer that captures the writing as it is

written. The most common of these devices is the electronic tablet or digitizer, which typically has a resolution of 200 points/in, a sampling rate of 100 points/s, and an indication of ‘inking’ or *pen down*.” *Id.* (emphasis in original).

48. *Tappert I* further explains that “[t]ablet digitizers have existed for three decades” and that “[a] number of technologies are available for tablet digitizers.” EX1015 at 2. “[T]he two main [technologies] are electromagnetic/electrostatic and pressure sensitive.” *Id.* “Pressure-sensitive tablets ... have layers of conductive and resistive material with a mechanical spacing between the layers.” *Id.* “An electrical potential is applied across one of the resistive layers, in either the x or y direction, to set up a voltage gradient that corresponds to position.” *Id.* “Pressure from the stylus tip at a point results in the conductive layer picking off the voltage (and thus the position) from the resistive layer.” *Id.*

49. *Tappert I* further explains that “[t]he most interesting development in recent years has been the combination of input and output-digitizer and display-on the same surface.” *Id.* at 3. “The latest development is to integrate the digitizer and display in a single hardware unit.” *Id.* *Tappert I* further describes a known IBM system in which “[a] transparent tablet and LCD display provide input and output on the same surface. Electronic inking echos [*sic*] the path traced by the stylus and

aids the user while writing. After the user writes a character, the recognized character replaces the inking.” *Id.* at 14.

50. *Beernink* ’438, filed in July 1994, also explains that “[p]en-based computers generally include a dual function display assembly which acts simultaneously as an input device (‘input tablet’) and as an output device. The display assembly typically includes a liquid crystal display (LCD) or other portable display having a matrix of pixels capable of displaying text, graphics, etc. A variety of different types of input tablets can be used, including a [touch] sensitive membrane positioned over the LCD.” *Id.*, 1:28-47. *Van Gestel* similarly discloses an apparatus with “a display device 104 which is integrated with the input device.” EX1008 ¶[0021]. “This display device initially shows the positions where the pen has touched the input device, thus imitating the writing with an ink pen on paper. So the user sees the input appearing on the input device.” *Id.*

2. Template matching in handwriting recognition

51. Before the earliest alleged priority date, it was known to perform handwriting recognition with a technique known as “template matching.” The ’334 patent itself acknowledges that “[u]sually, a handwritten character [is] entered on a detection device ... and recognised [sic] by means of templates.” EX1001, 1:28-29. The ’334 patent also explains its recognition method is “conventional”:

The pattern is thereafter recognised by being compared with templates in a database. These comparisons return a best

template, step 2. The best template comprises a pattern that is most similar to the handwritten pattern according to a predefined rule. *The recognition of the handwritten pattern is made according to a conventional method.* The database comprises several templates where at least two templates comprise patterns that represent different ways of writing a single character. The database may comprise between 2-50 different templates per character. Further, the pattern of the best template is presented on the screen, step 3. This is done automatically for each handwritten pattern the user enters on the screen. Thus, the actual template that is most similar to the entered handwritten pattern is presented. Thereby, the presented pattern will be very similar to the handwritten pattern and the user may understand how the result of the recognition emerged.

Id., 7:25-41.

52. *Tappert I* describes several types of character recognition known by August 1990. For example, curve matching entails “[c]urves from an unknown are matched against those of prototype characters, and the name of the prototype that best matches the unknown is assigned to the unknown.” EX1015 at 6. The curves “are usually functions of time, like preprocessed x and y values, the direction angle of the tangent to the[] trajectory of the writing, or both.” *Id.* *Tappert I* also describes three commercially available handwriting recognition systems that used “template matching,” which “simply means matching an unknown character against stored character templates.” *Id.*, at 12-13. Alternatively, elastic matching

can be used to measure points of an unknown symbol to a prototype. *Id.*; FIG. 5.

Elastic matching “is a form of nonlinear template matching.” *Id.*, 798.

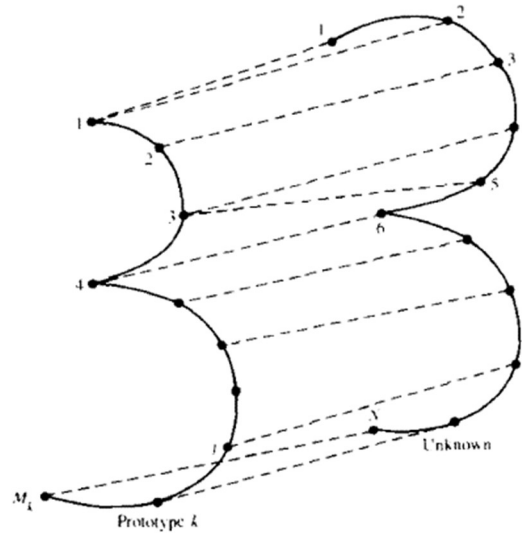


Fig. 5. Illustration of elastic matching [239].

Id., FIG. 5.

53. It was also known before the earliest alleged priority date to perform handwriting recognition by comparing the user’s input handwriting to multiple prototypes or templates for each of several symbols.

54. This is corroborated, for example, by *Sinden*, as discussed further below in Section XI.A.1.c(ii). This is also corroborated, for example, by U.S. Patent No. 5,319,721 Thomas E. Chefalas and Charles C. Tappert (EX1016, “*Chefalas ’721*”). Chefalas ’721 was filed on April 14, 1992.

United States Patent [19]
Chefalas et al.



US005319721A

[11] Patent Number: 5,319,721
[45] Date of Patent: Jun. 7, 1994

[54] METHODS AND APPARATUS FOR
EVOLVING A STARTER SET OF
HANDWRITING PROTOTYPES INTO A
USER-SPECIFIC SET

[75] Inventors: Thomas E. Chefalas, Jackson
Heights; Charles C. Tappert,
Ossining, both of N.Y.

[73] Assignee: International Business Machines
Corporation, Armonk, N.Y.

[21] Appl. No.: 868,369

[22] Filed: Apr. 14, 1992

[51] Int. Cl.³ G06K 9/00

[52] U.S. Cl. 382/13; 382/14;
382/15

[58] Field of Search 382/3, 13, 14, 15, 10,
382/24, 16, 37, 39; 395/20, 23

[56] References Cited

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4,654,873 3/1987 Fujisawa et al. 382/9
4,718,102 1/1988 Crane et al. 382/13

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ing Symbol Recognition"; *IBM Technical Disclosure
Bulletin*; vol. 24, No. 9, Feb. 1982; pp. 4522-4523.

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Pattern Recognition Proceedings, Jul. 30-Aug. 2, 1984,
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vol. 34, No. 3, Aug. 1991, p. 222.

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No. 5, Oct. 1986, pp. 2345-2346.

(List continued on next page.)

Primary Examiner—Michael T. Razavi

Assistant Examiner—Steven P. Klocinski

Attorney, Agent, or Firm—Perman & Green

[57] ABSTRACT

A method for use in a handwriting recognition system,
and apparatus for accomplishing the method, that gen-
erates a User set of prototype symbols. The method
includes the steps of (a) inputting one or more strokes
for representing a predetermined symbol; and (b) com-
paring characteristics of the inputted strokes to stroke
characteristics associated with one or more predeter-
mined Starter prototype symbols. If the stroke charac-
teristics match to within a predetermined threshold, the
method further includes a step of (c) averaging the
characteristics of the inputted stroke or strokes with the
characteristics of a corresponding one or ones of the
strokes of the matching one of the Starter prototype
symbols to form a User prototype symbol. Further steps
include (d) storing the User prototype symbol for subse-
quent use; and (e) deleting one or more Starter proto-
type symbols of the same label as the input symbol. If
the stroke characteristics do not match, the method
further includes the steps of (f) storing the characteris-
tics of the one or more inputted strokes as the User
prototype symbol for subsequent use; and (g) deleting
the one or more Starter prototype symbols. A counter is
maintained and deletes the Starter set only after a prede-
termined number of instances of the symbol have been
entered by the user.

EX1017

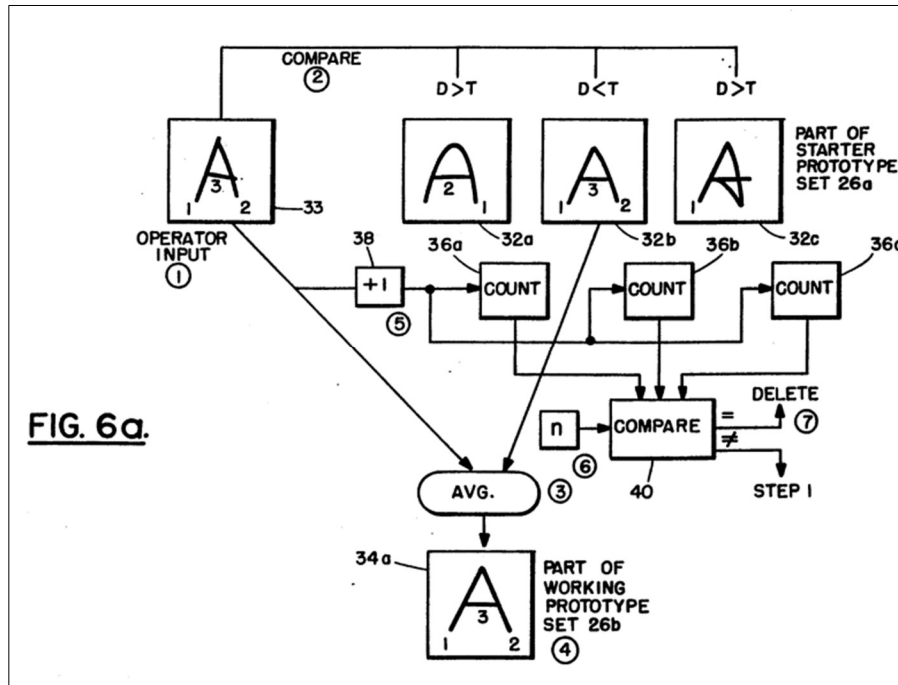
55. *Chefalas '721* discloses a method of "generating sets of prototype symbols and strokes for use in a handwriting recognition system." EX1017, 3:3-6. As background, *Chefalas '721* explains that "[m]any online, handwriting recognition systems use elastic curve matching to match an unknown character against prototype (template) characters." *Id.*, 1:45-47. "Such systems usually represent each way of writing a character by a single prototype that usually is one writing of the character. This minimizes the number of prototypes and therefore the

computation time for matching.” *Id.*, 1:59-63. “An important consideration is a total number of prototypes in a prototype set. As can be appreciated, the larger the number of prototypes, the greater is the amount of time required to examine the prototype set to identify those that most nearly match an input assemblage of strokes.” *Id.*, 2:20-24. “A further consideration is the ease and accuracy of a transition from a system-supplied, generic set of starter symbol prototypes to a more accurate set of working prototypes that are customized, during a training session, to the handwriting characteristics of a particular user.” *Id.*, 2:34-39.

56. “By example, three different prototypes of the uppercase letter ‘A’ may be provided so as to cover the case of an ‘A’ printed with one continuous stroke, with two strokes, or with three strokes. Other forms of the letter ‘A’ prototype may also be provided to cover different variations in stroke order and direction. As can be realized, if a given user consistently forms the letter ‘A’ with three strokes, and consistently uses the same stroke order and direction, then the alternate ‘A’ symbol starter prototypes are superfluous.” *Id.*, 2:43-53.

57. *Chefalas* ’721 discloses its method with reference to Figure 6a. “In step 1, the operator is prompted to enter, via the tablet 15 and pen 15, a sample 33 of the uppercase letter ‘A’, as in FIG. 3.” *Id.*, 7:6-8. “In step 2, the constituent strokes of the sample character 33 are compared, by the elastic matching technique referred to above, to the constituent strokes of each of

the starter prototypes 32a, 32b, and 32c. A difference (D) between the strokes of the sample character 33 and the strokes of each of the starter prototypes 32a, 32b, and 32c is compared to a threshold value (T).” *Id.*, 7:9-15.



EX1017, FIG. 6

58. As another example, U.S. Patent No. 5,710,832 (“*Berman*”) “relates to a method and system for training a handwriting recognizer.” EX1018, 1:15-17.

Berman was filed on December 8, 1995.

United States Patent [19]		[11] Patent Number:	5,710,832
Berman et al.		[45] Date of Patent:	Jan. 20, 1998
[54]	METHOD AND SYSTEM FOR DISPLAYING HANDWRITTEN DATA AND RECOGNIZED SYMBOLS	5,063,600 11/1991 Norwood	382/186
		5,121,441 6/1992 Chefalas et al.	382/13
		5,191,622 3/1993 Shojima et al.	382/185
		5,267,327 11/1993 Hirayama	382/13
		5,365,598 11/1994 Sklarew	382/189
[75]	Inventors: Eric Robert Berman, Redmond; Luis Fernando Talavera Abdala; Marlin Eller, both of Seattle; Shishir P. Pardikar, Redmond, all of Wash.		
	FOREIGN PATENT DOCUMENTS		
		2-187882 7/1990 Japan .	
[73]	Assignee: Microsoft Corporation, Redmond, Wash.		
	<i>Primary Examiner</i> —Yon J. Couso <i>Attorney, Agent, or Firm</i> —Seed and Berry LLP		
[21]	Appl. No.: 569,497		
[22]	Filed: Dec. 8, 1995		
	Related U.S. Application Data		
[63]	Continuation of Ser. No. 42,834, Apr. 5, 1993, Pat. No. 5,550,930, which is a continuation of Ser. No. 716,730, Jun. 17, 1991, abandoned.		

EX1018 (annotated)

59. *Berman* explains that “handwriting recognition systems use algorithms to map handwritten data to symbols. Typically, these systems internally store a prototype for each symbol that can be recognized. A prototype is a ‘picture’ of a handwritten symbol that is used to map handwriting to a symbol.” *Id.*, 1:44-48. “A system that recognizes just capital letters may have only 26 prototypes: one for each capital letter. Recognition systems use recognition algorithms to map handwritten data to a prototype.” *Id.*, 1:48-52. “As long as the user writes like the prototypes, the handwritten data is successfully recognized. Conversely, the more dissimilar the handwritten data and the prototype are, the more likely it is that the handwritten data will be misrecognized.” *Id.*, 1:52-56.

60. “A recognizer is that part of the recognition system that implements a recognition algorithm.” *Id.*, 1:62-63. “A trainable recognizer ... allows the user to

specify the handwritten data that corresponds to a symbol. For example, during training a recognizer may display a typewritten 'A' and prompt the user to input a handwritten 'A.' *The recognizer trains by modifying the prototype associated with the letter 'A' or adding another prototype for the letter 'A.'*” *Id.*, 2:3-9.

Berman recognizes that “a user may use different writing styles for a letter depending on the context. For example, a user may write the letter ‘h’ one way when it begins a word and another way when it follows the letter ‘t.’ When it follows a ‘t,’ the user may write the vertical part of the ‘t’ and when crossing the ‘t’ continue in the same stroke to make the letter ‘h.’ Thus, the ‘h’ is a continuation of the cross in the letter ‘t.’” *Id.*, 2:37-44.

3. Display and user interface techniques for handwriting recognition

61. Before the earliest alleged priority date, it was known to display either or both of the label (e.g., an alphanumeric character) for the template or prototype to which the user’s handwriting input was matched, or to display the handwritten pattern of the matched template or prototype itself.

62. *Fujisaki*, discussed below, is exemplary. Further, U.S. Patent No. 5,729,629 (*Dai*) discloses the display of a reference symbol to the user. *Dai* was filed November 18, 1996. *Dai* explains that “[t]he symbol recognizer 10 advantageously evaluates both individual features of the handwritten symbol and the symbol as a whole.” EX1019, 3:37-39. *Dai* further explains that:

The individual feature evaluation is accomplished by a label comparator 20 that compares the feature codes for the input symbol with feature codes of reference symbols stored in the memory unit and identifies the reference symbol or symbols having feature codes that most closely match the feature codes of the input symbol. The whole symbol evaluation is performed by a geometric comparator 22 that compares stored geometric models corresponding to the reference symbols having the most closely matching features with the geometric representation of the input symbol. The geometric comparator uses its comparison to identify the reference symbols whose geometric model or models most closely match the geometric representation of the input symbol.

Id., 3:39-52.

63. *Dai* explains that “[t]he reference symbol that most closely matches the handwritten input symbol, as determined by the label and geometric comparators, ***is sent to the user interface which displays the reference symbol to the user.***” *Id.*, 3:52-56 (emphasis added).

B. Overview of the prior art references

1. Analogous Art

64. Each of the prior art references summarized below and analyzed in the grounds below are analogous to the '334 patent because they are within the same field of endeavor and reasonably pertinent to at least one problem addressed by the '334 patent.

65. In particular, *Sinden* is directed to recognition of symbols handwritten on a digital tablet involving comparing handwritten symbols to symbols in a predefined alphabet or library of model symbols where the closest match is chosen.

66. Similarly, *Fujisaki* is directed to a handwriting recognition system that uses a character matcher to compare the handwriting input to stored character prototypes to identify within some probability that the handwriting input represents a specific character.

67. *Collins* “relates to the field of formatting handwritten data displayed on computer systems” and is applicable to handwriting recognition systems. EX1007, 1:11-12. Moreover, *Collins* is pertinent to displaying data representing handwriting, which is one of the issues to which the '334 patent is directed.

68. Finally, *Sklarew* discloses “a portable handwritten, keyboardless entry computer system” and is the same field of endeavor as the '334 patent. EX1008, 5:48-50.

2. *Sinden*

69. *Sinden* is a United States patent titled “Method of recognizing handwritten symbols.” EX1005, (54).

United States Patent [19]		[11] Patent Number:	5,333,209
Sinden et al.		[45] Date of Patent:	Jul. 26, 1994
[54]	METHOD OF RECOGNIZING HANDWRITTEN SYMBOLS	IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 12, No. 8, Aug. 1990. K. Zikan, “Least-Squares Image Registration,” ORSA Journal on Computing, vol. 3, No. 2, Spring 1991.	
[75]	Inventors: Frank W. Sinden, Princeton; Gordon T. Wilfong, Gillette, both of N.J.	<i>Primary Examiner</i> —Leo H. Boudreau <i>Attorney, Agent, or Firm</i> —Geoffrey D. Green	
[73]	Assignee: AT&T Bell Laboratories, Murray Hill, N.J.	[57] ABSTRACT	
[21]	Appl. No.: 857,198	An unknown handwritten symbol written on a digitizing tablet is compared with symbols in a predefined	
[22]	Filed: Mar. 24, 1992		

EX1005 at Cover (annotated)

70. *Sinden* discloses a system and method for recognizing handwritten symbols in which “[s]ymbols are written with stylus or pen 10 on digitizing tablet or pad 11”:

FIG. 1 is a block diagram of a system for performing the invention. *Symbols are written with stylus or pen 10 on digitizing tablet or pad 11.* Pad 11 is capable of sensing the position of the tip of pen 10 on the surface of pad 11 as well as the presence of pen 10 on the pad.

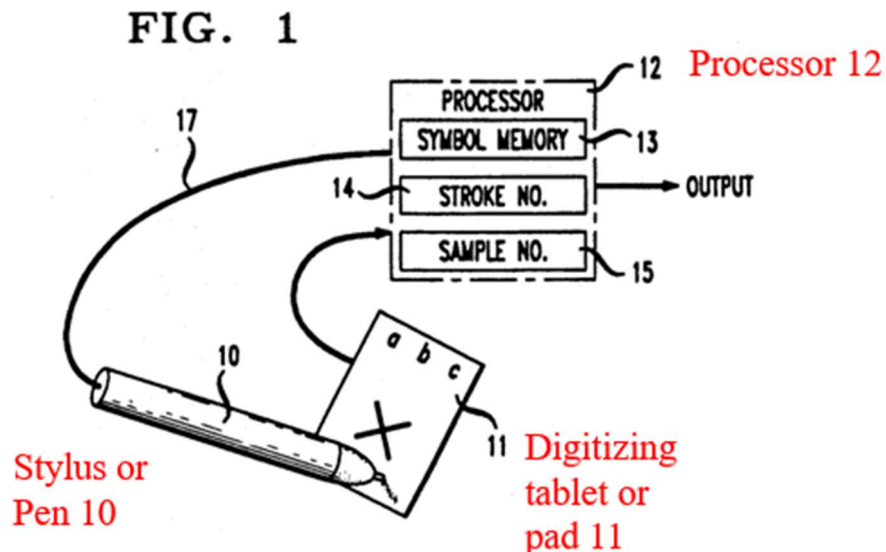
EX1005 at 2:50-54.

An unknown handwritten symbol written on a digitizing tablet is compared with symbols in a predefined "alphabet" or library of model symbols and the closest match chosen.

Id., 1:67-2:2

Both model symbols and unknown symbols are written into the system by means of pen 10 and pad 11. The system is essentially “trained” by writing in at least one model for each symbol that the system is expected to recognize and associating the samples recorded for that model symbol with a corresponding label. Thus, if it is desired for the system to be able to recognize alphanumeric characters, models for each character are so written and associated with the corresponding letter or number.

Id., 3:42-51.



Sinden (EX1005), FIG. 1 (annotated)

71. With reference to Figure 2, *Sinden* discloses “how samples of a handwritten symbol are recorded by the system.” *Id.*, 3:13-14, FIG. 2.

72. *Sinden*’s processor “can be either in the mode of accepting model symbols or in the mode of accepting unknown symbols”:

Processor 12 can be either in the mode of accepting model symbols or in the mode of accepting unknown symbols.

Id., 3:59-61

As will be clear to one skilled in the art, the activities shown in FIG. 2 (and FIG. 3) would typically be controlled by a computer program stored in memory in processor 12.

Id., 3:15-18,

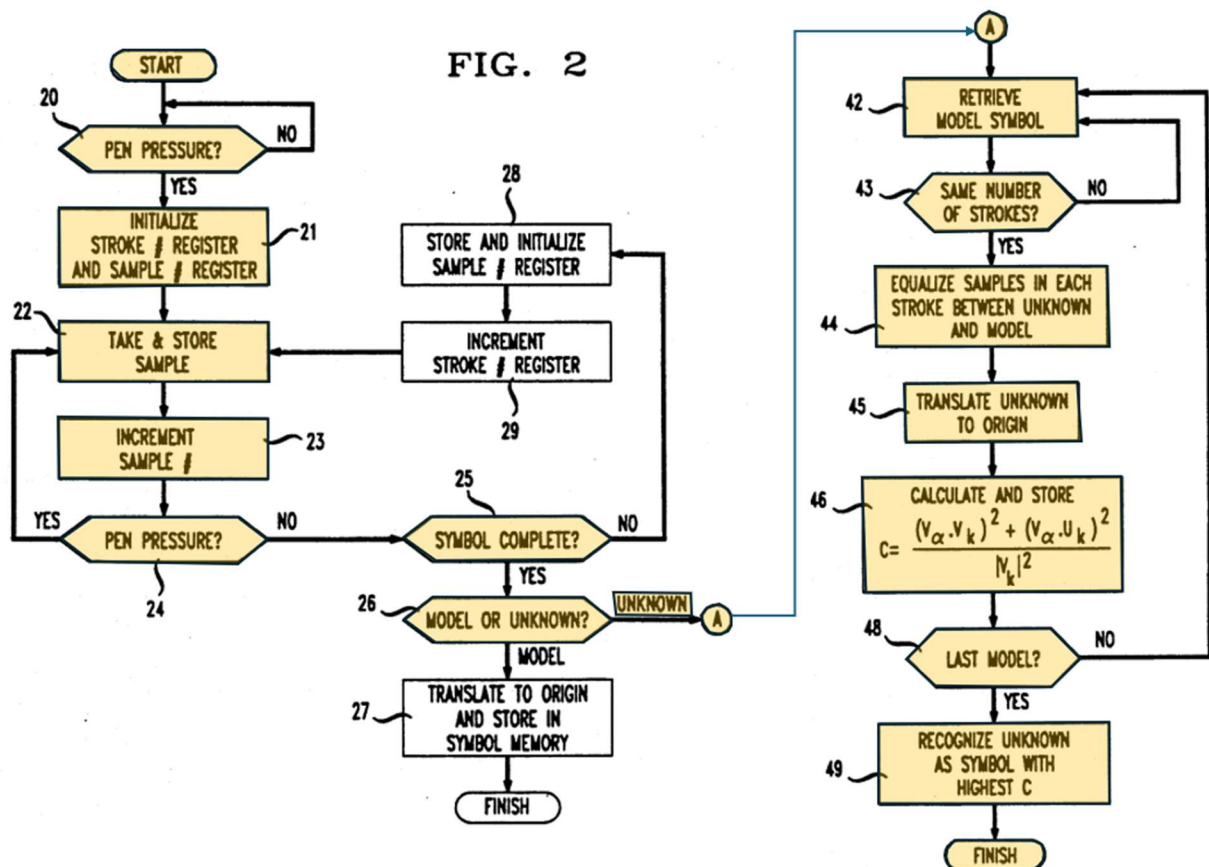
If the symbol written is an unknown symbol, then as indicated at block 26 in FIG. 2, processor 12 proceeds with the steps shown in the flow chart of FIG. 4.

Id., 4:32-34.

73. Model symbols are akin to the “templates” described in the ’334 patent, as they are reference model to which the user’s unknown symbol is compared. EX1001, 3:62-65 (“a ‘template’ means a model or representation of a pattern that is used for comparison with the handwritten pattern in order to recognise the handwritten pattern.”) If model symbols are being entered, the samples for each symbol are stored in symbol memory 13 of processor 12 without a comparison step. EX1005, 3:61-64. In this way, “[t]he system is essentially ‘trained’ by writing in at least one model for each symbol that the system is

expected to recognize and associating the samples recorded for that model symbol with a corresponding label.” *Id.*, 3:43-47.

74. Figure 4, by contrast, is a flow chart of “how the samples for an unknown symbol and the model symbols are compared to identify the unknown symbol.” *Id.*, 4:32-34, 4:63-65, FIG. 4. In sum, “an unknown symbol is compared with model symbols to find a match.” *Id.*, 7:59-60.

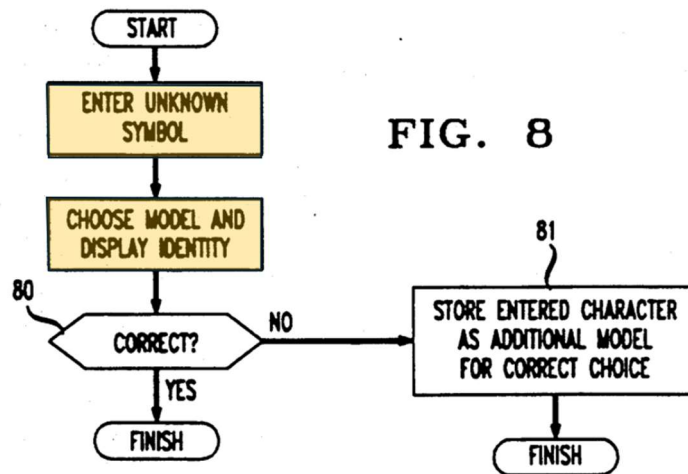


EX1005, FIGs. 2 and 4 (annotated).

75. With reference to Figure 8, *Sinden* further discloses a “training mode” in which “the invention can be structured to acquire additional models if the originals are not sufficient.” *Id.*, 8:3-8, FIG. 8. A person having ordinary skill in

the art would have understood *Sinden* to disclose that the training mode method shown in Figure 8 builds on the method disclosed in Figures 2 and 4 without repeating all the steps of Figures 2 and 4 again. In particular, *Sinden* states that “an unknown symbol is entered and the closest model symbol to the unknown is chosen using the method of the invention described above [with respect to Figures 2 and 4] and the choice is displayed to the person training the system.” *Id.*, 8:8-12.

76. The trainer can then indicate “whether or not the choice was correct, and, if incorrect, what the correct choice is.” *Id.*, 8:13-14. “Then, as indicated by block 81, the system stores the sample vector for the unknown symbol entered as an additional model for the correct choice. Such a training mode can be continued until the performance of the system is satisfactory.” *Id.*, 8:15-19.



Sinden (EX1005), FIG. 8 (annotated)

3. *Fujisaki*

77. *Fujisaki* is titled “On-line Handwriting Recognition Using a Prototype Confusability Dialog.” EX1006, (54).

United States Patent [19]		US0531500/A	
Fujisaki et al.		[11] Patent Number:	5,315,667
		[45] Date of Patent:	May 24, 1994
[54] ON-LINE HANDWRITING RECOGNITION USING A PROTOTYPE CONFUSABILITY DIALOG		[56] References Cited	
		U.S. PATENT DOCUMENTS	
[75] Inventors: Tetsunosuke Fujisaki, Armonk; Joonki Kim, White Plains; George J. Leibman, Mt. Kisco; Charles C. Tappert, Ossining, all of N.Y.		4,672,677 6/1987 Yamakawa 382/13 4,860,372 8/1989 Kuzunuki et al. 382/13 4,914,709 4/1990 Rudak 382/57 5,150,424 9/1992 Aguro 382/13	
[73] Assignee: International Business Machines Corporation, Armonk, N.Y.		<i>Primary Examiner</i> —Yon J. Couso <i>Attorney, Agent, or Firm</i> —Jack M. Arnold; Marc D. Schechter	

Fujisaki (EX1006), Cover (annotated)

78. *Fujisaki* discloses “a procedure for interactive editing of prototypes that are close to each other in prototype space” for use in a “training program.” *Id.*, 4:8-10; *see also id.*, 4:21-23.

This invention is directed to a procedure for interactive editing of prototypes that are close to each other in prototype space. This procedure improves the separation of prototypes and increases recognition accuracy. On-line recognition of handwriting by prototype matching is optimal when there is a minimum of prototype pairs whose similarity leads to recognition confusion. Stand-alone prototype editors allowed unrestricted deletion of prototypes. However, unconstrained user actions can lower recognition accuracy, since “good” prototypes could be deleted. Prototype set modification according to this invention is an improvement over the

previous one in several respects. First, it is incorporated into a handwriting training program which creates prototypes and then performs recognition using these prototypes. Whenever unknown writing is misrecognized, this invention can be invoked (a) to show the writer the reason for the misrecognition, i.e., the matching prototype whose label differs from the intended character, and (b) to present action choices. Second, in this invention the possible actions are limited by the user's own level of knowledge. The only prototypes he or she is aware of are those causing confusion.

Id., 4:8-30.

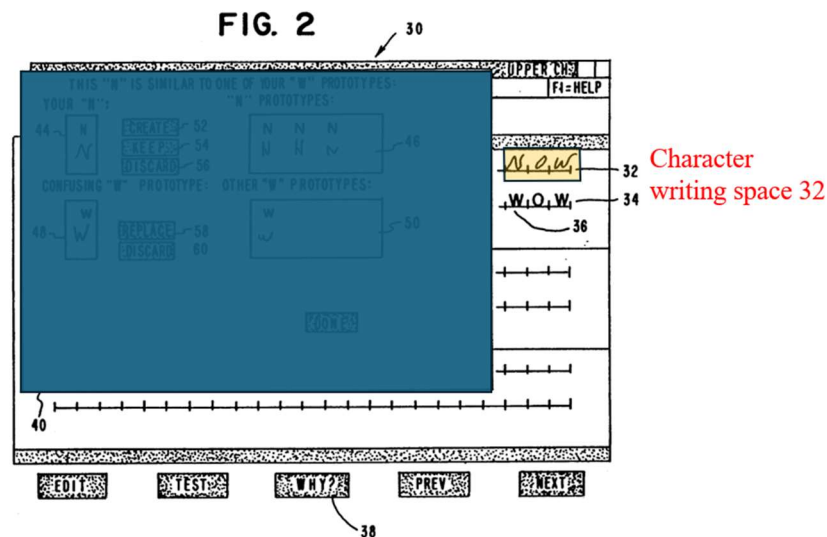
79. As background, *Fujisaki* explains that many on-line handwriting recognition systems use “curve matching methods to match an unknown character against prototype (template) characters.” *Id.*, 1:11-13. *Fujisaki*’s prototypes are akin to *Sinden*’s “model symbols” and the “templates” described in the ’334 patent. Optimal recognition is achieved “when there is a minimum of prototype pairs whose similarity leads to recognition confusion.” *Id.*, 4:12-15.

80. *Fujisaki* explains that although prior art prototype editors “allowed unrestricted deletion of prototypes,” “unconstrained user actions can lower recognition accuracy” because “‘good’ prototypes could be deleted.” *Id.*, 4:13-18. *Fujisaki* therefore teaches a technique for when the system misrecognizes the user’s handwriting, “(a) to show the writer the reason for the misrecognition, i.e., the matching prototype whose label differs from the intended character, and (b) to

present action choices.” *Id.*, 4:25-27. In this way, the user can be made aware of the prototypes causing the system’s confusion and take a more informed corrective action. *Id.*, 4:28-30.

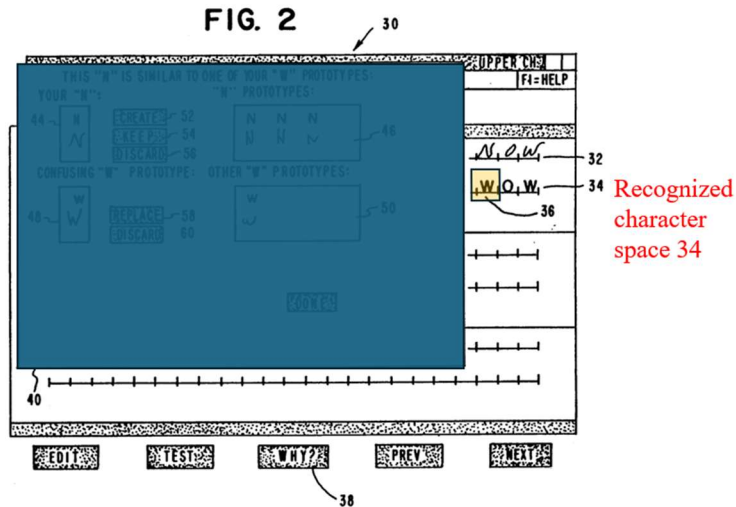
81. The system receives handwritten symbols using “a handwriting transducer comprised of an integrated electronic tablet and display 12 having a writing implement, such as a stylus 14.” *Id.*, 4:34-36; *see also id.*, 5:21-29, FIG. 1. Figure 2 shows a diagram of the face 30 of electronic tablet and display 12 and an exemplary use case or scenario to illustrate how its invention works. *Id.*, 5:25-27.

82. First, *Fujisaki* explains that the user will write “an unknown writing such as ‘now’ in the character writing space 32.” *Id.*, 5:30-31.



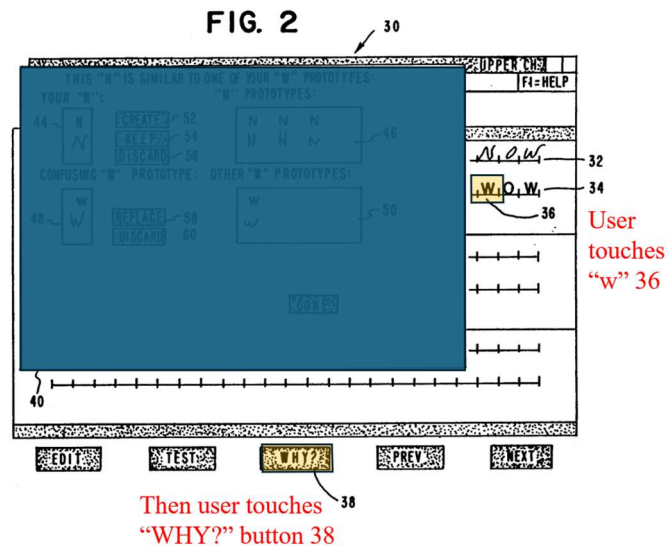
Fujisaki (EX1006), FIG. 2 (annotated)

83. Then, the system may misrecognize the unknown writing as “wow,” as shown in “recognized character space 34.” *Id.*, 5:31-33.



Fujisaki (EX1006), FIG. 2 (annotated)

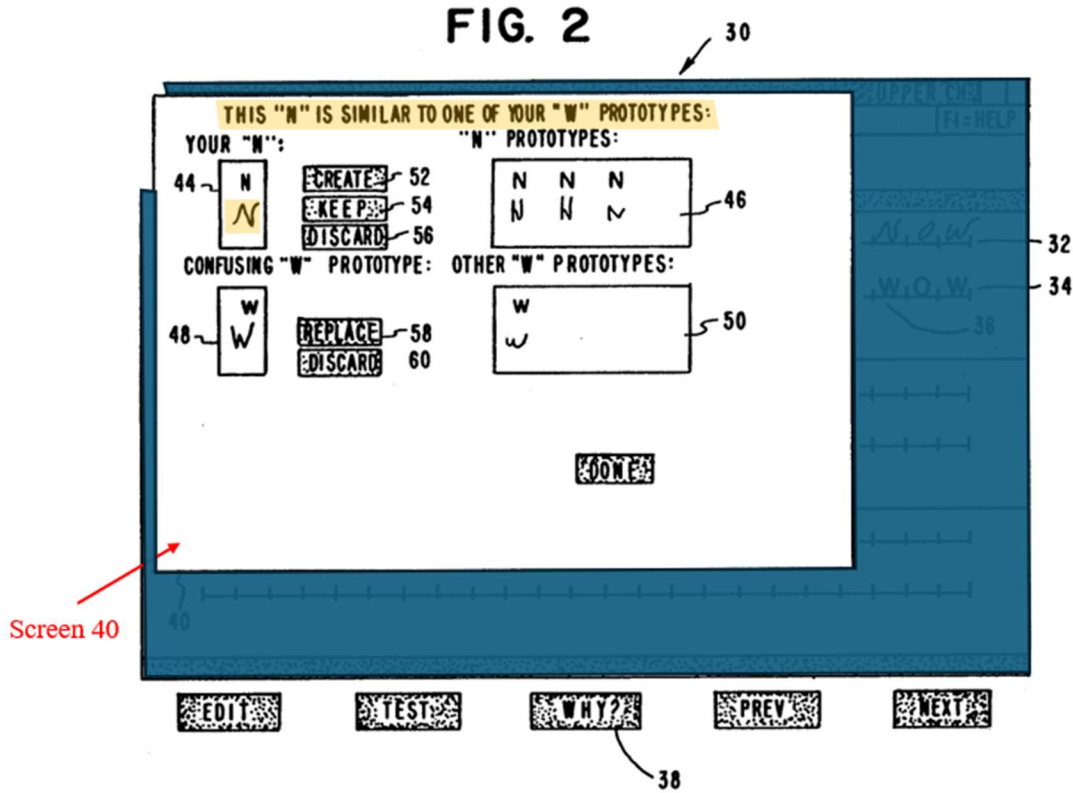
84. “The user then utilizes the stylus 14 ... to touch the ‘w’ 36 which is incorrect, and then touch[] the ‘WHY?’ button 38 to determine the cause of the error.” *Id.*, 5:33-36.



Fujisaki (EX1006), FIG. 2 (annotated)

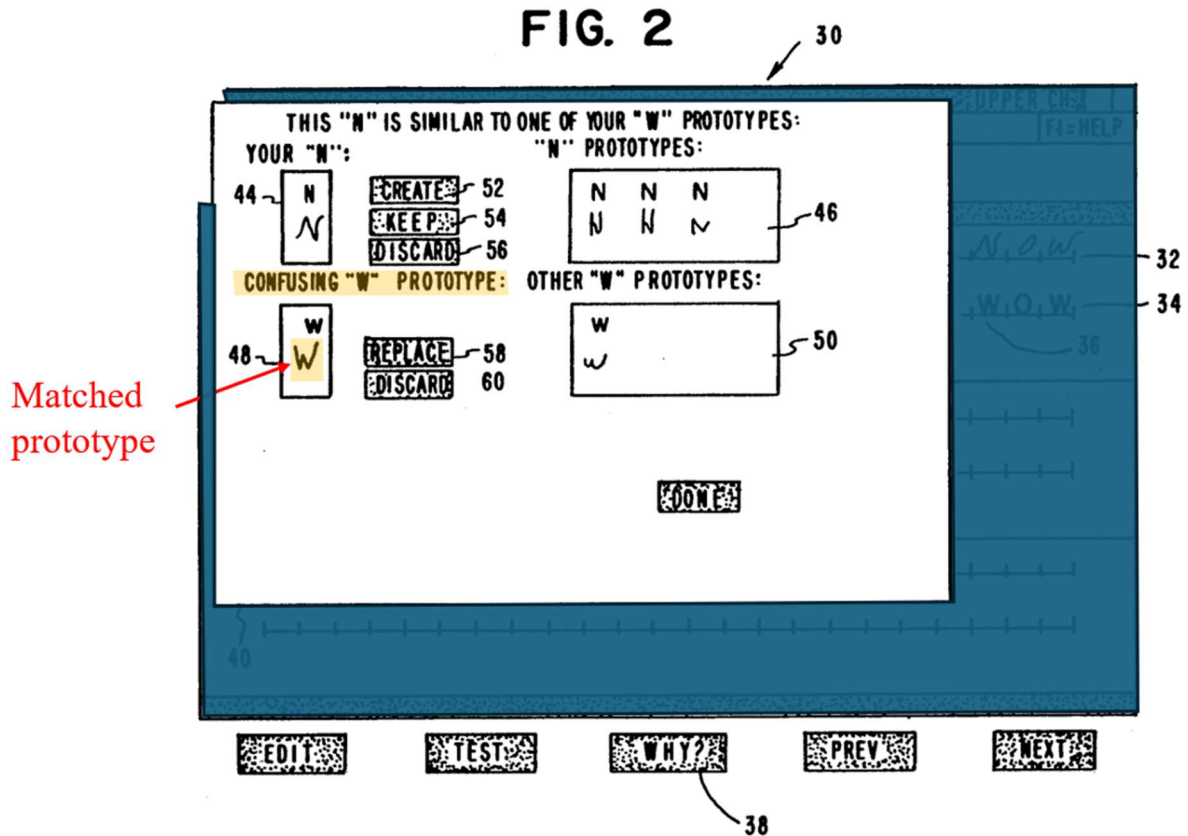
85. Then, screen 40 appears. *Id.*, 5:36-37. The cause of the error in recognition is indicated by sentence 42: “This ‘n’ is similar to one of your ‘w’

prototypes”. *Id.*, 5:38-39. *Fujisaki* states that “[t]he misrecognized writing is redrawn in box 44 with the prompted (intended) label n.” *Id.*, 5:40-41.



Fujisaki (EX1006), FIG. 2 (annotated)

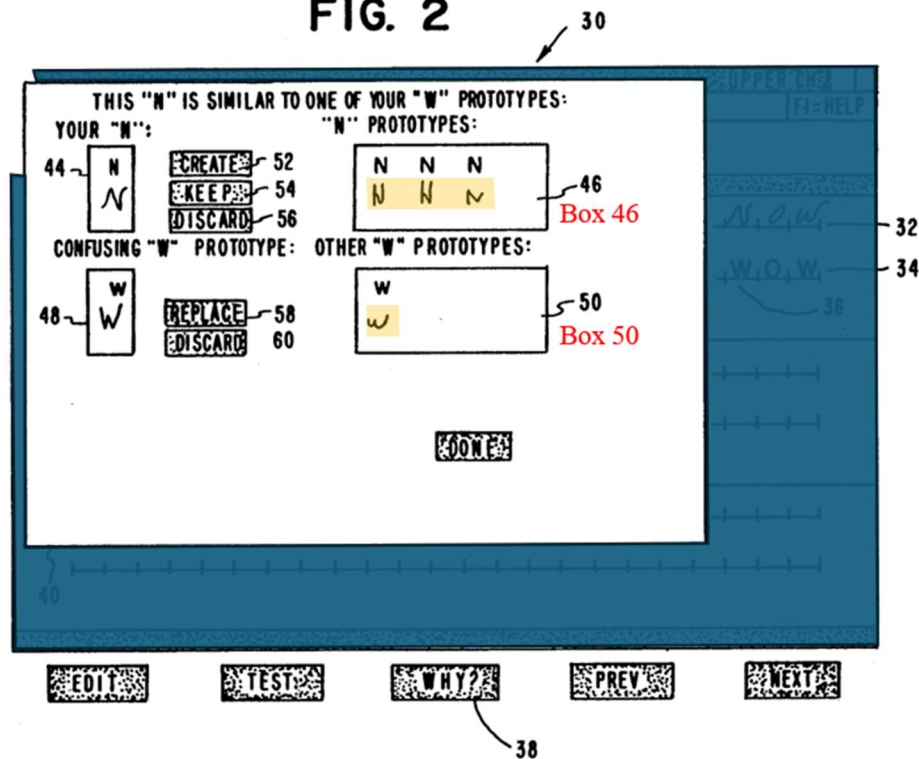
86. “The matched prototype (with unintended label w) is shown in box 48; other prototypes for this (unintended) label w are shown in box 50. The user sees the similarity between the unknown prototype and matching prototype and can decide how to alter the prototype set to prevent this confusion from repeating.” *Id.*, 5:43-48.



Fujisaki (EX1006), FIG. 2 (annotated)

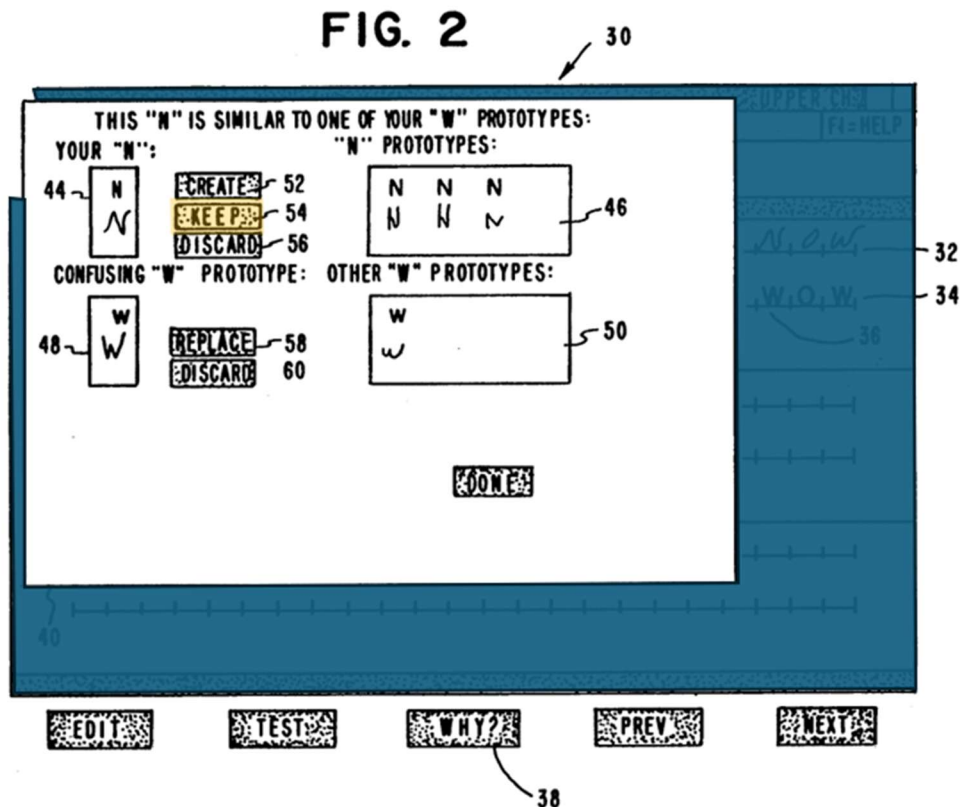
87. *Fujisaki* further discloses that “existing prototypes for n are shown in box 46.” *Id.*, 5:41-42, FIG. 2 (boxes 44, 46). Similarly, other prototypes for the (unintended) label w are shown in box 50. *Id.*, 5:43-45, FIG. 2 (boxes 48, 50).

FIG. 2



Fujisaki (EX1006), FIG. 2 (annotated)

88. The user of *Fujisaki*'s system can take various actions with respect to the intended (correct) label n, and with respect to the unintended (incorrect) label w. *Id.*, 5:48-50. For example, the user can press the "KEEP" button 54, which "causes the new writing of n shown in box 44 to become a prototype for the intended label, in the event that the user deems it to be typical. This resolves the confusion since the new prototype will be the closest match to the unknown, being equal to it." *Id.*, 5:63-68.



Fujisaki (EX1006), FIG. 2 (annotated)

4. *Collins*

89. *Collins* is titled “Method and Apparatus for Storing and Rapidly Displaying Graphic Data.” EX1007, (54).

United States Patent [19]		[11] Patent Number:	5,926,567
Collins et al.		[45] Date of Patent:	Jul. 20, 1999
[54] METHOD AND APPARATUS FOR STORING AND RAPIDLY DISPLAYING GRAPHIC DATA			
[75] Inventors: Roger S. Collins, Novato; John L. Friend, Pleasanton, both of Calif.		5,363,138	11/1994 Hayashi 348/390
		5,386,504	1/1995 Yoda et al. 345/340
		5,430,811	7/1995 Fukushima 382/254
		5,432,871	7/1995 Novik 382/232
		5,434,928	7/1995 Wagner 382/187
		5,555,322	9/1996 Terai 382/232
		5,634,095	5/1997 Wang et al. 345/340
[73] Assignee: Compaq Computer Corporation, Houston, Tex.		5,844,569	12/1998 Eisler et al. 345/433

EX1007, Cover (annotated)

90. *Collins* “relates to the field of formatting handwritten data displayed on computer systems” (EX1007 at 1:11-12) and discloses “a method and apparatus for storing and rapidly yet recognizably displaying graphic data” (EX1007 at Abstract).

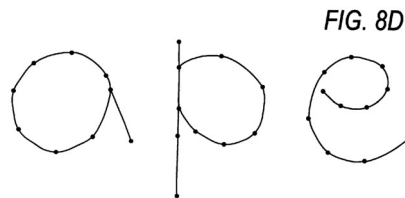
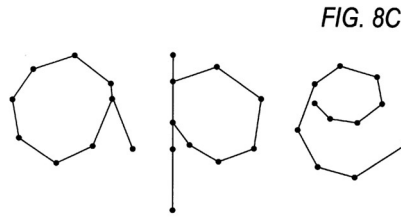
91. As background, *Collins* discloses that, “[g]enerally, a pen-based computer system captures digital ink in the form of many polylines.” *Id.*, 1:57-58. “The system samples points along [] each handwritten stroke or polyline at a predetermined sampling frequency. Those points represent the inputted graphic data and are digitally stored in memory.” *Id.*, 1:66-2:2. “The system derives an image of the graphic data by connecting the stored points with line segments. Thus, each polyline is a collection of the line segments connecting the stored points.” *Id.*, 2:2-5.

92. The problem with the prior art “is the amount of time that is typically required for the system to display, upon the user’s prompt, the digital ink representing the graphic data. Generally, displaying the ink can take several seconds.” *Id.*, 2:19-23. *Collins* notes that some systems draw “into an off-screen bitmap, and then display the bitmap,” and “[t]hese methods and devices can accommodate ‘instant’ screen updates, but they still generally require several seconds to create a bitmap representing the graphic data.” *Id.*, 2:42-46. Thus, the prior art systems are not well suited for allowing a user of a pen-based system to

glance through data fields on the system's display as one would typically flip through pages in an actual paper notebook. *Id.*, 2:48-52.

93. In view of these problems, it is *Collins*' objective "to display pages in a recognizable fashion despite using approximate images in a rapid display 'fast-flipping' mode quickly rendering each page upon the user's command." *Id.*, 3:7-10. In sum, *Collins* teaches reducing the set of sample points that are stored by the system so that display can occur more rapidly. *Id.*, 3:35-40 ("Reducing the number of points to be retained facilitates efficient data storage as well as rapid display. Yet, the system can still render and display a recognizable image representing the graphic data based only on the derived set of retained points—without the system ever having to store more points than just the retained points.").

94. *Collins* teaches that the system can initially draw an "approximate rendition" and then apply smoothing techniques to draw a "fully rendered" form. *Id.*, 3:21-29. In Figure 8C, *Collins* shows an "approximate rendition being displayed is the result of simple straight-line connections between the retained points." *Id.*, 13:65-14:1. In Figure 8D, *Collins* shows the fully rendered form of the handwritten word "ape." *Id.*, 14:6-7. Application of smoothing techniques results in a fully rendered form that more closely matches the original curvature of the handwritten graphic data. *Id.*



Collins (EX1007), FIGs. 8C and 8D

95. *Collins* further teaches that its system “achieves its speed when ‘flipping pages’ of graphic data by initially rendering the partial bitmap image of a selected page of graphic data. The system then takes any existing machine idle time to perform additional rendering.” *Id.*, 7:25-29. “Depending on the availability of machine idle time, the system prepares renditions of both the next and the prior pages of graphic data off-screen, so that they are ready to be displayed as well. The system also renders a full bitmap image of the graphic data one polyline at a time to prepare a full bitmap image of the current page of graphic data for displaying.” *Id.*, 7:30-35.

96. “Given sufficient idle time, the system renders bitmaps in the following order of decreasing priority: (1) a reduced bitmap of the current page; (2) a reduced bitmap of the next page; (3) a reduced bitmap of the prior page; (4) a full

bitmap of the current page; (5) a full bitmap of the next page; and (6) a full bitmap of the prior page.” *Id.*, 7:37-42.

Thus, for example, if the user flips to the next page after the full bitmap of the next page is rendered (assume that the system has completed rendering for priority levels 1 through 5), then:

(a) the former next page becomes the new current page and the former current page becomes the new prior page;

(b) the full bitmap of the new current page (former next page) is displayed (having already been rendered for the former next page); and

(c) the system resumes rendering from the top of the priority chain--here, the systems saves processing time at new priority levels 1, 3, 4, and 6 because it has already rendered a reduced bitmap for the new current page (former next page), a reduced bitmap for the new prior page (former current page), a full bitmap for the new current page (former next page), and a full bitmap for the new prior page (former current page).

Id., 8:7-24.

5. *Sklarew*

97. *Sklarew* is titled “Handwritten Keyboardless Entry Computer System.” EX1008, (54).

98. *Sklarew* is discussed in the background section of Fujisaki:

U.S. Pat. No. 4,972,496 to Sklarew discloses a keyboardless entry computer system which includes a transparent input screen that generates positional information when contacted by a stylus, and a

display screen mounted physically below the input screen such that a character that is displayed can be seen below the input screen. The system includes a computer that has been programmed to compile the positional information into Strokes, to calculate Stroke characteristics, and then compare the Stroke characteristics with those stored in a database in order to recognize the symbol drawn by the stylus. Key features of the system are: (1) transparent position sensing subsystem; (2) underlying display on which to mimic drawing of sensed positions and to show characters or symbols; (3) means to convert sensed positions first into plotted Points and then into recognized characters or symbols; and (4) means to “learn” to associate sensed input positions with a character or symbol.

EX1006, 3:29-47.

99. *Sklarew* relates to “a keyboardless input system to a computer” (EX1008, 1:25-28), “which has the ability to recognize and display Handwritten Symbols and cause the computer to display Font Symbols” (EX1008, 3:15-20). *Sklarew* discloses establishing a database that stores the correspondence between Handwritten Symbols and font symbols.

FIG. 10 is a top plan view of a screen illustrating the “initializing” of the database for Handwritten Symbols.

Id., 5:35-36.

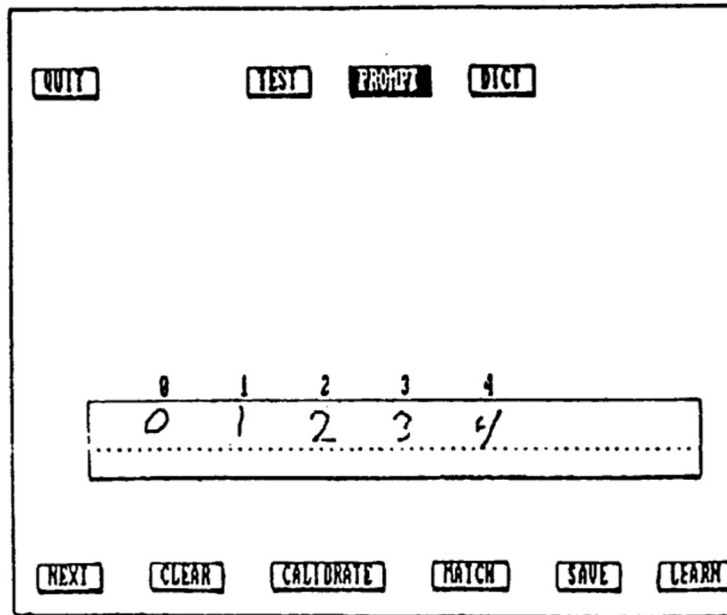


Fig. 10

Sklarew (EX1008), FIG. 10

1. A handwritten symbol recognition apparatus comprising:
 - a display screen;
 - hand-held means for use by a user to write or draw a handwritten symbol on or over at least a portion of the display screen;
 - a digitizing means for digitizing the handwritten symbol to enable evaluation of a characteristic of the handwritten symbol;
 - a database for storing a characteristic of a handwritten symbol previously written or drawn by an individual user to correspond to a given font symbol or command symbol; and***
 - a processor coupled to the digitizing means and the database for comparing a characteristic of the handwritten symbol with the characteristic of the previously written or drawn handwritten symbol stored in the database and, if the comparison is successful,

identifying the handwritten symbol as corresponding to the given font symbol or command symbol.

EX1008, 33:56-34:7 (claim 1)

100. “For example, if using the Roman alphabet, the ... twenty-six letters of the alphabet and the numerals from 0 to 9 would be inserted into the database.”

Id., 11:5-8. The computer will also “store a suitable array of Font Symbols for conversion of the Handwritten Symbols.” *Id.*, 11:12-14.

101. *Sklarew* explains that, in operation, the user’s input is recorded into strokes and compared with “previously entered strokes accumulated into a database, and determines [if] the Stroke is represented by a symbol in the database.” *Id.*, 13:2-5. “If a match is found (if the Font Symbol represented by the Strokes is recognized), as indicated in decision diamond 84, microprocessor 50 (FIG. 4) causes the symbol to be sent to display screen 20 (FIG. 4) as indicated in processing box 86.” *Id.*, 13:5-9.

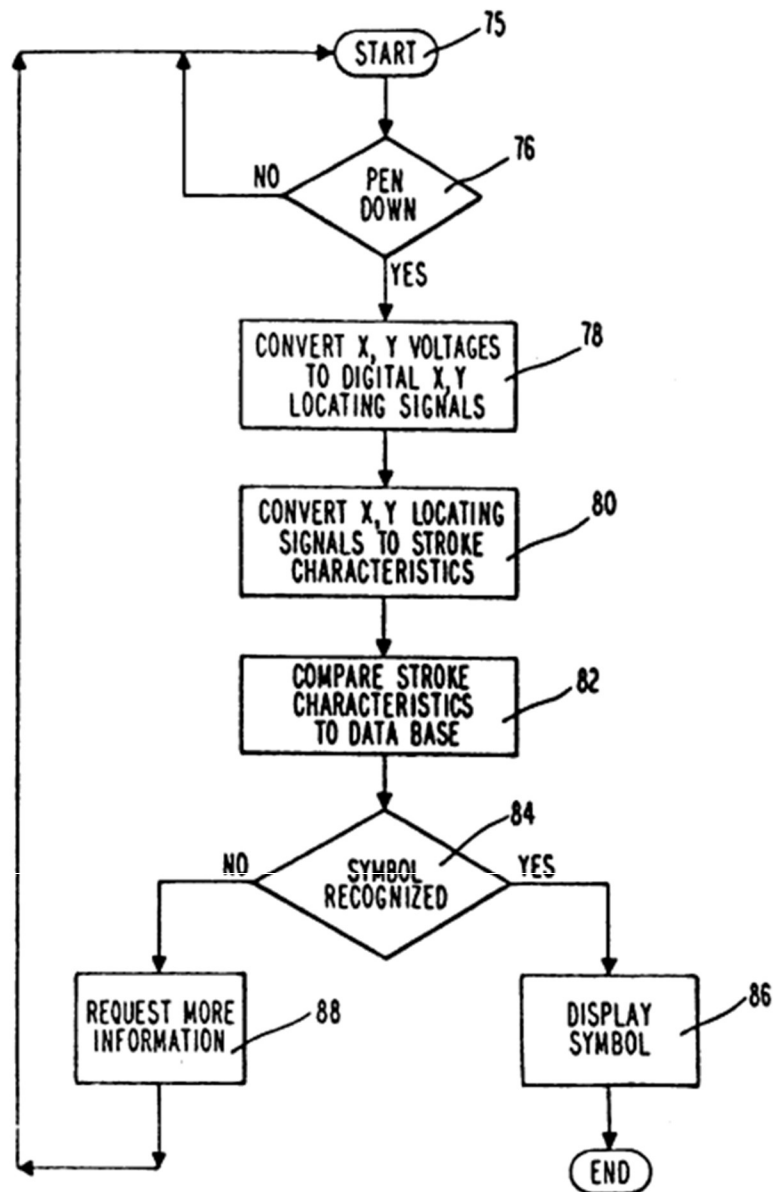


Fig. 5

Sklarew (EX1008), FIG. 5

IX. LEVEL OF ORDINARY SKILL IN THE ART

102. I have been informed and understand that, in the context of an invalidity analysis, a person having ordinary skill in the art is a hypothetical person who looks to prior art at the time of the invention. I further understand that the

factors that may be considered in determining the level of ordinary skill include: (1) the problems encountered in the art; (2) the prior art solutions to the problems encountered in the art; (3) the rapidity of innovation; (4) the sophistication of the technology; and (5) the education level of active workers in the field. I understand that these factors need not all be considered for the analysis and that one or more of these factors may control.

103. I was asked to provide my opinion on the level of one of ordinary skill in the art with respect to the alleged invention of the '334 patent in August 2002. Based on my consideration of the factors above, I believe a person of ordinary skill in the art would have had would have had at least a Bachelor's of Science Degree (or equivalent) in an academic area emphasizing computer science, computer engineering, or a related technical field, and about two years of experience in machine learning, pattern recognition, or related subjects. A greater amount of education could compensate for fewer years of work experience, and vice versa.

104. As of August 16, 2002, I met, and in fact exceeded, the qualifications of a person of ordinary skill in the art. To be clear, all of my opinions in this declaration are from the perspective of one of ordinary skill in the art as I have defined it here during the relevant timeframe.

X. CLAIM CONSTRUCTION

105. I am informed that the inclusion of the term “means” in a claim element that recites a function creates a presumption that the claim covers the corresponding structure, material, or acts described in the specification for performing the claimed function, as well as the equivalent such structures, materials, or acts. I am informed that this is commonly referred to as a means-plus-function claim limitation. In this way, the term “means” is essentially a generic reference for the corresponding structure disclosed in the specification. The limitation does not cover every conceivable means of performing the recited function, but only the structure disclosed in the specification a performing the function, and its equivalents. I understand that the presumption may be rebutted in certain circumstances. For example, if the claim does not recite any function associated with the claimed “means,” then the presumption may not apply.

106. I am informed that the first step in construing a means-plus-function limitation is to identify the function recited in the claim. The next step is to identify the corresponding structure set forth in the written description that performs the particular function set forth in the claim. As to the first step, identification of whether a function has been specified to perform the claim limitation relies primarily on the claim language itself.

107. Here, claims 1 and 15 of the '334 patent recite “detection means for detecting entry of a handwritten symbol.”

1. A method performed by a handwriting recognition device for presenting a recognized handwritten symbol, the recognition device having a processor and detection means for detecting entry of a handwritten symbol, the method comprising the steps of:

detecting, by the detection means, a handwritten pattern that is entered by a user,

recognizing, by the processor, the detected handwritten pattern, wherein said step of recognizing comprises:

comparing the handwritten pattern to a plurality of templates, wherein each of the plurality of templates represents at least one of a plurality of handwriting symbol patterns of handwritten ways of hand writing symbols, and

returning a best template selected from the plurality of templates that represents one of the plurality of handwriting symbol patterns as a best handwriting symbol pattern which, according to a predefined rule, is most similar to the handwritten pattern, wherein at least two of the plurality of templates comprise different ones of the plurality of handwriting symbol patterns which represent different handwritten ways of handwriting a single symbol; and

presenting the best handwriting symbol pattern of the best template.

EX1001, Claim 1 (annotated)

15. A method performed by a handwriting recognition device for sequentially presenting a plurality of recognized handwritten symbols, the recognition device having a processor and detection means for detecting entry of a handwritten symbol, the method comprising for each handwritten pattern the steps of:

detecting, by the detection means, the handwritten pattern, recognizing, by the processor, the detected handwritten pattern, wherein said step of recognizing comprises:

comparing the handwritten pattern to a plurality of templates, wherein each of the plurality of templates represents at least one of a plurality of handwriting symbol patterns of handwritten ways of hand writing symbols and

returning a best interpretation of the handwritten pattern, said best interpretation being based on one of the plurality of handwriting symbol patterns as a best handwriting symbol pattern of a best template selected from the plurality of templates that, according to a predefined rule, is most similar to the handwritten pattern, wherein at least two of the plurality of templates comprise different ones of the plurality of handwriting symbol patterns which represent different handwritten ways of handwriting a single symbol, and wherein the different ones of the plurality of handwriting symbol patterns of said at least two of the plurality of templates return different best interpretations when being most similar to the handwritten pattern; and

presenting the best interpretation.

EX1001, Claim 15 (annotated)

108. In my opinion, “detection means for detecting entry of a handwritten symbol” invokes the presumption that this claim term should be construed to cover the structure corresponding to the function of “detecting entry of a handwritten symbol” that is provided in the specification of the ’334 patent, as well as the equivalents of that structure. The claim language includes the term “means” and recites a function “for detecting entry of a handwritten symbol,” and there is no structure recited in the claim for performing that function.

109. In my opinion, the table below summarizes the corresponding structure disclosed in the '334 patent specification.

Limitation (Function Underlined)	Corresponding Structure
Claim 1: “detection means <u>for detecting entry of a handwritten symbol</u>” Claim 15: (same)	A screen sensitive to handwriting (EX1001, 6:33-36, 7:15-17, 7:35-37, 7:44-45, 7:65-66), a separate screen (<i>id.</i>, 6:41-42, 7:17-18), a pressure sensitive screen (<i>id.</i>, 8:45-48), a scanner for detecting patterns written on a piece of paper (<i>id.</i>, 6:42-43), an intelligent pen incorporating a camera for detection of a handwritten pattern (<i>id.</i>, 6:44-45), and equivalents thereof
Claim 1: “<u>detecting</u>, by the detection means, <u>a handwritten pattern that is entered by a user</u>” Claim 15: “<u>detecting</u>, by the detection means, <u>the handwritten pattern</u>”	

110. As noted in the above table, the '334 patent discloses a “pressure sensitive screen” as corresponding structure. Based on my background and experience, a person having ordinary skill in the art would have understood that a “pressure sensitive screen,” as that term is used in the '334 patent, refers to a structure with multiple sub-components including a pressure-sensitive digitizer and a display screen, such as a liquid crystal display (“LCD”). This is corroborated, for example, by U.S. Patent 6,215,476 (“*Depew*”). *Depew* was filed in October 10, 1997 and relates to an electromagnetic pen digitizer that is integrated into a flat panel display. EX1020 at 1:5-9.

111. As background, *Depew* explains that “[w]ithin a computer system, numerous techniques exist for inputting data and commands from a user to the

computer system. One technique is to use a special computer ‘pen’ for entering information via a display screen of a computer system.” *Id.*, 1:11-15. “A user moves the pen around on the screen, inputting or selecting information to be transmitted to the computer system.” *Id.*, 1:15-17. *Depew* provides a general overview of prior art technologies for inputting information to a computer system with a pen:

A variety of technologies exist for inputting information to a computer system using a pen. One such technique uses a special pen in conjunction with an electromagnetic pen digitizer that is placed behind the display unit of a computer system. By moving the pen around on the glass screen of a display unit, and/or by pressing the pen against the glass screen, the electromagnetic pen digitizer is able to receive information from the pen and transmit this information to the computer system. The pen is able to transmit information using electromagnetic signals that are picked up by antenna on the digitizer. One advantage of using an electromagnetic pen digitizer is that this technology is able to input information from the pen such as its X, Y coordinates on the display, pen button status, the tilt of the pen and the pressure of the pen on the glass screen. Such electromagnetic pen digitizers are especially useful in (but not limited to) flat panel display assemblies of a portable computer.

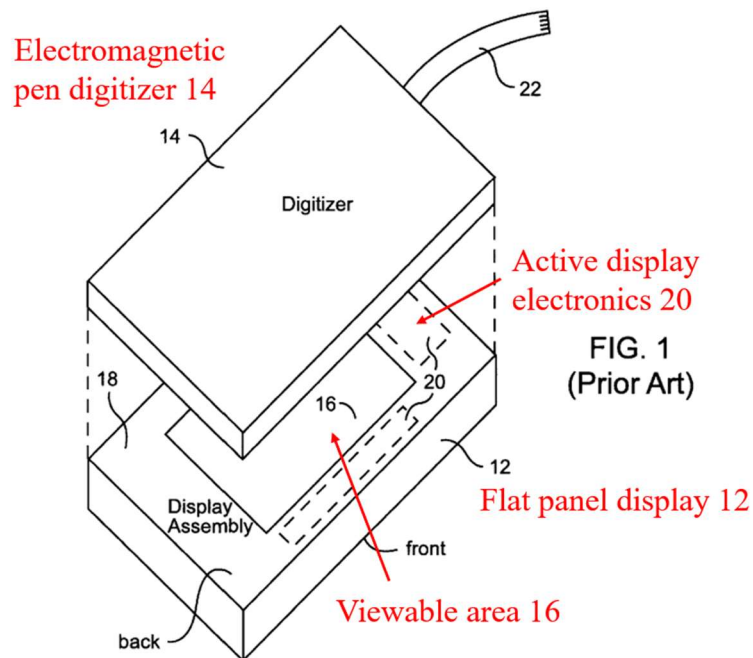
Id. at 1:18-35.

112. With reference to Figure 1, *Depew* shows a prior art electromagnetic pen digitizer. *Depew* explains that prior art digitizers “have been assembled with

flat panel displays simply by placing a discrete digitizer ... completely behind the flat panel display”:

As shown in FIG. 1, electromagnetic pen digitizers to date have been assembled with flat panel displays simply by placing a discrete digitizer implemented using standard printed circuit board technology completely behind the flat panel display (including being behind the diffuser backlight and behind the active display electronics). FIG. 1 shows a display unit 10 of a computer system having a flat panel display assembly 12 and an electromagnetic pen digitizer 14. Digitizer 14 is a standard electromagnetic pen digitizer. Display 12 includes viewable area 16 through which information is presented to the user and through which the user may input information, and an outside side area 18 that is not used for presenting or inputting information. In older generations of flat panel displays, side area 18 is relatively large compared to viewable area 16 and incorporates the active display electronics 20 that control the presentation of information on viewable area 16 of display 12.

Id., 1:36-52.

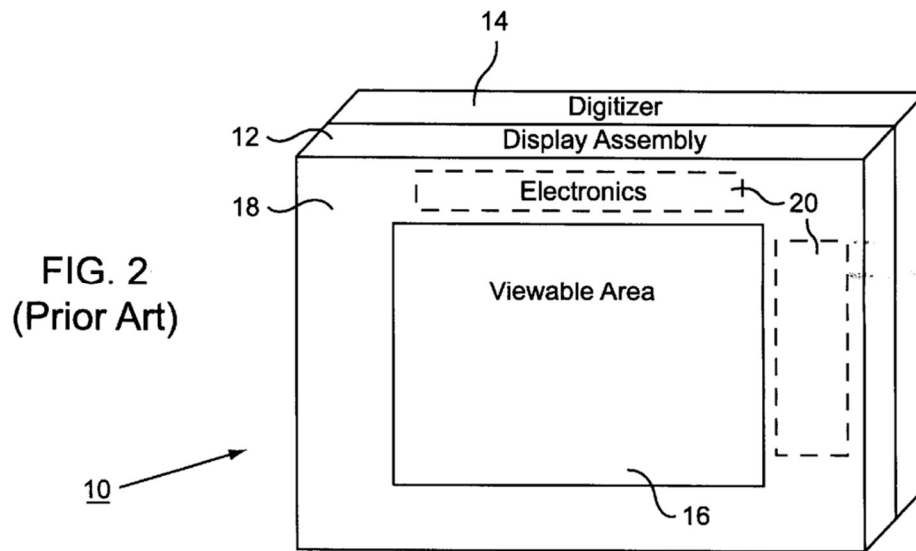


Depew (EX1020) at FIG. 1 (annotated)

113. *Depew* illustrates a different view of the digitizer of Figure 1 in Figure 2:

As can be seen in FIG. 2, active display electronics 20 are located in side area 18 outside of viewable area 16 of display 12. Thus, because side area 18 is relatively large compared to viewable area 16, electronics 20 are easily incorporated to the side of viewable area 16. Thus, electronics 20 do not interfere with the interaction between a special pen moving on viewable area 16 and electromagnetic pen digitizer 14 located behind display 12. In other words, having electronics 20 to the side of area 16 prevents electronics 20 from interfering with electromagnetic signals between the pen and the digitizer. Such a design for a display unit is workable, although viewable area 16 may be relatively small.

Id. 1:53-64.



Depew (EX1019) at FIG. 2

114. Based on my background and experience, a person having ordinary skill in the art would have understood that it is the pressure sensitive digitizer component of the “pressure sensitive screen” that detects the user’s input and not the display screen (e.g., LCD) component. Thus, a person having ordinary skill in the art would have understood that, although the ’334 patent refers to a “pressure sensitive screen” that performs the recited function, it is actually the pressure-sensitive digitizer component of the “pressure sensitive screen” that performs the recited function.

115. Accordingly, in my opinion, a person having ordinary skill in the art would have understood the ’334 patent to disclose that a pressure-sensitive digitizer is corresponding structure for the recited function.

116. Other than for the above term, I have given all the claim terms their plain and ordinary meaning, as would have been understood by a person having ordinary skill in the art at the time of the alleged invention, which I understand is August 16, 2002, having taken into consideration the language of the claims, the specification, and the prosecution history of record.

XI. SPECIFIC GROUNDS FOR CHALLENGE

117. In the sections below, I explain in detail how claims 1-4, 8-10, 15-16, 19-22, and 26-28 of the '334 patent are not patentable over the prior art. More particularly:

118. **Ground 1A** challenges claims 1, 2, 8-10, 15, 19, 20, and 26-28 as obvious over the combination of *Sinden* and *Fujisaki*.

119. **Ground 1B** challenges claims 3, 4, 21, and 22 as obvious over the combination of *Sinden*, *Fujisaki*, and *Collins*.

120. **Ground 2** challenges claims 15 and 16 as obvious over the combination of *Sinden*, *Fujisaki*, and *Sklarew*.³

³ To the extent my declaration refers to prior art references other than those recited in the above-listed grounds 1A, 1B, and 2, I am using such references as evidence supporting what I believe would have been known to a person of ordinary skill in the art at the time of the alleged invention, for example, about the state of the art and/or the benefits and advantages of certain design choices.

A. Ground 1A: *Sinden* in Combination with *Fujisaki* Renders Obvious Claims 1, 2, 8-10, 15, 19, 20, 26-28

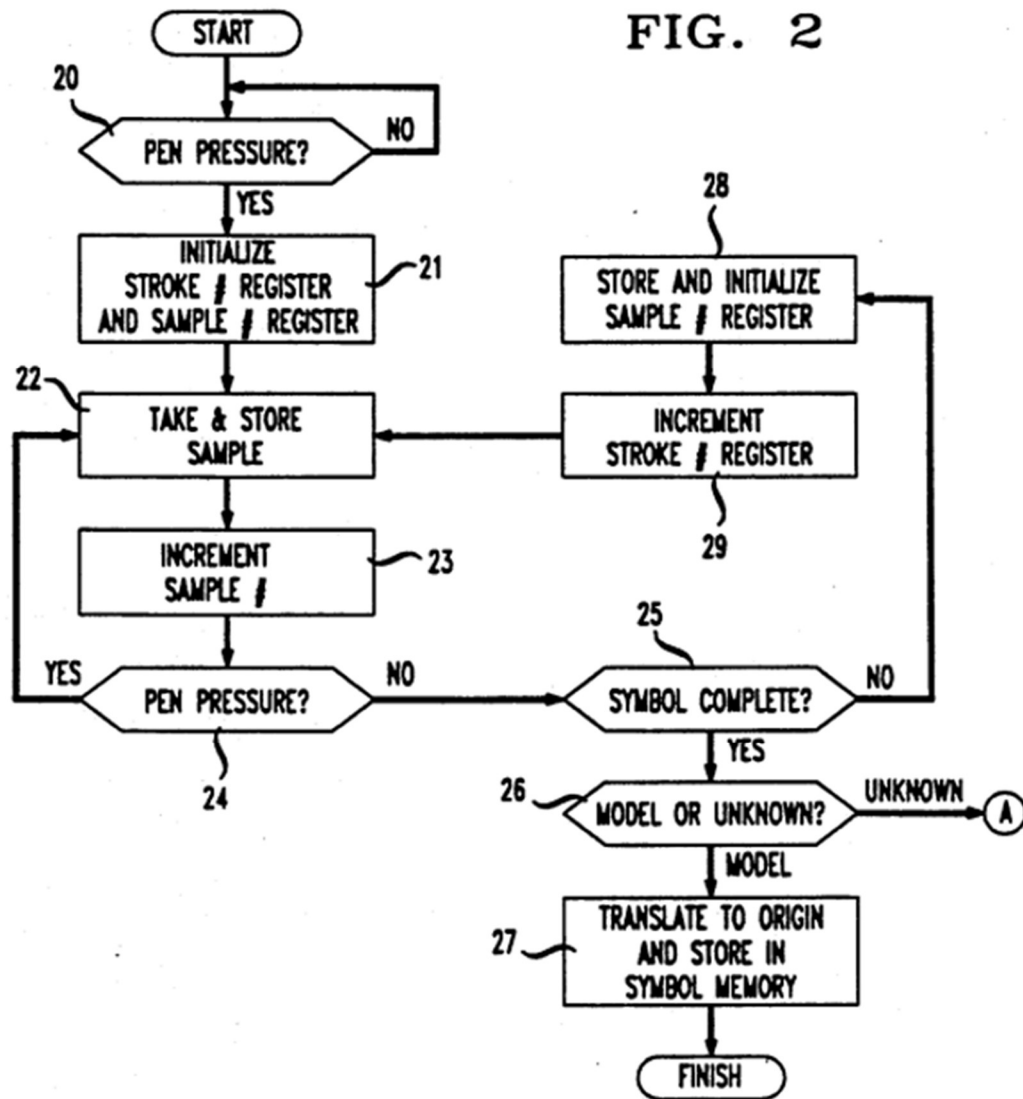
1. Claim 1

- a. 1[pre]: “A method performed by a handwriting recognition device for presenting a recognized handwritten symbol, the recognition device having a processor and detection means for detecting entry of a handwritten symbol, the method comprising the steps of:”**

121. I understand that “[a] method performed by a handwriting recognition device for presenting a recognized handwritten symbol, the recognition device having a processor and detection means for detecting entry of a handwritten symbol, the method comprising the steps of:” is the preamble to claim 1 of the ’334 patent. I have been asked to assume that the preamble is a claim limitation. Under that assumption, in my opinion, *Sinden* in combination with *Fujisaki* teaches “[a] method performed by a handwriting recognition device for presenting a recognized handwritten symbol, the recognition device having a processor and detection means for detecting entry of a handwritten symbol.”

122. As context, and as detailed in Section VIII.B.2, *Sinden* discloses a method with reference to Figure 8 that builds on the methods disclosed with reference to Figures 2 and 4 without restating all of the steps of the methods of Figures 2 and 4. EX1005, 8:8-12. Thus, although the analysis of the Challenged Claims focuses on *Sinden*’s method of Figure 8, the description of the methods of Figures 2 and 4 is cited to describe the overall method of Figure 8.

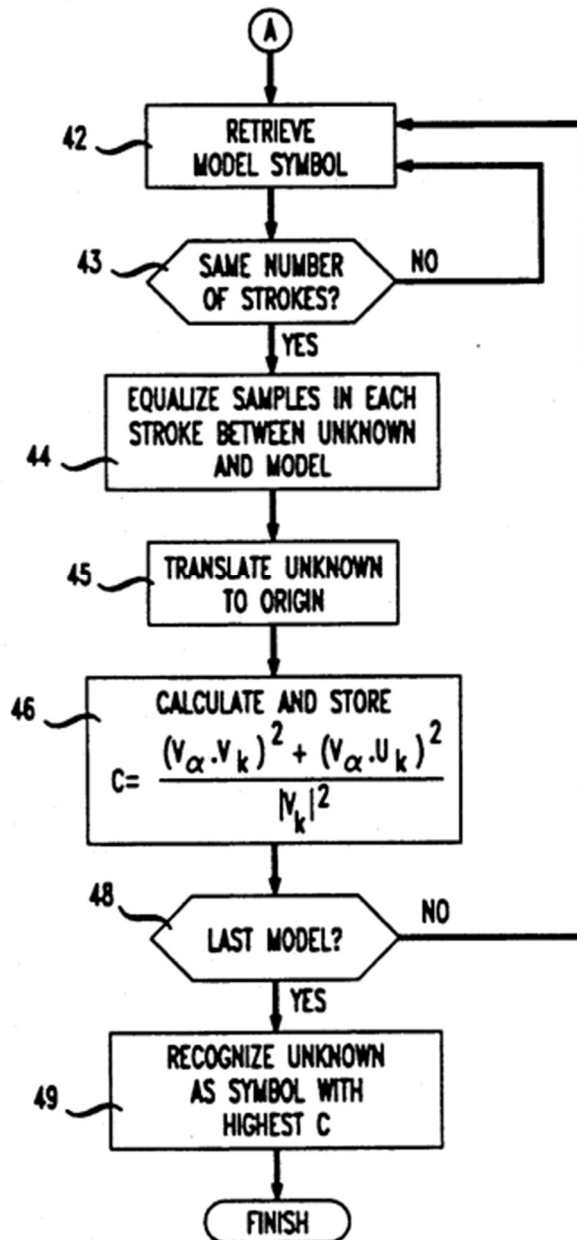
123. The method of Figure 2 shows “how samples of a handwritten symbol are recorded by the system of FIG. 1.” EX1005, 3:13-15. The handwritten symbol is either entered and stored as a model symbol or entered as an unknown symbol to be compared to previously entered model symbols. *Id.*, 3:59-64 (“Processor 12 can be either in the mode of accepting model symbols or in the mode of accepting unknown symbols. Referring again to FIG. 2, if the symbol being written is a model symbol, then as indicated by blocks 26 and 27, the samples for such symbol are stored in symbol memory 13 of processor 12.”), 4:32-34 (“If the symbol written is an unknown symbol, then as indicated at block 26 in FIG. 2, processor 12 proceeds with the steps shown in the flow chart of FIG. 4.”).



EX1005, FIG. 2

124. The method of Figure 4 shows “how the samples for an unknown symbol and the model symbols are compared to identify the unknown symbol.” *Id.*, 4:63-65.

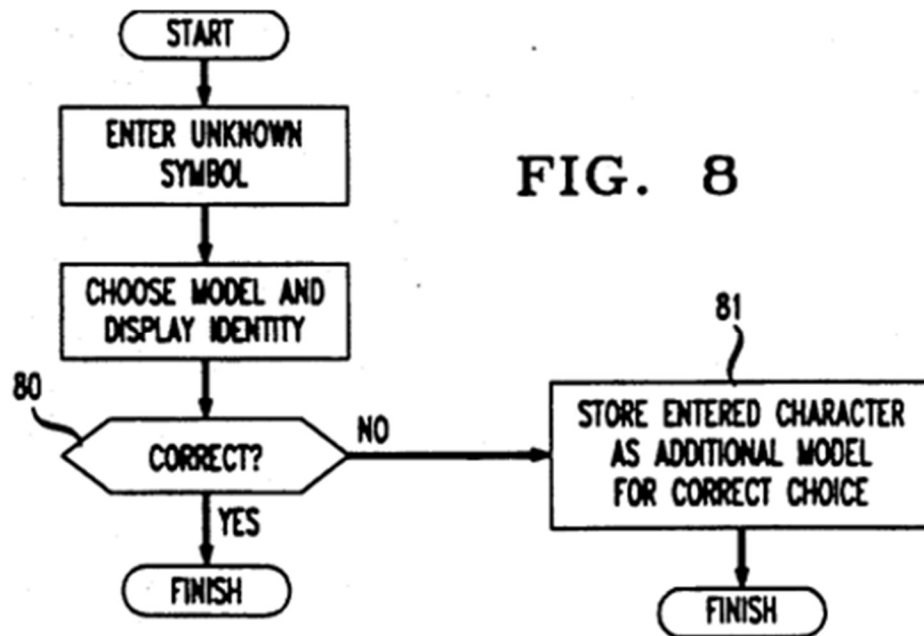
FIG. 4



EX1005, FIG. 4

125. The method of Figure 8 uses the methods of Figures 2 and 4 such that
 “an unknown symbol is entered and the closest model symbol to the unknown is

chosen using the method of the invention and the choice is displayed.” EX1005, 8:8-12, FIG. 8.



EX1005, FIG. 8

126. *Sinden*’s teaching is consistent with how the ’334 patent describes “[a] method ... for presenting a recognized handwritten symbol.” The ’334 patent discloses that “a handwritten pattern is entered by the user” and is “recognised by being compared with templates in a database.” *Id.*, 7:22-26. The comparison returns “a best template,” and “the pattern of the best template is presented.” *Id.*, 7:26-29, 7:34-35.

127. A person having ordinary skill in the art would have understood “presented” to include “displayed” because the ’334 patent describes presenting “on a screen,” and a person having ordinary skill in the art would have understood

that to present “on a screen” is to “display.” This is further corroborated by the Examiner’s Reasons for Allowance included in the Notice of Allowance discussed in Section VII, in which the Examiner stated that the prior art did not teach “presenting/displaying” the best handwriting symbol pattern of the best template.

Reasons for Allowance

[5] The following is an examiner’s statement of reasons for allowance:

Regarding **Claim 1**, while the prior art of record teaches Claim 1, Apr. 22, 2009 (see Office Action at p. 6-7, Jul. 14, 2009), the prior art of record does not teach wherein at least two of the plurality of templates comprise different ones of the plurality of handwriting symbol patterns which represent different handwritten ways of handwriting a single symbol.

The prior art of record compares users’ handwritten symbol patterns to either standard template font or one user’s personal template handwriting, but does not compare the users’ handwritten symbol patterns to a plurality of templates comprising different ones of the plurality of handwriting symbol patterns which represent different handwritten ways of handwriting a single symbol.

In addition, the prior art of record then does not teach **presenting/displaying** the best handwriting symbol pattern of the best template (a feature of Claims 1 and 33).

Claims 15, 33, and 34 allowable by analogy. Claims 2-14 and 16-32 allowable by dependency.

EX1004 at 587 (annotated)

128. In addition, the ’334 patent equates “displayed” items with a “presentation” of items. EX1001, 5:45-47 (“The alternative interpretations may be *displayed* directly or the user could request a *presentation* of alternative interpretations.”)

129. Moreover, in my opinion, and based on my background and experience, a person having ordinary skill in the art would have understood *Sinden* to teach that the closest model symbol (i.e., a “recognized handwritten symbol”) is displayed because *Sinden* states that “the choice,” i.e., “the closest model symbol” that was chosen, is displayed.

130. *Sinden* discloses that the system that implements the method of Figure 8 includes a “processor” and “digitizing tablet or pad.” EX1005, 2:44-47, 2:51-57, FIG. 1.

FIG. 1 is a block diagram of *a system for performing the invention*.

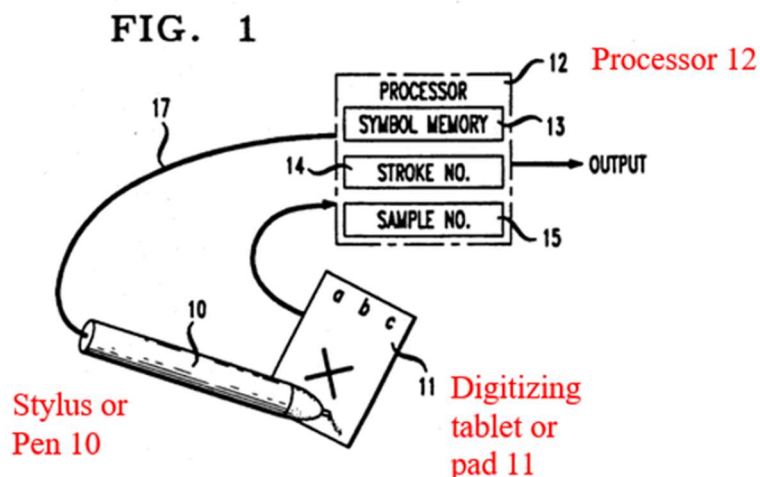
Symbols are written with stylus or pen 10 on digitizing tablet or pad 11. Pad 11 is capable of sensing the position of the tip of pen 10 on the surface of pad 11 as well as the presence of pen 10 on the pad.

Pad 11 is connected to processor 12. With some types of pads, pen 10 may also be connected to processor 12 as indicated by line 17.

EX1005, 2:50-57

FIG. 8 is a flow chart showing one method that *can be used by the system of the invention* system [sic] to strengthen its ability to recognize different versions of the same symbol.

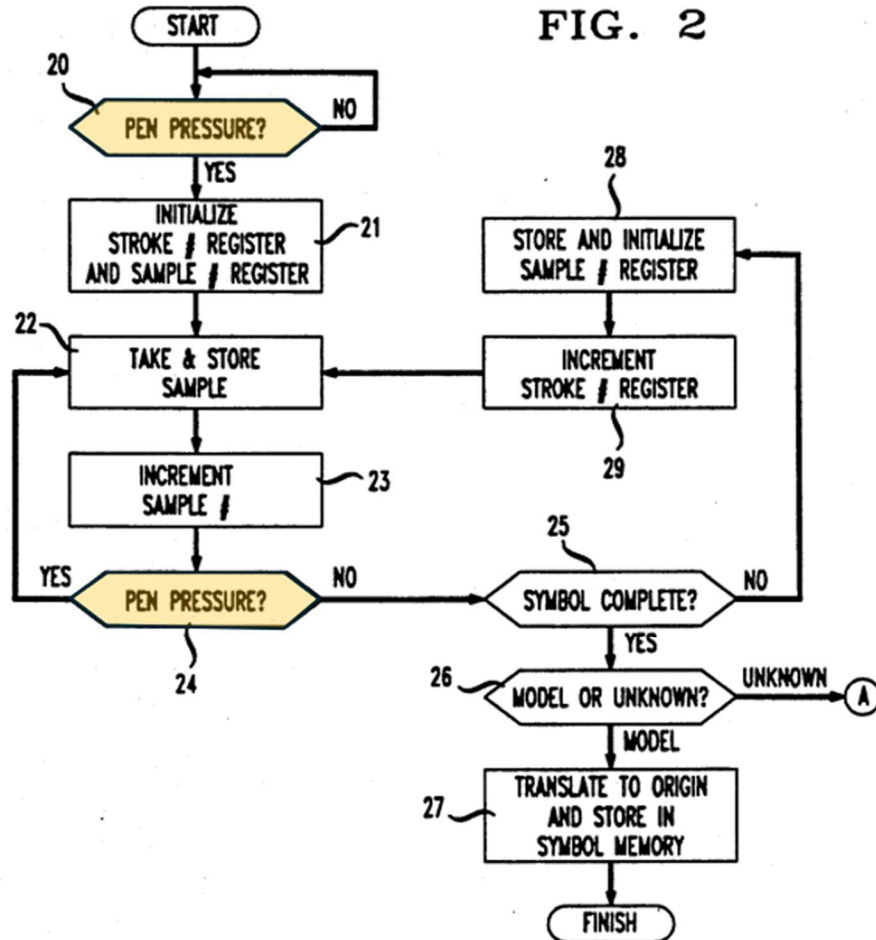
EX1005, 2:44-47



EX1005, FIG. 1 (annotated)

131. *Sinden* explains that handwritten symbols are written on the digitizing tablet or pad, where the tablet or pad are able to sense the presence and position of the stylus or pen on the pad. *Id.*, 2:50-54 (“Pad 11 is capable of sensing the position of the tip of pen 10 on the surface of pad 11 as well as the presence of pen 10 on the pad.”). *Sinden* further explains that the processor reacts to “pen pressure” as the “processor 12 waits until pen 10 touches pad 11.” *Id.*, 3:19-20, FIG. 2 (box 20, “Pen Pressure?”). Although *Sinden* initially refers to a “digitizing tablet or pad 11,” the specification later only refers to “pad 11.” *See e.g.*, EX1005, 2:55, 2:65. A person having ordinary skill in the art would have understood that *Sinden* uses the terms “digitizing tablet” and “pad” interchangeably, and that later references to “pad” also encompass “digitizing tablet.”

132. Samples are taken “until pen 10 is lifted from pad 11, as indicated by block 24.” *Id.*, 3:26-27, FIG. 2 (block 24, “Pen Pressure?”)



EX1005, FIG. 2 (annotated)

133. Because *Sinden* discloses that the handwritten symbol is recorded based on the detection of pen pressure on the digitizing tablet or pad 11, in my opinion, and based on my background and experience, a person having ordinary skill in the art would have understood *Sinden* to disclose that the digitizing tablet or pad 11 is “pressure sensitive” and that it detects entry of a handwritten symbol.

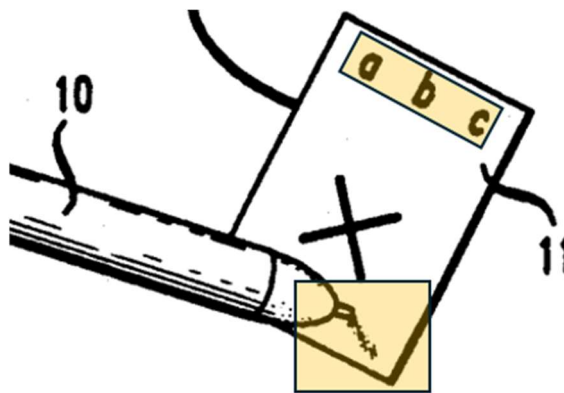
A person having ordinary skill in the art would have further understood that a pressure sensitive digitizing tablet includes a pressure sensitive digitizer because the digitizer is the component that detects and transduces the pen pressure. *See* Section X. As discussed in Section X, a person having ordinary skill in the art would have understood that a pressure-sensitive digitizer tablet is corresponding structure for the claimed “detection means.”

134. If Patent Owner argues or the Board otherwise finds that the corresponding structure for the claimed “detection means” does not include a pressure-sensitive digitizer, a person having ordinary skill in the art would have understood *Sinden* to disclose this limitation because a person having ordinary skill in the art would have understood that *Sinden* to disclose a “pressure-sensitive screen.”

135. As shown and annotated below, *Sinden*’s Figure 1 shows that the digitizing tablet or pad 11 displays letters and a trace of the user’s pen input. *Sinden*’s illustration of this functionality is consistent with description of the functionality attributed to the structure of a tablet digitizer that includes a display screen. This is corroborated, for example, by *Tappert I*, which described an IBM system with a “transparent tablet and LCD display” that “provide input and output on the same surface.” EX1015 at 14. “Electronic inking echos [*sic*] the path traced by the stylus and aids the user while writing.” *Id.*; *see also id.*, at 16 (“Electronic

ink is the instantaneous display of the trace of the motion of the stylus tip directly under the stylus. In a table-display system, it is the electronic equivalent of normal ink.”).

136. Although *Sinden* does not describe the display capabilities of the digitizing tablet or pad 11, a person having ordinary skill in the art would have understood that a such a tablet or pad that ***did not*** have display capabilities would not have the characteristics of *Sinden*’s digitizing tablet or pad illustrated in Figure 1. Moreover, *Sinden* describes a “display” functionality (EX1005, 8:8-12), and there is no other structure in *Sinden* besides the digitizing tablet or pad that would perform that function. Thus, in my opinion, a person having ordinary skill in the art would have understood *Sinden* to disclose that the digitizing tablet or pad 11 includes an integrated display screen. Accordingly, a person having ordinary skill in the art would have understood *Sinden* to disclose that the digitizing tablet or pad comprises a “pressure sensitive ***screen***.”



EX1005, FIG. 1 (excerpted and annotated)

137. If Patent Owner argues or the Board otherwise finds that *Sinden* does not literally disclose the corresponding structure of the claimed “detection means” because *Sinden* does not expressly disclose a “pressure sensitive screen,” then *Sinden*’s pressure-sensitive digitizing tablet or pad 11 is at least a structural equivalent. *Sinden*’s pressure-sensitive digitizing tablet or pad 11 performs the identical function (detecting entry of a handwritten symbol), in substantially the same way (by using a measure of pressure to detect the user drawing a handwritten symbol), to achieve the same result (a detected handwritten symbol).

138. If Patent Owner argues or the Board finds that *Sinden* does not disclose that its digitizing tablet or pad includes a display screen, it nevertheless would have been obvious to implement *Sinden*’s digitizing tablet or pad with a display screen in view of *Fujisaki*. In a similar handwriting recognition system, *Fujisaki* discloses “a handwriting transducer comprised of an integrated electronic tablet and display 12 having a writing implement, such as a stylus 14.” EX1006, 4:31-36. There were known design incentives to implementing a digitizing tablet with a screen as taught by *Fujisaki*, including the ability to provide the user feedback as he/she wrote on the screen to mimic ink on a page, and to make it so the user did not need to divert attention from the tablet to a separate screen to see what was being written. *See Tappert I* at 1 (explaining that renewed interest in on-line handwriting recognition was attributable to recent the hardware advance of

“combining tablets and flat displays” which “brings input and output into the same surface” and “permits the use of electronic ink, providing immediate feedback to the writer of the digitized writing. Electronic ink is the instantaneous display of the trace of the motion of the stylus tip directly under the stylus.”).

139. Thus, a person having ordinary skill in the art would have considered the combination to amount to use of a known technique (using a digitizer with an integrated display screen) to improve similar devices (*Sinden*’s system is similar to *Fujisaki*’s) in the same way (to provide a digitizing tablet with an integrated screen that provides feedback to the user while inputting handwriting). A POSITA also would have considered the combination to amount to following known design trend (integrating the digitizer and display screen) to achieve a predictable result (*Sinden*’s digitizing tablet with an integrated screen).

140. A person having ordinary skill in the art would have had a reasonable expectation of success in making the combination because it would have been within the skill of a person having ordinary skill in the art to modify *Sinden*’s system to implement its digitizing tablet with a display screen as taught by *Fujisaki*, as corroborated by *Fujisaki* itself, and because the technology had been available since the early 1990s.

141. A person having ordinary skill the art would have understood the *Sinden-Fujisaki* combination teaches *Sinden*’s digitizing tablet or pad with an

integrated display screen that records or detects a handwritten symbol using a measure of pressure (a “pressure sensitive screen”). If Patent Owner argues or the Board otherwise finds that the *Sinden-Fujisaki* does not literally disclose the corresponding structure of the claimed “detection means” because *Sinden-Fujisaki* does not expressly disclose a “pressure sensitive screen,” then the *Sinden-Fujisaki* pressure-sensitive digitizing tablet or pad with an integrated display screen is at least a structural equivalent as it performs the identical function (detecting entry of a handwritten symbol), in substantially the same way (by using a measure of pressure to detect the user drawing a handwritten symbol), to achieve the same result (a detected handwritten symbol).

142. Accordingly, a person having ordinary skill in the art would have understood *Sinden* in combination with *Fujisaki* to teach a system for performing a method including comparing an unknown handwritten symbol to handwritten model symbols to determine a closest match and displaying the closest model symbol (“[a] method performed by a handwriting recognition device for presenting a recognized handwritten symbol”), wherein the system includes a processor (“the recognition device having a processor”) and a digitizing tablet or pad with an integrated display that records a handwritten symbol based on sensing pen pressure (“and detection means for detecting entry of a handwritten symbol”).

b. 1[a]: “detecting, by the detection means, a handwritten pattern that is entered by a user;”

143. In my opinion, *Sinden* in combination with *Fujisaki* teaches “detecting, by the detection means, a handwritten pattern that is entered by a user.”

144. For the same reasons explained in Section XI.A.1.a that a person having ordinary skill in the art would have understood *Sinden* to disclose the claimed function in 1[pre], i.e., “detecting entry of a **handwritten symbol**,” and the corresponding structure of for the “detection means,” a person having ordinary skill in the art would have understood *Sinden* to disclose the claimed function of 1[a], i.e., “detecting ... **a handwritten pattern**” and the corresponding structure for “detection means” or its equivalent.

145. The ’334 patent explains that “a pattern is a specific way of writing a symbol, i.e. a pattern has a certain appearance.” EX1001, 3:57-59. Thus, a person having ordinary skill in the art would have understood that *Sinden*’s digitizing tablet or pad which records a handwritten symbol to also teach recording (i.e., detecting) a “handwritten pattern.”

146. Furthermore, *Sinden* generally discloses implementing its disclosure to be “used by an individual or a small number of users.” EX1005, 8:40-41. *Sinden* also discloses that the method of Figure 8 may be used by a “trainer.” *Id.*, 8:13. In my opinion, and based on my background and experience, a person having ordinary skill in the art would have understood a “trainer” to be a type of “user”

because trainers use the system, and the '334 patent does not draw any distinctions between “users” and “trainers.” Thus, in my opinion, a person having ordinary skill in the art would have understood would have understood *Sinden* to teach that it is a user that enters the handwritten symbol.

147. Accordingly, a person having ordinary skill in the art would have understood *Sinden* in combination with *Fujisaki* to teach recording a handwritten symbol (“detecting ... a handwritten pattern”) on a digitizing tablet or pad (“by the detection means”) entered using a pen by a user or trainer (“that is entered by a user”).

- c. *1[b]: “recognizing, by the processor, the detected handwritten pattern, wherein said step of recognizing comprises: comparing the handwritten pattern to a plurality of templates, wherein each of the plurality of templates represents at least one of a plurality of handwriting symbol patterns of handwritten ways of handwriting symbols, and returning a best template selected from the plurality of templates that represents one of the plurality of handwriting symbol patterns as a best handwriting symbol pattern which, according to a predefined rule, is most similar to the handwritten pattern, wherein at least two of the plurality of templates comprise different ones of the plurality of*

handwriting symbol patterns which represent different handwritten ways of hand writing a single symbol;

(i) “recognizing, by the processor, the detected handwritten pattern, wherein said step of recognizing comprises:”

148. In my opinion, *Sinden* in combination with *Fujisaki* teaches “recognizing, by the processor, the detected handwritten pattern.”

149. As detailed below in Sections XI.A.1.c(ii) and XI.A.1.c(iii), *Sinden* teaches, with reference to Figure 4, the “comparing” and “returning” steps of “recognizing ... the detected handwritten pattern.”

150. Furthermore, *Sinden* discloses that the method of Figure 4 is implemented by the processor:

If the symbol written is an unknown symbol, then as indicated at block 26 in FIG. 2, processor 12 proceeds with the steps shown in the flow chart of FIG. 4.

EX1005, 4:32-34.

FIG. 1 is a block diagram of a system for performing the invention.

Id., 2:50-51.

FIG. 4 is a flow chart showing the method of the invention.

Id., 2:31-32.

FIG. 8 is a flow chart showing one method that can be used by the system of the invention system to strengthen its ability to recognize different versions of the same symbol.

Id., 2:44-47.

151. Accordingly, a person having ordinary skill in the art would have understood *Sinden* in combination with *Fujisaki* to teach the processor performing both recited steps of the claimed “recognizing ... the detected handwritten pattern.” (“recognizing, by the processor, the detected handwritten pattern”).

- (ii) **“comparing the handwritten pattern to a plurality of templates, wherein each of the plurality of templates represents at least one of a plurality of handwriting symbol patterns of handwritten ways of hand writing symbols ... wherein at least two of the plurality of templates comprise different ones of the plurality of handwriting symbol patterns which represent different handwritten ways of hand writing a single symbol;”**

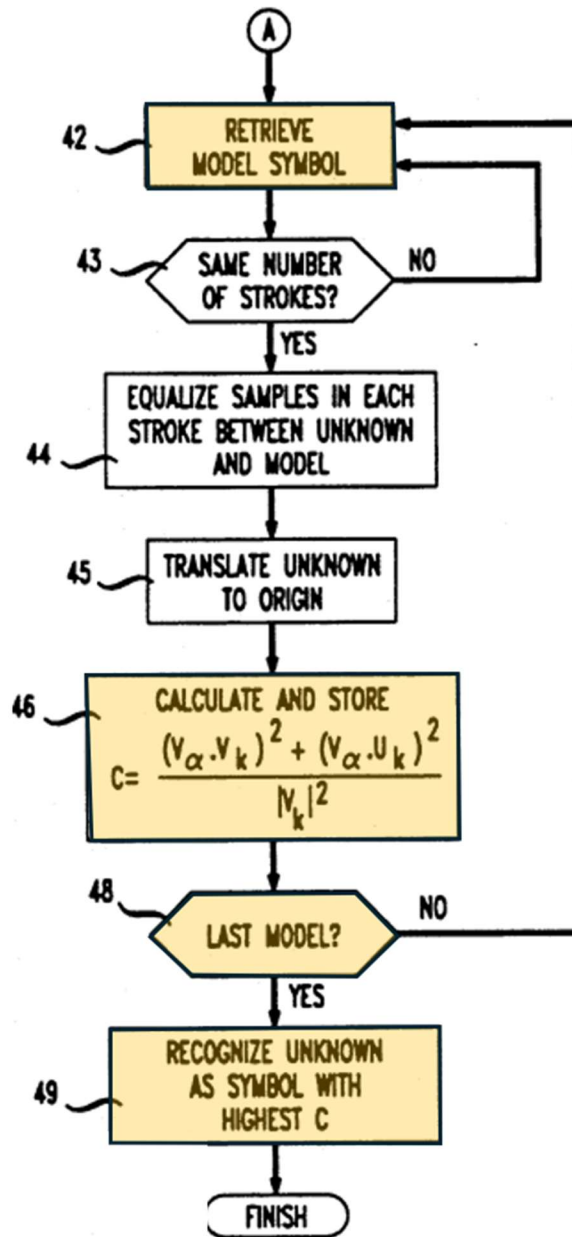
152. In my opinion, *Sinden* in combination with *Fujisaki* teaches “comparing the handwritten pattern to a plurality of templates, wherein each of the plurality of templates represents at least one of a plurality of handwriting symbol patterns of handwritten ways of hand writing symbols ... wherein at least two of the plurality of templates comprise different ones of the plurality of handwriting symbol patterns which represent different handwritten ways of hand writing a single symbol.”.

153. In general, *Sinden* discloses that “an unknown symbol is compared with model symbols to find a match.” EX1005, 7:59-60, FIG. 4. In particular, *Sinden* discloses that as a symbol is written on the pad, “processor 12 collects a time sequence of samples of the position of the tip of pen 10 on the surface of pad 11 [where] [e]ach sample is a set of x-y coordinates,” to form a vector. EX1005, 2:65-3:4; *see also id.*, 4:21-22 (“The samples for a symbol can be thought of in a mathematical sense as a vector.”).

154. Next, as described with reference to Figure 4, *Sinden* discloses comparing the samples corresponding to the user’s unknown symbol to model symbols. EX1005, 4:33-34, 4:63-65 (“FIG. 4 is a flow chart showing how the samples for an unknown symbol and the model symbols are compared to identify the unknown symbol.”); *id.*, 4:65-5:3 (“After an unknown symbol is entered, the vector v_k for a model symbol having the same number of strokes as the unknown [symbol] is retrieved, as indicated by blocks 42 and 43. Vector v_a for the unknown [symbol] and vector v_k for the model must then be compared to determine how well they correlate.”).

155. More particularly, the method compares the vector for the unknown symbol to each model symbol in a library or alphabet of model symbols and calculates a correlation value C. EX1005, 2:10-16 (“The comparison ... involves calculating a correlation factor from scalar products of the vector for the unknown

symbol and two versions of the vector *for each model symbol* and choosing the model symbol having the highest correlation factor.”); *id.*, 4:65-5:3; FIG. 4 (block 48 “Last model?”); 7:20-25 (“After such calculations have been performed for all the models of interest, then a threshold is determined as indicated by block 72.”). “The correlation C represents the degree of closeness of vector v_α for the unknown symbol to vector v_k for the model symbol. The higher the value of C , the closer the vectors. Thus, as indicated by blocks 47, 48 and 49, the model symbol associated with the highest value of C is recognized as the unknown symbol.” EX1005, 5:59-64.



Sinden FIG. 4 (annotated)

156. In my opinion, and based on my background and experience, a person having ordinary skill in the art would have understood that *Sinden*’s “model symbols” are “templates” because each model symbol represents a handwritten

way of writing a symbol to which the user's handwritten unknown symbol is compared. The '334 patent also states:

a "template" means *a model* or representation of a pattern that is used for comparison with the handwritten pattern in order to recognise [sic] the handwritten pattern.

EX1001, 3:62-65. Thus, in my opinion, a person having ordinary skill in the art would have understood *Sinden* to disclose comparing the vector of the unknown symbol ("handwritten pattern") to a library or alphabet model symbols ("to a plurality of templates").

157. A person having ordinary skill in the art would have further understood that each of *Sinden*'s model symbols (i.e., templates) represent at least one handwritten pattern for a symbol, for example, an alphanumeric character, because *Sinden* discloses that the system is "'trained' by writing in **at least one model for each symbol** that the system is expected to recognize and associating the samples recorded for that model symbol with a corresponding label" and that "models for each [alphanumeric character] are ... written and associated with the corresponding letter or number." EX1005, 3:44-51; *see also id.*, 3:6-12 ("Symbols can be letters, words, Chinese or Kanji characters, cursive script, engineering or chemical symbols."); 1:45-58 ("There is a need to be able to recognize many kinds of symbols, including such symbols as alphanumeric characters, cursive script,

Chinese or Kanji characters, electrical, chemical and architectural symbols, and so on.”). In my opinion, and based on my background and experience, a person having ordinary skill in the art would have therefore understood *Sinden* to disclose that each model symbol (i.e., template) “represents at least one of a plurality of handwriting symbol patterns of handwritten ways of hand writing symbols.”

158. *Sinden* further discloses implementing the system with multiple model symbols (i.e., templates) for a single symbol to account for variations in the way that different users write each symbol. EX1005, 7:60-8:2.

In the embodiment of the invention described above, an unknown symbol is compared with model symbols to find a match. ***More than one model can be stored for each symbol***, if desired, to allow for variations in the way symbols are written by a particular user or even to create a user-independent system. For a user-independent system, the library of model symbols can include all likely variations and combinations of number of strokes, stroke order and stroke direction for each symbol. Such variations increase the probability of correct identification of unknown symbols written by anyone. Such a library can be pre-recorded and used advantageously in systems that are furnished to users “off the shelf”.

EX1005, 7:58-8:2

If the models are highly stylized or individualistic, then only the writer of the models may be able to write characters that can be correctly recognized. *However, a number of different examples of each character can be entered as models* to take into account the variation that is possible or the system can adapt itself, as will be described below.

Id., 3:52-58

For applications in which the invention will be used by an individual or a small number of users, an embodiment can be configured that adapts to the user or users and operates faster as it adapts. In such an embodiment, the system is initially configured to be user-independent by inclusion of all likely variations of symbols in the model library, as described above. Then, instances of symbols input by users are added to the library and, after a suitable number of such user instances are added, the original models are discarded. The number of user instances kept for each symbol can be quite small, possibly as small as one model per symbol. Thus, because the number of models for each symbol is reduced, which reduces the calculation time needed to determine the closest model, and the symbols are specific to the user or users, the

system will evolve from a user-independent system to a user-independent system that is faster and more accurate.

Conversely, for a user-independent system that is expected to be used by a large number of users, an embodiment can be configured that adapts by adding models, for example, as explained in the description of FIG. 8 above. However, because increasing the number of models will tend to increase the calculation time needed to determine the closest model, such a system will tend to be slower than a user-dependent system.

Id., 8:40-65

159. Thus, a person having ordinary skill in the art would have understood *Sinden* to disclose “at least two of the plurality of templates comprise different ones of the plurality of handwriting symbol patterns which represent different handwritten ways of hand writing a single symbol.”

160. A person having ordinary skill in the art would have further understood that in such an implementation (i.e., a system with multiple model symbols for a single symbol), *Sinden*’s method for recognizing unknown symbols would involve comparing the user’s handwritten unknown symbol to each of at least two model symbols that represent different handwritten ways of writing a

single symbol. That is, a person having ordinary skill in the art would have understood that the method of Figure 4 would involve comparing the unknown symbol to each model symbol stored in the system. So, in a system implemented with multiple model symbols per symbol (e.g., per letter), the method would compare each unknown symbol with at least two model symbols that represent a single symbol.

161. To note, *Sinden*'s comparison algorithm first compares the number of strokes of each unknown symbol to the number of strokes in each model symbol. EX1005, 4:65-5:3 ("After an unknown symbol is entered, the vector v_k for a model symbol having the same number of strokes as the unknown is retrieved, as indicated by blocks 42 and 43."). A person having ordinary skill in the art would have understood *Sinden* to teach comparing the unknown symbol to each model symbol because the stroke-number comparison is a comparison between the unknown symbol and the model symbol even if, e.g., *Sinden* does not calculate a C value for each model symbol.

162. Accordingly, a person having ordinary skill in the art would have understood *Sinden* in combination with *Fujisaki* to teach comparing the vector of an unknown symbol entered by the user ("comparing the handwritten pattern") to a library of model symbols ("to a plurality of templates") wherein each of the model symbols are handwritten and represent a symbol ("wherein each of the plurality of

templates represents at least one of a plurality of handwriting symbol patterns of handwritten ways of hand writing symbols”) and that there is more than one model symbol per symbol to be recognized (e.g., alphanumeric character) to account for variations in the way each symbol is written (“wherein at least two of the plurality of templates comprise different ones of the plurality of handwriting symbol patterns which represent different handwritten ways of hand writing a single symbol”).

(iii) “returning a best template selected from the plurality of templates that represents one of the plurality of handwriting symbol patterns as a best handwriting symbol pattern which, according to a predefined rule, is most similar to the handwritten pattern;”

163. In my opinion, *Sinden* in combination with *Fujisaki* teaches “returning a best template selected from the plurality of templates that represents one of the plurality of handwriting symbol patterns as a best handwriting symbol pattern which, according to a predefined rule, is most similar to the handwritten pattern.”

164. As explained in Section XI.A.1.c(ii), *Sinden* discloses comparing the unknown symbol to each model symbol in a library or alphabet of model symbols and calculates a correlation value C . The correlation C represents the degree of closeness or similarity of vector v_a for the unknown symbol to vector v_k for the model symbol, and the model symbol associated with the highest value of C is recognized as the unknown symbol. EX1005, 5:59-64; *see also id.*, 9:33-37 (“In

Equation 5, C is a measure of the similarity or closeness between an unknown symbol and a model symbol or, more precisely, the similarity or closeness between the vector v_a representing the unknown symbol and the vector v_k representing the model symbol.”). And, in the context of the method of Figure 8, this is how “an unknown symbol is entered and the closest model symbol to the unknown is chosen.” *Id.*, 8:5-10.

165. In my opinion, a person having ordinary skill in the art would have understood that choosing the closest model symbol constitutes “returning a best template.” Based on my background and experience, a person having ordinary skill in the art would have understood that the plain and ordinary meaning of “returning” in the context of the ’334 patent to refer to the recognition process, executed by the processor, reporting the outcome of the recognition comparison. This is corroborated, for example, by the Microsoft Computer Dictionary, which provides that the verb “return” means “to report the outcome of a called routine to the calling routine or program.” EX1021. This is also consistent with how the ’334 patent equates “returned” with “determined” with respect to the result of the claimed comparison. *See* EX1001, 7:66-8:4 (“The pattern is then recognised and the best interpretation based on the best template is **returned**. After the best interpretation has been **determined** it is manipulated....”); *see also id.*, 7:46-48 (“each pattern is sequentially and individually recognised by comparing it to

templates in a database, whereby a best interpretation is returned, step 11.”); 8:49-52 (“The processor 64 uses a database 66 of templates for comparison to the handwritten pattern, and the recognition returns a best template.”).

166. Moreover, a person having ordinary skill in the art would have understood *Sinden*’s model symbol to be a “template” (Section XI.A.1.c(i)), that each unknown symbol is compared to a plurality of model symbols (Section XI.A.1.c(i)), each of which represents a handwritten symbol (Section XI.A.1.c(i)). And because *Sinden* discloses that the model symbol associated with the highest value of C, i.e., highest value of closeness or similarity, is recognized as the unknown symbol, a person having ordinary skill in the art would have understood *Sinden* to disclose that the “closest model symbol” is chosen based on a “pre-defined rule.” In other words, the “pre-defined rule” is that the model symbol with the highest value of similarity is considered to be the recognized model symbol.

167. Accordingly, a person having ordinary skill in the art would have understood *Sinden* in combination with *Fujisaki* to teach choosing a closest model symbol (“returning a best template”) from among an alphabet or library of model symbols representing handwritten symbols (“selected from the plurality of templates that represents one of the plurality of handwriting symbol patterns”) that has a vector with the highest correlation value (“as a best handwriting symbol

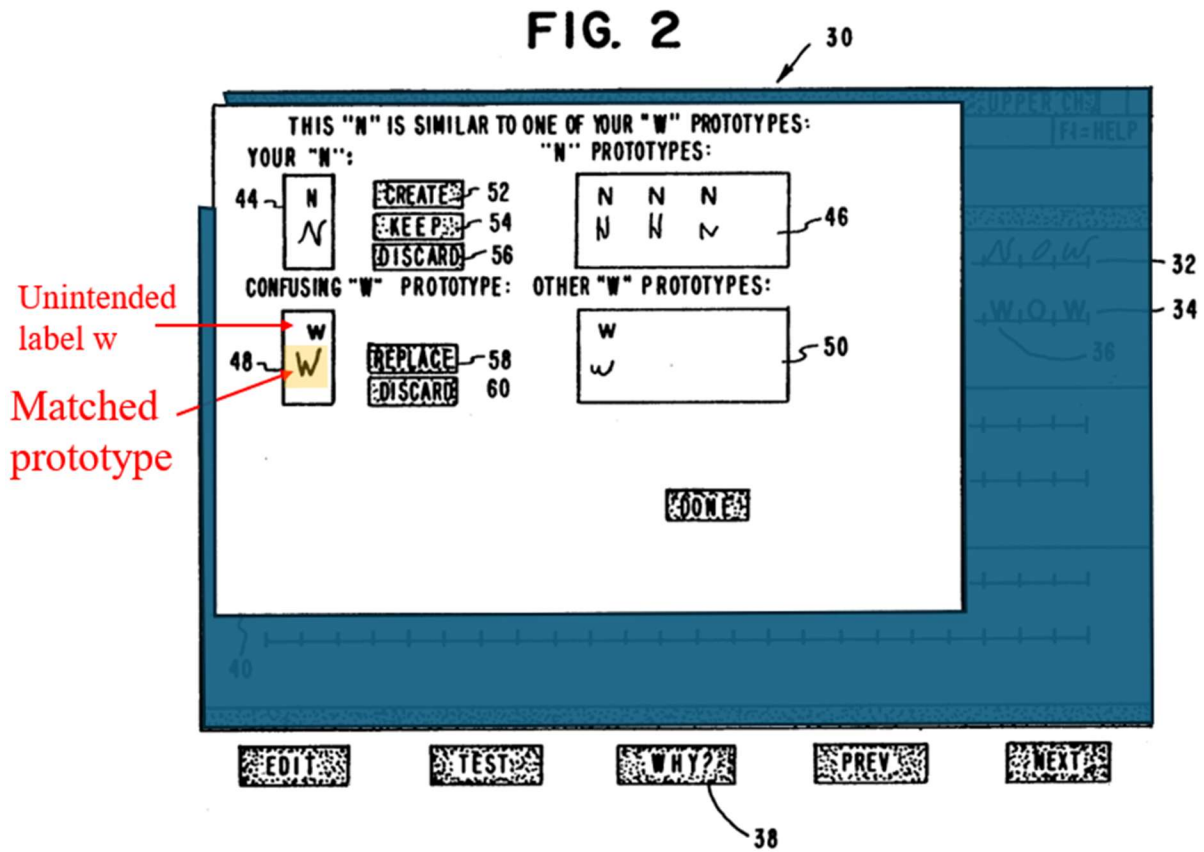
pattern which, according to a predefined rule, is most similar to the handwritten pattern”).

d. 1[c]: “presenting the best handwriting symbol pattern of the best template.”

168. In my opinion, *Sinden* in combination with *Fujisaki* teaches “presenting the best handwriting symbol pattern of the best template.”

169. As discussed above in Section XI.A.1.a, a person having ordinary skill in the art would have understood *Sinden* to teach that the closest model symbol is displayed, and a person having ordinary skill in the art would have understood displaying to constitute “presenting.” *Sinden* does not, however, teach the details related to how to display the closest model symbol.

170. As detailed in Section VIII.B.3, *Fujisaki* is directed to an improved technique for interactive editing of prototypes in an on-line handwriting recognition system for use in a training program. More particularly, *Fujisaki* discloses a handwriting recognition system and that if the system misrecognizes the user’s handwriting, the user may press a button and the system will display the prototype to which the user’s input was matched — “[t]he matched prototype (with unintended label w) is shown in box 48.” EX1006, 5:43-44.



EX1006, FIG. 2 (annotated)

171. In view of the above, a person having ordinary skill in the art would have understood *Fujisaki* to provide an explicit teaching that displaying the matched prototype in box 48 comprises displaying the best handwriting symbol pattern of the best template because Figure 2 shows that the handwritten pattern of the matched prototype for W is displayed.

172. In my opinion, a person having ordinary skill in the art would have understood *Fujisaki*'s prototypes to be akin to *Sinden*'s "model symbols," which are both "templates" as that term is used in the '334 patent. Indeed, *Fujisaki* refers

to prototypes as “template[s].” EX1006, 1:11-13 (“Many on-line, handwriting recognition systems use curve matching methods to match an unknown character against prototype (template) characters.”). As is known in the art, a “template” is the reference data that represents a symbol, such as an alphanumeric character, against which the user’s handwritten input data is compared for the purpose of recognizing the user’s handwritten input data. This is consistent with how the ’334 patent describes a “template” as “a model or representation of a pattern that is used for comparison with the handwritten pattern in order to recognise the handwritten pattern. As a template is a representation of a specific pattern there may exist several templates being representations of the same symbol, but defining different ways of writing the symbol.” EX1001, 3:62-4:4. That is also what *Sinden*’s “model symbols” are and what *Fujisaki*’s “prototypes” are.

173. Moreover, a person having ordinary skill in the art would have understood *Fujisaki*’s matched prototype to be the same as *Sinden*’s “closest model symbol” because *Fujisaki*’s character matcher performs the same general function as *Sinden* to identify the matched prototype. That is, *Fujisaki* explains that the character matcher, like *Sinden*’s comparison algorithm in Figure 4, compares “unknown characters written by the user” (like *Sinden*’s “unknown symbols”) to “prototype characters” (like *Sinden*’s “model symbols”) to determine the best match. *Compare* EX1005, 1:67-2:2 (“An unknown handwritten symbol written on

a digitizing tablet is compared with symbols in a predefined ‘alphabet’ or library of model symbols and the closest match chosen.”) *with* EX1006, 7:35-40 (“a character matcher which compares unknown characters written by the user with prototype characters stored in said character prototype memory to determine the best match between the unknown characters and the prototype characters for producing recognized characters”).

174. A person having ordinary skill in the art would have considered it obvious to apply *Fujisaki*’s teaching to display the pattern of the matched prototype (i.e., model symbol) to *Sinden*, and a person having ordinary skill in the art would have had a reasonable expectation of success in doing so. A person having ordinary skill in the art would have recognized that *Sinden* provides few implementation details for its training mode, and a person having ordinary skill in the art looking to implement *Sinden*’s training mode would have been motivated to consider references that disclose such details would have readily identified *Fujisaki*’s techniques as a suitable implementation, as *Fujisaki* is specifically directed to techniques for implementing a training program like *Sinden*’s training mode.

175. Thus, applying *Fujisaki*’s teachings to *Sinden* would have amounted to following an express teaching, suggestion, or motivation in the art, i.e., a suggestion to implement *Sinden*’s interactive technique for editing model symbols

in accordance with *Fujisaki*'s teachings for the same purpose. It also would have amounted to applying a known technique (*Fujisaki*'s teachings related to its interactive prototype editing technique) to a known device (*Sinden*'s system with a training mode) ready for improvement to yield predictable results (*Sinden*'s training mode implemented with *Fujisaki*'s teachings for a training mode).

176. In addition, a person having ordinary skill in the art would have considered it obvious to modify *Sinden* to implement *Fujisaki*'s teaching to display the pattern of the matched prototype (i.e., model symbol) because a person having ordinary skill in the art would have recognized that it would improve the functionality of *Sinden*'s system. As discussed, *Fujisaki* is directed to an improved prototype editing technique, akin to *Sinden*'s "training mode," that gives the user additional knowledge about why the user's handwritten input was misrecognized, including by displaying the template to which the user's handwriting was matched. EX1006, 4:23-30 ("Whenever unknown writing is misrecognized, this invention can be invoked (a) to show the writer the reason for the misrecognition, i.e., the matching prototype whose label differs from the intended character, and (b) to present action choices. Second, in this invention the possible actions are limited by the user's own level of knowledge. The only prototypes he or she is aware of are those causing confusion.").

177. *Fujisaki* explains that its technique advances the goal of achieving optimal recognition performance by improving the separation of the stored prototypes through informing the user about similar prototypes. *Id.*, 4:8-15 (“This invention is directed to a procedure for interactive editing of prototypes that are close to each other in prototype space. This procedure improves the separation of prototypes and increases recognition accuracy. On-line recognition of handwriting by prototype matching is optimal when there is a minimum of prototype pairs whose similarity leads to recognition confusion.”).

178. Optimal recognition performance is a common objective of all handwriting recognition systems. Indeed, a person having ordinary skill in the art would have understood that recognition performance, or accuracy, is one of the more important considerations in designing a handwriting recognition system. This is corroborated, for example, by *Tappert 2*, which explains that “[i]deally, a handwriting recognizer can be designed for maximum speed, accuracy, and flexibility.” EX1022 at 1. *Sinden*’s disclosure recognizes this by disclosing techniques for improving the accuracy of its recognition. EX1005, 8:17-19 (“Such a training mode can be continued until the performance of the system is satisfactory.”); 8:51-57 (“Thus, because the number of models for each symbol is reduced, which reduces the calculation time needed to determine the closest model, and the symbols are specific to the user or users, the system will evolve from a

user-independent system to a user-[dependent] system that is faster *and more accurate*.”) Thus, a person having ordinary skill in the art would have considered it obvious to modify *Sinden* to implement *Fujisaki*’s teaching to display the pattern of the matched prototype.

179. A person having ordinary skill in the art therefore would have considered the combination to be obvious because it amounted to the use of a known technique (*Fujisaki*’s teaching to display the pattern corresponding to the prototype) to improve similar devices (*Sinden* and *Fujisaki* both disclose handwriting recognition systems with the ability to modify the stored templates) in the same way (to improve recognition performance).

180. A person having ordinary skill in the art would have had a reasonable expectation of success in making the modification because *Sinden* and *Fujisaki* disclose similar online handwriting recognition systems, e.g., because they are both processor-based template-matching systems, and the programming that would have been required would have been within the skill of an ordinary artisan. For example, *Sinden* already teaches comparing the user’s unknown symbol to a library of model symbols (i.e., templates) and choosing the closest model symbol, and it would not have been difficult to program *Sinden* to display the closest model symbol as taught by *Fujisaki* because there were known techniques for displaying such data, as corroborated by *Fujisaki* itself.

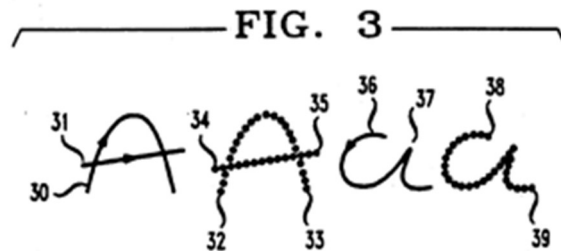
181. Accordingly, a person having ordinary skill in the art would have understood the *Sinden-Fujisaki* combination to teach displaying the handwritten pattern of the closest model symbol (“presenting the best handwriting symbol pattern of the best template.”).

2. Claim 2: “The method according to claim 1, wherein the at least one of the plurality of handwriting symbol patterns of each of the plurality of templates is represented by geometrical information relating to an appearance of said handwriting symbol pattern.”

182. In my opinion, *Sinden* in combination with *Fujisaki* teaches “[t]he method according to claim 1, wherein the at least one of the plurality of handwriting symbol patterns of each of the plurality of templates is represented by geometrical information relating to an appearance of said handwriting symbol pattern.”

183. For example, *Sinden* discloses that model symbols are comprised of a sample “set of x-y coordinates” where “samples are taken at a rate of about 250 samples per second and the (x,y) coordinates and the position of pen 10 can be sensed with a resolution of about 0.1 mm.” EX1005, 2:65-3:5. *Sinden* further discloses that unknown symbols and model symbols are represented as vectors for purposes of comparison. *Id.*, 4:21-22. *Sinden* further provides examples of “handwritten symbols and dots representing samples taken for such symbols.” EX1005, 2:29-30, FIG. 3. *Sinden* explains that “[t]he block letter ‘A’ shown on the

left can be written with two strokes 30 and 31 with the strokes moving in the directions shown by the arrows.” *Id.*, 4:37-40. Alternatively, “[t]he dotted version of letter ‘A’ shows samples taken as the letter is written with the speed of the pen tip relatively constant.” *Id.*, 4:40-42. Importantly, “the samples for symbols that appear to be indential [*sic*] can be quite different, depending on how the symbols were actually written.” *Id.*, 4:55-58.



EX1005, FIG. 3

184. In my opinion, a person having ordinary skill in the art would have understood *Sinden*’s teaching of representing model symbols as vectors comprising a set of x-y coordinates is consistent with the ’334 patent, which discloses that the “geometrical information allows the template to be compared to a handwritten pattern” and which can be “represented by positions of discrete dots, which may easily be compared to a handwritten pattern.” *Id.*, 4:47-49, 4:53-55.

185. In my opinion, and based on my background and experience, a person having ordinary skill in the art would have further understood that *Sinden*’s vectors relate to the appearance of the symbol pattern because a person having ordinary

skill in the art would have understood that the x-y coordinates of the samples represent a shape or appearance of the symbol in two-dimensional space. Specifically, using *Sinden*'s vectors, the two-dimensional shape of the symbol may be fully constructed, hence the vectors relate to the representation of the appearance of the symbol.

186. Accordingly, a person having ordinary skill in the art would have understood the *Sinden-Fujisaki* combination to teach that each model symbol comprises a vector formed from a sample set of x-y coordinates (“wherein the at least one of the plurality of handwriting symbol patterns of each of the plurality of templates is represented by geometrical information”) and that the set of x-y coordinates represent a shape or appearance of the symbol in two-dimensional space (“relating to an appearance of said handwriting symbol pattern.”).

3. Claim 8: “The method according to claim 1, wherein the handwritten pattern is entered on an input area on the screen and the best handwriting symbol pattern of the best template is presented in a presentation area on the screen, wherein said presentation area overlaps the input area.”

187. In my opinion, *Sinden* in combination with *Fujisaki* teaches “[t]he method according to claim 1, wherein the handwritten pattern is entered on an input area on the screen and the best handwriting symbol pattern of the best template is presented in a presentation area on the screen, wherein said presentation area overlaps the input area.”

a. “The method according to claim 1, wherein the handwritten pattern is entered on ... the screen”

188. As an initial matter, a person having ordinary skill in the art would have understood the claim to require the handwritten pattern is entered on an input area on “*a* screen,” not “*the* screen,” because there is no “screen” recited in claim 1 to which “the screen” refers back. A person having ordinary skill in the art would have understood that “the screen” is a typographical error that should be interpreted as “a screen.”

189. As explained in Section XI.A.1.a, *Sinden* explains that handwritten symbols are written on the digitizing tablet or pad, and a person having ordinary skill in the art would have understood that *Sinden*’s digitizing tablet or pad includes a display screen. Thus, a person having ordinary skill in the art would have understood *Sinden* to disclose “wherein the handwritten pattern is entered on a screen.” If Patent Owner argues or the Board finds that *Sinden* does not disclose that its digitizing tablet or pad includes a display screen, it nevertheless would have been obvious to implement *Sinden*’s digitizing tablet or pad with a display screen in view of *Fujisaki* for the same reasons discussed in Section XI.A.1.a.

190. Accordingly, a person having ordinary skill in the art would have understood the *Sinden-Fujisaki* combination to teach that the user’s unknown symbol is input on the digitizing tablet that includes a screen (“wherein the handwritten pattern is entered on ... the screen”)

- a. “... on an input area ... and the best handwriting symbol pattern of the best template is presented in a presentation area on the screen, wherein said presentation area overlaps the input area.”**

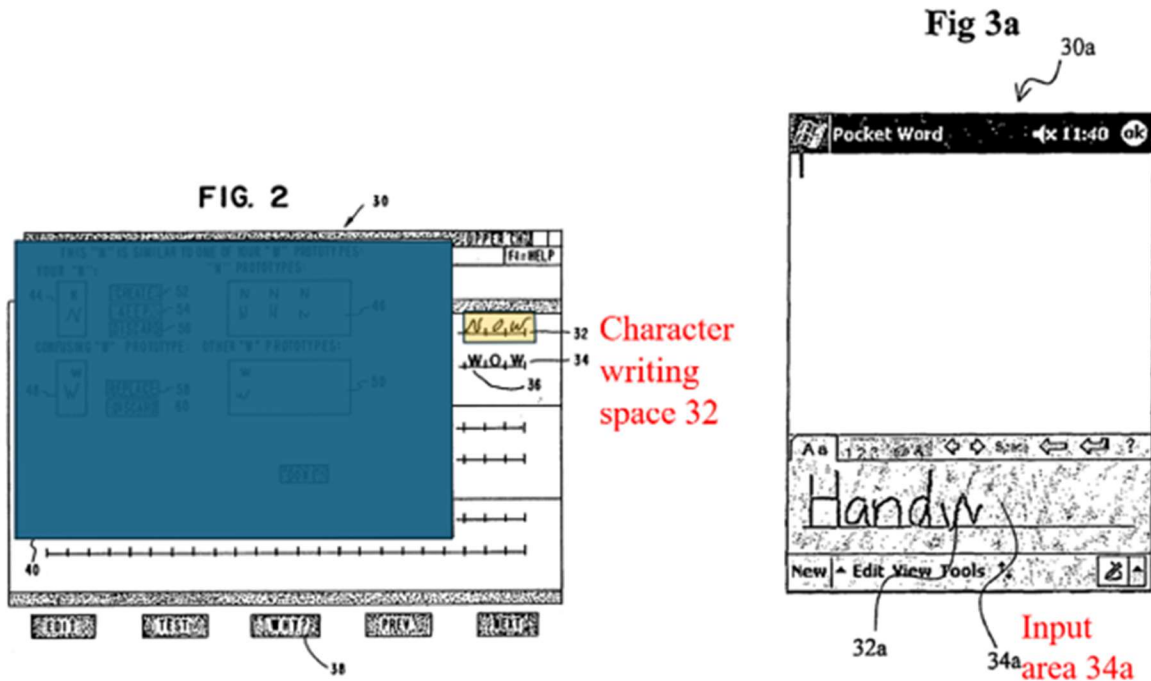
191. *Sinden* discloses that, in training mode, the closest model symbol is chosen and displayed, and then the user can indicate whether the choice was correct or not, and if incorrect, what the correct choice is. EX1005, 8:3-19. *Sinden* does not describe the details of the graphical user interface for such a method. A person having ordinary skill in the art looking to implement *Sinden*’s training mode would have readily identified *Fujisaki*.

192. *Fujisaki* teaches a graphical user interface applicable to a training program akin to *Sinden*’s training mode. See EX1006, 4:18-23 (“Prototype set modification according to this invention is an improvement over the previous one in several respects. First, it is incorporated into a handwriting training program which creates prototypes and then performs recognition using these prototypes.”).

193. *Fujisaki* teaches that the user’s handwritten input is entered in “character writing space 32,” which, as illustrated in Figure 2, is part of a larger window interface. EX1006, 5:30-31. In my opinion, a person having ordinary skill in the art would have understood the window that includes character writing space 32 is an area where the user inputs handwriting. This is consistent with how the ’334 patent describes “an input area on the screen.” EX1001, 7:65-66 (“The pattern

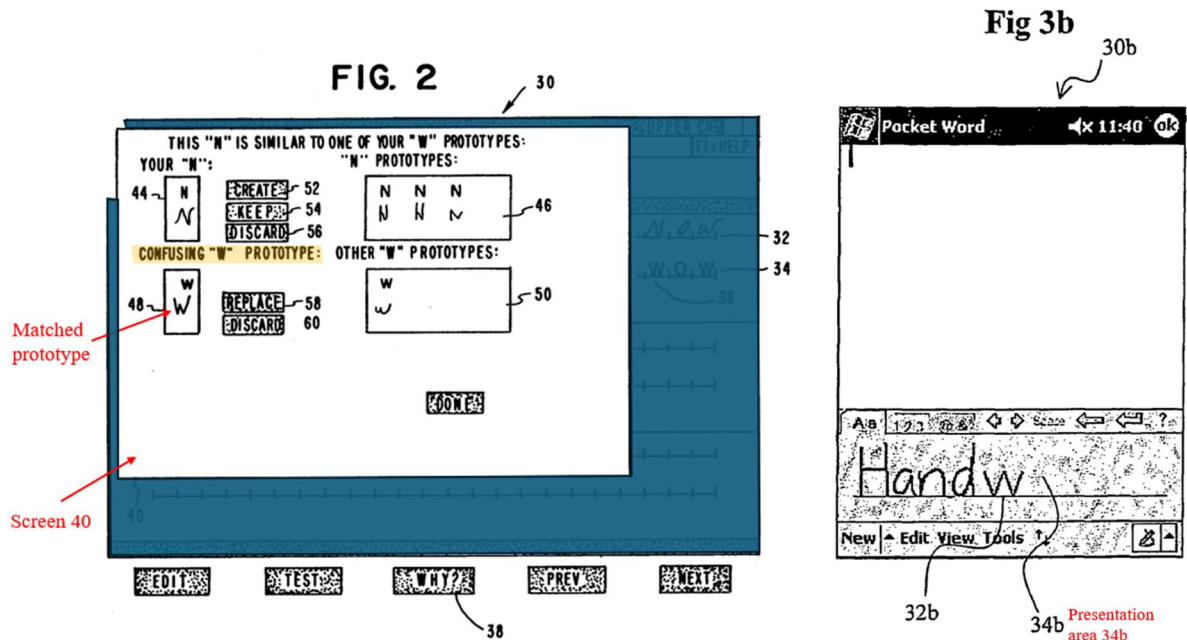
is entered on an input area 34 *a* on the screen which is sensitive to handwriting.”);

FIG. 3a.



EX1006, FIG. 2 (annotated); EX1001, FIG. 3a (annotated)

194. *Fujisaki* further teaches that upon pressing the “WHY?” button 38, screen 40 appears. EX1006, 5:35-37. And *Fujisaki* teaches displaying the prototype (i.e., template) to which the user’s input was matched as part of screen 40. *Id.*, 5:38-45. The user can then take appropriate action with respect to the matched prototype. EX1006, 5:51-6:27 (describing, e.g., a REPLACE button, a DISCARD button, a CREATE button, and a KEEP button).



EX1006, FIG. 2 (annotated); EX1001, FIG 3b (annotated)

195. *Fujisaki*'s screen 40 is consistent with how the '334 patent describes "the best handwriting symbol pattern of the best template is presented in a presentation area on the screen, wherein said presentation area overlaps the input area." EX1001, 8:4-6 ("After manipulation and recognition, as shown in FIG. 3b, the manipulated best interpretation 32b is presented in a presentation area 34b."), FIG. 3. A person having ordinary skill in the art would have understood that *Fujisaki*'s screen 40, including box 48 which displays the prototype to which the user's input was matched, to overlap the input window to which character writing space 32 belongs.

196. A person having ordinary skill in the art would have considered it obvious to modify *Sinden* to implement *Fujisaki*'s teachings related to the display

of a screen that overlaps the input window with character writing space 32 and would have had a reasonable expectation of success in doing so. A person having ordinary skill in the art would have considered *Fujisaki*'s graphical user interface to be a suitable implementation for *Sinden*'s training mode, as *Fujisaki* is specifically directed to a user interface for a training program similar to *Sinden*'s training mode. Thus, the combination would have amounted to applying a known technique (*Fujisaki*'s graphical user interface for an interactive prototype editing technique) to a known device (*Sinden*'s system with a training mode) ready for improvement to yield predictable results (*Sinden*'s training mode implemented with *Fujisaki*'s teachings related to a graphical user interface for a training program).

197. A person having ordinary skill in the art would have had a reasonable expectation of success in making the combination because *Fujisaki*'s teachings related to its graphical user interface are based on conventional graphics (e.g., windows). Moreover, *Fujisaki* and *Sinden* are similar, processor-based handwriting recognition systems, and *Fujisaki* itself demonstrates that a person having ordinary skill in the art would have been able to implement its teachings in *Sinden*'s system.

198. In sum, a person having ordinary skill in the art would have understood the *Sinden-Fujisaki* combination to teach the user inputting *Sinden*'s unknown symbol on *Sinden*'s digitizing tablet including a display screen in

Fujisaki's character writing space, and that the handwritten pattern of *Sinden*'s closest model symbol is displayed as part of another, overlapping window on the screen of *Sinden*'s digitizing tablet or pad. As explained in Section XI.A.1.c(ii), a person having ordinary skill in the art would have understood that the unknown symbol is "the handwritten pattern" and, as explained in Section XI.A.1.d, the pattern corresponding to the closest model symbol represents "the best handwriting symbol pattern of the best template."

199. Accordingly, a person having ordinary skill in the art would have understood the *Sinden-Fujisaki* combination to teach the user inputting *Sinden*'s unknown symbol ("the handwritten pattern") on *Sinden*'s digitizing tablet or pad with a screen in *Fujisaki*'s character writing space which is part of a larger input area on a screen ("is entered on an input area on the screen") and the pattern corresponding to *Sinden*'s closest model symbol ("and the best handwriting symbol pattern of the best template") is displayed as part of an overlapping window on the screen of *Sinden*'s digitizing tablet or pad ("is presented in a presentation area on the screen, wherein said presentation area overlaps the input area.").

4. **Claims 9 and 10: "[Claim 9] The method according to claim 1, wherein the step of recognizing comprises returning at least one alternative template selected from the plurality of templates. [Claim 10] The method according to claim 9, wherein the step of presenting comprises presenting the at**

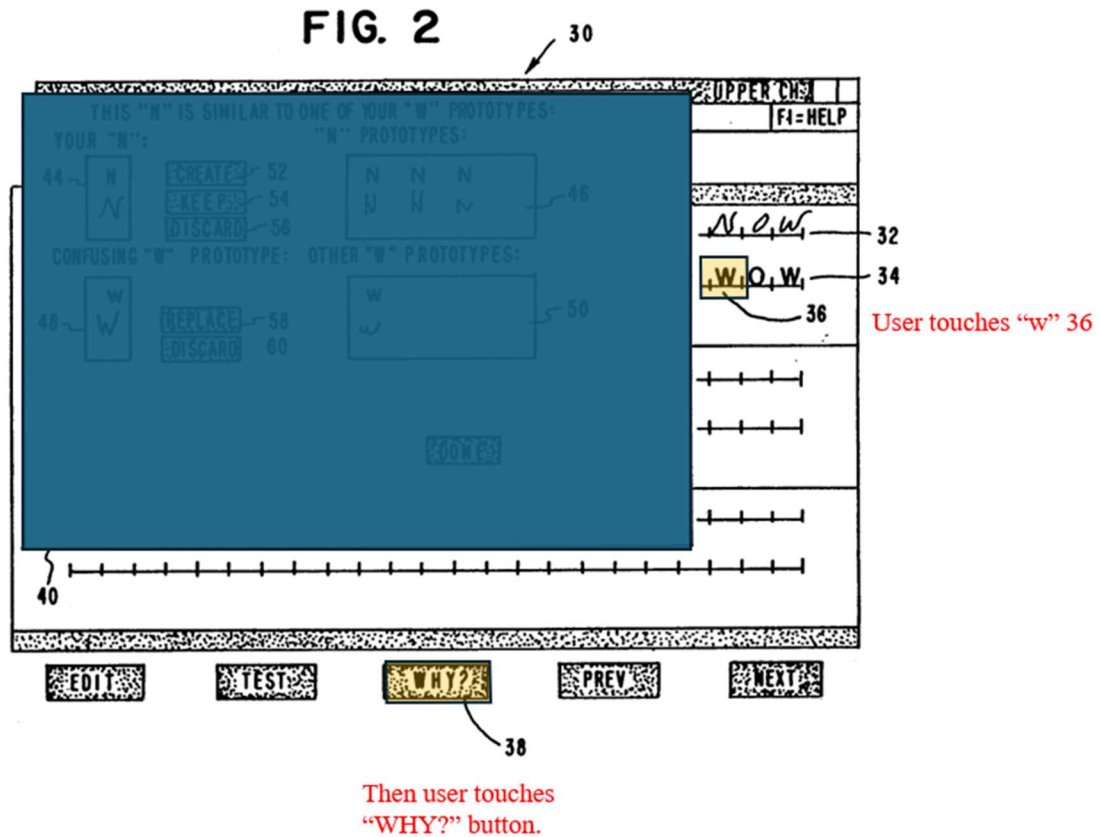
least one of the plurality of handwriting symbol patterns of the at least one alternative template at a request of a user.”

200. In my opinion, *Sinden* in combination with *Fujisaki* teaches “[t]he method according to claim 1, wherein the step of recognizing comprises returning at least one alternative template selected from the plurality of templates” and “[t]he method according to claim 9, wherein the step of presenting comprises presenting the at least one of the plurality of handwriting symbol patterns of the at least one alternative template at a request of a user.”

201. *Sinden* discloses that, in training mode, the closest model symbol is chosen and displayed, and then the user can indicate whether the choice was correct or not, and if incorrect, what the correct choice is. EX1005, 8:3-19. *Sinden* does not describe the details of how the user indicates whether the choice was correct or incorrect, or otherwise what the correct choice is. A person having ordinary skill in the art looking to implement *Sinden*’s training mode would have readily identified *Fujisaki* and considered *Fujisaki*’s technique for prototype editing to be suitable for implementing *Sinden*’s training mode because *Fujisaki*’s technique is used for the same purpose as *Sinden*’s training mode — to modify and correct a set of stored model symbols (i.e., templates, or prototypes).

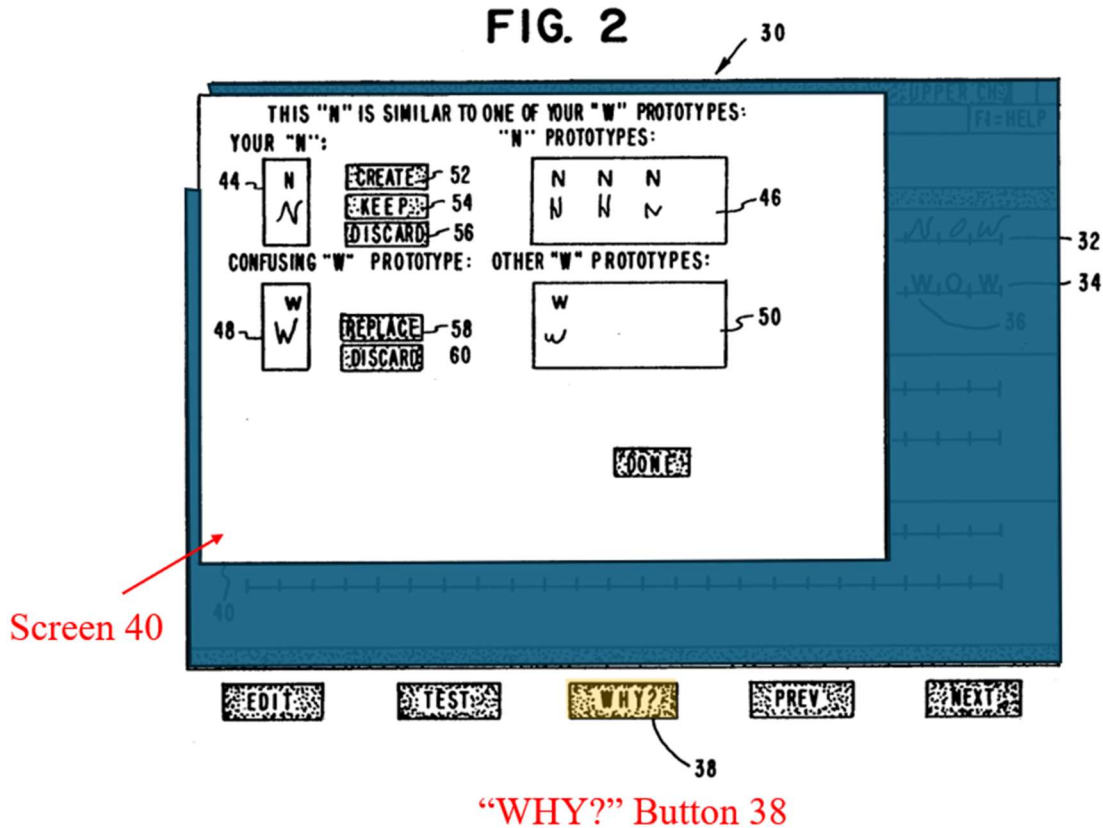
202. *Fujisaki* teaches that after the user inputs an unknown symbol, “[t]he user then utilizes the stylus 14 ... to touch the ‘w’ 36 which is incorrect, and then

touch[] the ‘WHY?’ button 38 to determine the cause of the error.” EX1006, 5:33-36.



EX1006, FIG. 2 (annotated)

203. “Screen 40 then appears in response to the touching of button 38.” *Id.*, 5:36-37.



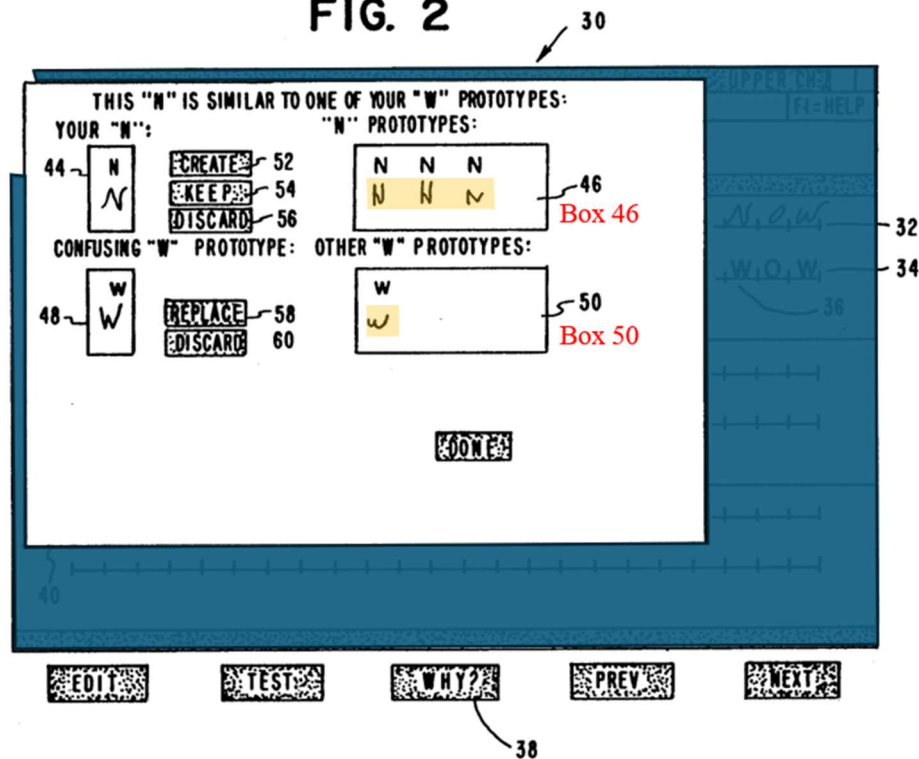
EX1006, FIG. 2 (annotated)

204. *Fujisaki*’s screen 40 presents a “matched prototype ... in box 48.”

EX1006, 5:39-44. On the same screen, *Fujisaki* presents multiple other prototypes.

Id., 5:30-50. *Fujisaki* discloses that “existing prototypes for n are shown in box 46.” *Id.*, 5:41-42, FIG. 2 (boxes 44, 46). Similarly, “[t]he matched prototype (with unintended label w) is shown in box 48; other prototypes for this (unintended) label w are shown in box 50.” *Id.*, 5:43-45, FIG. 2 (boxes 48, 50).

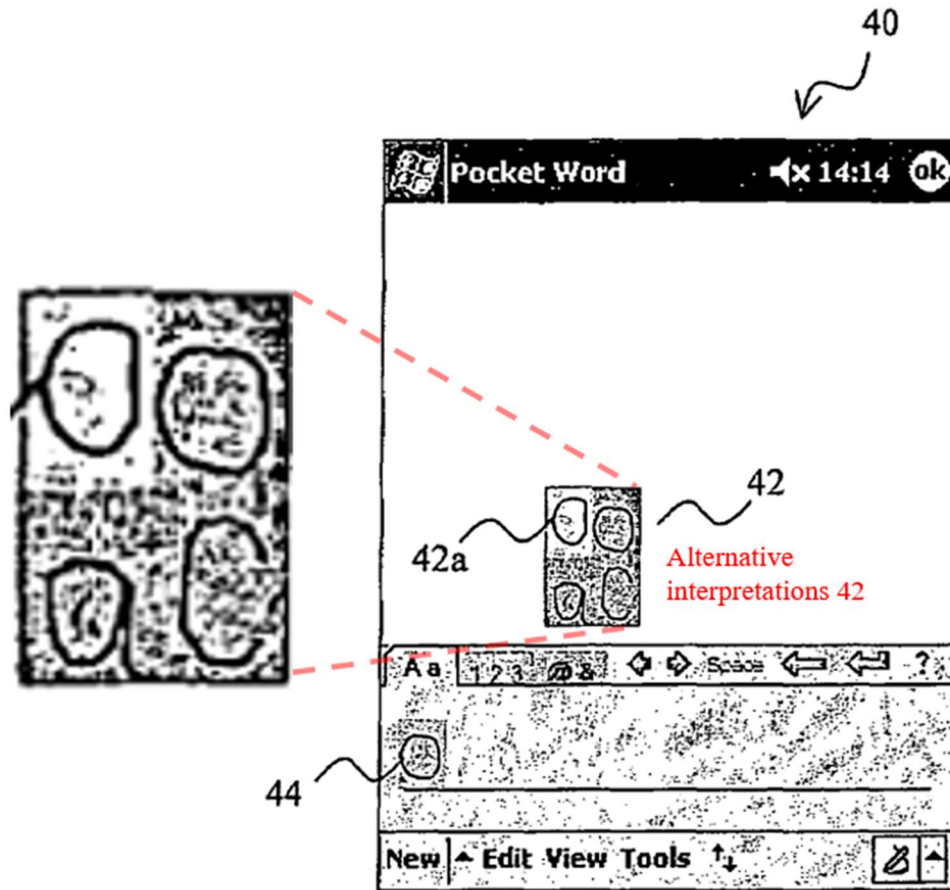
FIG. 2



EX1006, FIG. 2 (annotated)

205. This is consistent with the '334 patent's disclosure related to claims 9 and 10 as the other prototypes are meant to include the other potentially correct matches. EX1001, 5:45-54 ("The alternative interpretations may be displayed directly or the user could request a presentation of alternative interpretations. Letting the user request a presentation of the alternatives is a very efficient way of presenting interpretations to the user, if the recognition mostly returns correct interpretations. Thus, alternative interpretations need not be presented when the recognition returns a correct best interpretation. *Still, the user is enabled to choose the correct interpretation from the presented alternatives.* Thus, reentering of the

pattern could be avoided”); 8:13-17 (“After a handwritten pattern has been recognised and the best interpretation 44 has been returned, alternative interpretations 42 are also returned to help the user select another interpretation, if the best interpretation 44 presented is incorrect.”), FIG. 4.



EX1001, FIG. 4 (annotated)

206. Thus, a person having ordinary skill in the art would have considered *Fujisaki*'s teaching to display the pattern of additional prototypes for the intended and unintended labels after when the user presses the "WHY?" button 38 to

constitute presenting the handwritten pattern of at least one alternative template selected from a plurality of templates at the request of a user.

207. A person having ordinary skill in the art would have considered it obvious to modify *Sinden* to implement this teaching from *Fujisaki* and would have had a reasonable expectation of success in doing so. A person having ordinary skill in the art would have understood that *Fujisaki*'s teachings of displaying additional prototypes for the intended and unintended labels would have been an efficient technique for allowing the user to identify the correct choice and would have assisted the user in understanding what the correct choice is. Thus, a POSITA would have considered the combination to amount to the use of known technique (*Fujisaki*'s teaching to display alternative prototypes) to improve similar devices (*Sinden* and *Fujisaki* teach similar handwriting recognition systems and training programs) in the same way (to provide the user more knowledge about how to correct the set of model symbols or prototypes in an efficient manner).

208. A person having ordinary skill in the art would have considered the *Sinden-Fujisaki* combination to teach displaying not only the closest model symbol, but other model symbols from the library for symbols that the user intended or not.

209. The '334 patent does not disclose any details for how the alternative interpretations are determined and returned or otherwise require that they be

determined in any particular manner. A person having ordinary skill in the art would have understood that to display the alternative model symbols, the system returns the alternative model symbols. At a minimum, *Fujisaki*'s teaching amounts to an express suggestion to determine and return additional model symbols.

Techniques for determining such alternatives were known and would have been within the skill of an ordinary artisan to implement. This is corroborated, for example, by U.S. 7,158,678 ("*Nagel*"), which describes a technique for generating a probability score and a list of likely matches that exceed a predetermined probability score. That list may then be used to display to the user a list of alternatives.

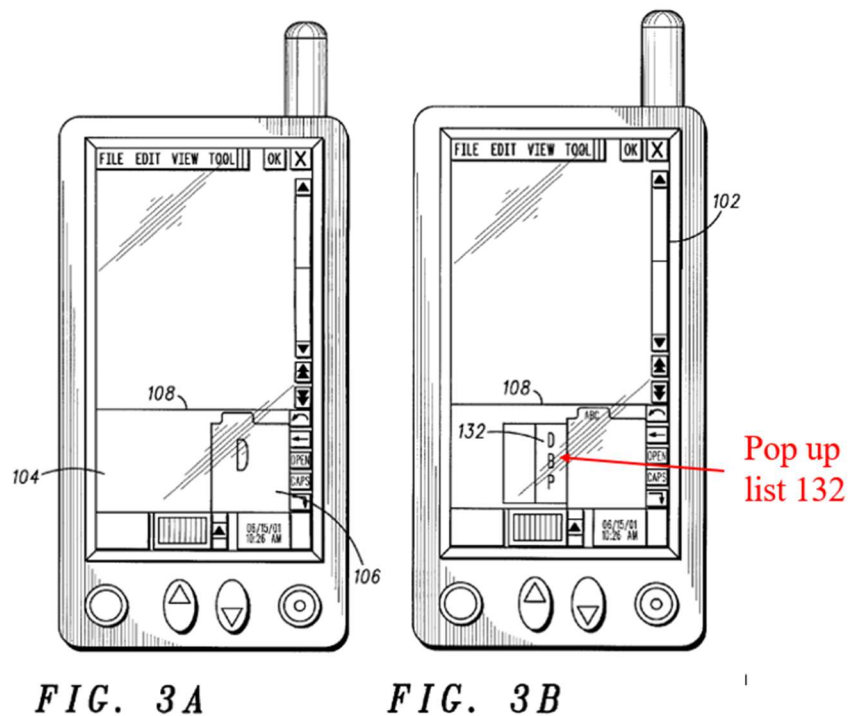
The recognition engine compares a handwritten input word against all words contained in the main dictionary and the user dictionary. *A probability score is generated by the recognition engine for each dictionary word which is indicative of the likelihood that the handwritten word matches that particular dictionary word.* Based on each words' probability score, a list of likely matches is collected. From the recognition results, the handwriting recognition engine generates a confidence score for the one word (the primary word) with the highest probability score. If that confidence score exceeds a preselected confidence threshold, it is an indication that the recognition engine has

correctly recognized the written word and that the primary word choice is in fact correct.

EX1024, 3:62-4:9.

Entry begins in the character input area 106 in FIG. 3A, causing an entry to be recognized as an individual handwritten character and treated accordingly. ... Further, to increase the likelihood of presenting the user with the correct character, *a pop-up list 132 is provided as shown in FIG. 3B, listing likely characters in descending order of likelihood.*

Id., 4:48-56.



Nagel (EX1024), FIGs. 3A, 3B (annotated)

FIG. 4 is an example of a flow diagram of a method 140 for implementing the handwriting user interface of the preferred embodiment of the present invention. First, in step 142 a handwritten entry is made into the designated screen input area. In step 144 a check is made to determine whether the handwritten entry is in the text input area 104 or character input area 106. If the handwritten entry is in the text input area 104 in step 146, the handwriting recognition engine matches the handwritten input as described in Seni et al. ***Otherwise, in step 148 a probability score is generated for each possible character to indicate the likelihood that the input character is that particular character. In step 150, the highest scoring characters are identified. In step 152 the top scoring characters are displayed in a pop-up list 132.*** In step 154, the user selects the correct character and that selected character is inserted into or at the end of the character string in the input buffer and displayed above the input area 108. Then, returning to step 142, the user is allowed to continue character or word entry.

Id., 5:1-19.

210. Thus, a person having ordinary skill in the art would have considered the *Sinden-Fujisaki* combination to render obvious returning alternative model symbols (“alternative templates”).

211. Moreover, a person having ordinary skill in the art would have understood that it would be useful to implement *Sinden*'s training mode to be triggered or activated manually with the user's press of a button. A person having ordinary skill in the art would have understood that it would have frustrated the ordinary use of the *Sinden-Fujisaki* system if, for example, each time the user entered an unknown symbol, the system automatically displayed the closest model symbol and alternative model symbols without first requiring a request from the user to do so. Thus, a person having ordinary skill in the art would have appreciated that implementing *Fujisaki*'s teaching related to the "WHY?" button would have improved the *Sinden-Fujisaki* combination by providing a less frustrating experience while using the system.

212. Accordingly, a person having ordinary skill in the art would have understood the *Sinden-Fujisaki* combination to teach displaying alternative model symbols in addition to the closest model symbol ("the step of recognizing comprises returning at least one alternative template selected from the plurality of templates") and displaying the handwritten pattern of the alternative model symbols in response to the user pressing a button ("presenting the at least one of

the plurality of handwriting symbol patterns of the at least one alternative template at a request of a user.”).

5. Claim 15

- a. ***15[pre]: “A method performed by a handwriting recognition device for sequentially presenting a plurality of recognized handwritten symbols, the recognition device having a processor and detection means for detecting entry of a handwritten symbol, the method comprising for each handwritten pattern the steps of:”***

213. In my opinion, to the extent the preamble is limiting, *Sinden* teaches “[a] method performed by a handwriting recognition device for sequentially presenting a plurality of recognized handwritten symbols, the recognition device having a processor and detection means for detecting entry of a handwritten symbol.”

214. As discussed in Section XI.A.1.a, a person having ordinary skill in the art would have understood *Sinden* to disclose, with reference to Figure 8, “[a] method ... for presenting a recognized handwritten symbol.” *Sinden* also teaches a handwriting recognition device “having a processor and detection means for detecting entry of a handwritten symbol” for the same reasons discussed in Section XI.A.1.a.

215. *Sinden* further discloses that the training method of Figure 8 “can be continued until the performance of the system is satisfactory.” EX1005, 8:17-19. In

my opinion, a person having ordinary skill in the art would have understood this to mean that the user or trainer could repeatedly perform the method of Figure 8 as needed to achieve optimal performance, and that this would involve repeating the method at least two times over time because *Sinden* discloses that there is an entire library or alphabet of model symbols to which the method of Figure 8 is applicable. EX1005, 1:67-2:2 (“An unknown handwritten symbol written on a digitizing tablet is compared with symbols in a predefined ‘alphabet’ or library of model symbols and the closest match chosen.”); 7:63-66 (“For a user-independent system, the library of model symbols can include all likely variations and combinations of number of strokes, stroke order and stroke direction for each symbol.”)

216. A person having ordinary skill in the art would have further understood that repeating the method of Figure 8 at least two times would constitute “sequentially presenting a plurality of recognized handwritten symbols” because each time the method of Figure 8 is performed, another “closest model symbol” would be displayed, one after another.

217. And as discussed in Section XI.A.1.a, displaying the closest model symbol constitutes “presenting” a “recognized handwritten symbol.”

218. *Sinden* further discloses that the method of Figures 2, 4, and 8 operate for “each handwritten pattern” because *Sinden* discloses recording an individual

vector for an unknown symbol (Section XI.A.1.b), comparing that vector to vectors for a library of model symbols and choosing the closest model symbol (Sections XI.A.1.c(ii), XI.A.1.c(iii)), and then displaying the closest model symbol Section XI.A.1.d. By contrast, *Sinden* does not disclose, for example, choosing a plurality of best model symbols ***and then*** displaying the chosen plurality of best model symbols together in a set. *Sinden*'s methods are therefore performed for each unknown symbol ("each handwritten pattern").

219. Accordingly, a person having ordinary skill in the art would have understood *Sinden* to teach a method with respect to Figure 8 that may be performed two or more times, one after another ("[a] method ... for sequentially presenting a plurality of recognized handwritten symbols") implemented by the system in *Sinden*'s which has a processor and a digitizing tablet or pad ("performed by a handwriting recognition device ... the recognition device having a processor and detection means for detecting entry of a handwritten symbol") each step of the method performed for each unknown symbol ("comprising for each handwritten pattern the steps of:").

b. 15[a]

220. In my opinion, *Sinden* teaches limitation 15[a] for the same reasons discussed in Sections XI.A.1.b.

c. 15[b]

221. In my opinion, *Sinden* teaches the “recognizing” and “comparing” limitations of 15[b] for the same reasons discussed in Sections XI.A.1.c(i) and XI.A.1.c(ii).

222. In my opinion, *Sinden* also teaches the “returning” limitation of 15[b]. As shown in the table below, there are two differences in the claim language between the “returning” limitation of claim 1 and the “returning” limitation of claim 15.

Claim 1	Claim 15
returning a best template selected from the plurality of templates that represents one of the plurality of handwriting symbol patterns as a best handwriting symbol pattern which, according to a predefined rule, is most similar to the handwritten pattern	returning a best interpretation of the handwritten pattern, said best interpretation being based on one of the plurality of handwriting symbol patterns as a best handwriting symbol pattern of a best template selected from the plurality of templates that, according to a predefined rule, is most similar to the handwritten pattern
wherein at least two of the plurality of templates comprise different ones of	wherein at least two of the plurality of templates comprise different ones of

the plurality of handwriting symbol patterns which represent different handwritten ways of handwriting a single symbol; and	the plurality of handwriting symbol patterns which represent different handwritten ways of handwriting a single symbol,
	and wherein the different ones of the plurality of handwriting symbol patterns of said at least two of the plurality of templates return different best interpretations when being most similar to the handwritten pattern; and

223. First, claim 15 recites “returning a best interpretation of the handwritten pattern” rather than “returning a best template” as recited in claim 1. As explained in Section XI.A.1.c(iii), a person having ordinary skill in the art would have understood *Sinden* to teach choosing a closest model symbol (“returning a best template”).

224. *Sinden* discloses “returning a best interpretation of the handwritten pattern” for the same reasons explained in Section XI.A.1.c(iii) because a person having ordinary skill in the art would have understood the ’334 patent to disclose “returning the best interpretation of the handwritten pattern” encompasses “returning a best template.”

225. The '334 patent states that “the term ‘best interpretation’ may according to one embodiment imply ‘the pattern of a best template.’” EX1001, 4:35-39; *see also id.*, claim 19 (“The method according to claim 15, wherein the best interpretation is the handwriting symbol pattern of the best template.”). A person having ordinary skill in the art would have understood that *Sinden*’s “closest model symbol” represents the handwritten pattern of a model symbol that most closely matches the handwritten pattern of the user’s unknown symbol because the model symbols are handwritten patterns. EX1005, 3:42-46 (“Both model symbols and unknown symbols are written into the system by means of pen 10 and pad 11.”). Thus, a person having ordinary skill in the art would have understood that returning the “closest model symbol” also returns the pattern of the closest model symbol. Accordingly, a person having ordinary skill in the art would have understood *Sinden* to disclose choosing the closest model symbol (“returning a best interpretation of the handwritten pattern”).

226. Moreover, a person having ordinary skill in the art would have understood that *Sinden*’s closest model symbol (the “best interpretation of the handwritten pattern”) is “based on one of the plurality of handwriting symbol patterns as a best handwriting symbol pattern of a best template selected from the plurality of templates” because the closest model symbol represents the handwriting symbol pattern of the model symbol, among a plurality of model

symbols, that most closely matches the pattern of the user's unknown symbol. And a person having ordinary skill in the art would have understood that *Sinden's* closest model symbol is selected from a plurality of templates "according to a predefined rule" and is "most similar to the handwritten pattern" for the same reasons discussed in Section XI.A.1.c(iii).

227. The second difference is that claim 15 recites "the different ones of the plurality of handwriting symbol patterns of said at least two of the plurality of templates return different best interpretations when being most similar to the handwritten pattern." As explained in Section XI.A.1.c(ii), *Sinden* also discloses implementing the system with multiple model symbols (i.e., templates) for a single symbol to account for variations in the way that different users write. In my opinion, a person having ordinary skill in the art would have understood *Sinden* to teach implementing the system such that each model symbol is different from every other model symbol, so each "closest model symbol" returned would be different from every other "closest model symbol" returned.

228. This is consistent with how the '334 patent describes this feature. *See* EX1001, 7:52-56 ("The database comprises at least two templates that represent different patterns, which represent different ways of writing a single character. For each template in the database, when being most similar to the handwritten pattern, the device returns a unique best interpretation."). In other words, the '334 patent

explains that each template represents a unique pattern, so when it is determined to be the best match to the handwritten pattern, a different “best interpretation” is returned.

229. Accordingly, a person having ordinary skill in the art would have understood *Sinden* to teach choosing the closest model symbol (“returning a best interpretation of the handwritten pattern, said best interpretation being based on one of the plurality of handwriting symbol patterns as a best handwriting symbol pattern of a best template”) from among an alphabet or library of model symbols (“selected from the plurality of templates”) that has a vector with the highest correlation value (“that, according to a predefined rule, is most similar to the handwritten pattern”) wherein each model symbol represents a variation on how model symbols are written (“wherein the different ones of the plurality of handwriting symbol patterns of said at least two of the plurality of templates return different best interpretations when being most similar to the handwritten pattern”).

d. 15[c]: “presenting the best interpretation.”

230. In my opinion, *Sinden* in combination with *Fujisaki* teaches “presenting the best interpretation.” The difference between limitation 15[c] and 1[c] is that limitation 15[c] requires presenting the “best interpretation” rather than “the best handwriting symbol pattern of the best template” as recited in claim 1.

231. As explained in Section XI.A.5.c, a person having ordinary skill in the art would have understood a “best interpretation” to encompass the pattern of a “best template.”

232. Accordingly, a person having ordinary skill in the art would have understood the *Sinden-Fujisaki* combination to teach this feature for the same reasons explained in Section XI.A.1.d.

- i. **Claim 19: “The method according to claim 15, wherein the best interpretation is the handwriting symbol pattern of the best template, and wherein the step of presenting comprises presenting the best handwriting symbol pattern of the best template on a screen.”**

233. In my opinion, *Sinden* in combination with *Fujisaki* teaches “[t]he method according to claim 15, wherein the best interpretation is the handwriting symbol pattern of the best template, and wherein the step of presenting comprises presenting the best handwriting symbol pattern of the best template on a screen.”

234. As explained in Section XI.A.5.c, a person having ordinary skill in the art would have understood *Sinden* to disclose choosing the closest model symbol (“returning a best interpretation of the handwritten pattern”) and that the closest model symbol represents the handwriting symbol pattern of the model symbol (i.e., template) that most closely matches the pattern of the user’s unknown symbol.

235. As explained in Sections XI.A.1.d and XI.A.5.d, the *Sinden-Fujisaki* combination teaches displaying the handwritten pattern of the closest model symbol (“presenting the best interpretation.”).

236. As explained in Section XI.A.3, a person having ordinary skill in the art would have understood the *Sinden-Fujisaki* combination to teach the pattern corresponding to Sinden’s closest model symbol is displayed as part of a window in box 48 on the screen of *Sinden*’s digitizing tablet or pad.

237. Accordingly, a person having ordinary skill in the art would have understood the *Sinden-Fujisaki* combination to teach displaying the handwritten pattern of the closest model symbol (“wherein the best interpretation is the handwriting symbol pattern of the best template”) on *Sinden*’s digitizing tablet or pad (“and wherein the step of presenting comprises presenting the best handwriting symbol pattern of the best template on a screen.”).

- i. **Claim 20: “The method according to claim 19, wherein each of the plurality of handwriting symbol patterns of a template is represented by geometrical information relating to an appearance of each of said plurality of handwriting symbol patterns.”**

238. In my opinion, *Sinden* in combination with *Fujisaki* teaches this claim for the reasons discussed in Section XI.A.2.

- i. **Claim 26: “The method according to claim 15, wherein the handwritten pattern is entered on an input area on a screen and the best interpretation is presented in a presentation**

area on the screen, whereby said presentation area overlaps the input area.”

239. In my opinion, *Sinden* in combination with *Fujisaki* teaches this claim for the same reasons discussed in Sections XI.A.3 and XI.A.5.c. As explained in Section XI.A.5.c, a person having ordinary skill in the art would have understood “the best interpretation” to encompass the pattern of the best template, i.e., the pattern of *Sinden*’s closest model symbol.

i. Claims 27 and 28: “The method according to claim 15, wherein the step of recognizing comprises returning at least one alternative interpretation. ... wherein the step of presenting comprises presenting the at least one alternative interpretation at the request of a user.”

240. In my opinion, *Sinden* in combination with *Fujisaki* teaches these claims for the same reasons discussed in Sections XI.A.4 and XI.A.5.c. As noted in Section XI.A.5.c, a person having ordinary skill in the art would have understood “the best interpretation” to encompass the pattern of the best template, i.e., the pattern of *Sinden*’s closest model symbol. Relatedly, because the “best interpretation” may be the “pattern of the best template,” a person having ordinary skill in the art would have understood that an “alternative interpretation” may be a pattern of an alternative template.

B. Ground 1B: *Sinden* in Combination with *Fujisaki* and *Collins* Renders Obvious Claims 3, 4, 21, and 22

1. Motivation to modify the *Sinden-Fujisaki* combination in view of *Collins*

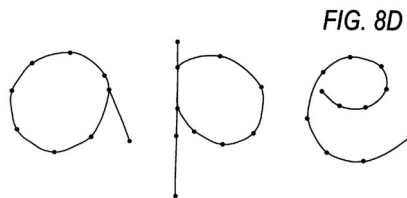
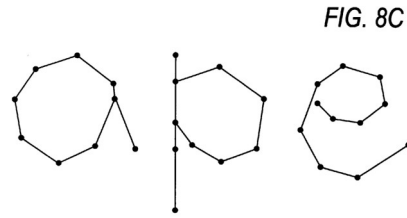
241. *Collins* “relates to the field of formatting handwritten data displayed on computer systems.” EX1007, 1:11-12. As background, *Collins* discloses that, “[g]enerally, a pen-based computer system captures digital ink in the form of many polylines.” *Id.*, 1:57-58. “The system samples points along [] each handwritten stroke or polyline at a predetermined sampling frequency. Those points represent the inputted graphic data and are digitally stored in memory.” *Id.*, 1:66-2:2. “The system derives an image of the graphic data by connecting the stored points with line segments. Thus, each polyline is a collection of the line segments connecting the stored points.” *Id.*, 2:2-5.

242. The problem with the prior art “is the amount of time that is typically required for the system to display, upon the user’s prompt, the digital ink representing the graphic data. Generally, displaying the ink can take several seconds.” *Id.*, 2:19-23. *Collins* notes that some systems draw “into an off-screen bitmap, and then display the bitmap,” and “[t]hese methods and devices can accommodate “instant” screen updates, but they still generally require several seconds to create a bitmap representing the graphic data.” *Id.*, 2:42-46. Thus, the prior art systems are not well suited for allowing a user of a pen-based system to

glance through data fields on the system's display as one would typically flip through pages in an actual paper notebook. *Id.*, 2:48-52.

243. In view of these problems, it is *Collins*' objective "to display pages in a recognizable fashion despite using approximate images in a rapid display or 'fast-flipping' mode and quickly rendering each page upon the user's command." *Id.*, 3:7-10. In sum, *Collins* teaches reducing the set of sample points that are stored by the system so that display can occur more rapidly. *Id.*, 3:35-40 ("Reducing the number of points to be retained facilitates efficient data storage as well as rapid display. Yet, the system can still render and display a recognizable image representing the graphic data based only on the derived set of retained points—without the system ever having to store more points than just the retained points.").

244. *Collins* teaches that the system can initially draw an "approximate rendition" and then apply smoothing techniques to draw a "fully rendered" form. *Id.*, 3:21-29. In Figure 8C, *Collins* shows an "approximate rendition being displayed is the result of simple straight-line connections between the retained points." *Id.*, 13:65-14:1. In Figure 8D, *Collins* shows the fully rendered form of the handwritten word "ape." *Id.*, 14:6-7. Application of smoothing techniques results in a fully rendered form that more closely matches the original curvature of the handwritten graphic data. *Id.*



EX1007, FIGs. 8C and 8D

245. *Collins* further teaches that its system “achieves its speed when ‘flipping pages’ of graphic data by initially rendering the partial bitmap image of a selected page of graphic data. The system then takes any existing machine idle time to perform additional rendering.” *Id.*, 7:25-29. “Depending on the availability of machine idle time, the system prepares renditions of both the next and the prior pages of graphic data off-screen, so that they are ready to be displayed as well. The system also renders a full bitmap image of the graphic data one polyline at a time to prepare a full bitmap image of the current page of graphic data for displaying.” *Id.*, 7:30-35.

246. “Given sufficient idle time, the system renders bitmaps in the following order of decreasing priority: (1) a reduced bitmap of the current page; (2) a reduced bitmap of the next page; (3) a reduced bitmap of the prior page; (4) a full

bitmap of the current page; (5) a full bitmap of the next page; and (6) a full bitmap of the prior page.” *Id.*, 7:37-42.

247. Thus, for example, if the user flips to the next page after the full bitmap of the next page is rendered (assume that the system has completed rendering for priority levels 1 through 5), then:

- (a) the former next page becomes the new current page and the former current page becomes the new prior page;
- (b) the full bitmap of the new current page (former next page) is displayed (having already been rendered for the former next page); and
- (c) the system resumes rendering from the top of the priority chain--here, the systems saves processing time at new priority levels 1, 3, 4, and 6 because it has already rendered a reduced bitmap for the new current page (former next page), a reduced bitmap for the new prior page (former current page), a full bitmap for the new current page (former next page), and a full bitmap for the new prior page (former current page).

Id., 9:7-24.

248. In my opinion, a person having ordinary skill in the art would have considered it obvious to modify the *Sinden-Fujisaki* combination to implement the above-described teachings from *Collins* and would have had a reasonable expectation of success in doing so.

249. A person having ordinary skill in the art would have understood that *Collins*' teachings are applicable to handwriting recognition systems like the *Sinden-Fujisaki* combination because *Collins* discloses that its teachings are applicable to, for example, "Microsoft Windows for Pen™" which "provides certain handwriting recognition algorithms." EX1007, 8:42-58.

250. Moreover, a person having ordinary skill in the art would have understood that handwriting recognition systems need to display graphical data and would benefit from *Collins*' teachings to provide faster rendering of handwriting recognition results. This is true with respect to the *Sinden-Fujisaki* combination because, as explained in Section XI.A.1.d, the combination teaches displaying the pattern of the closest model symbol, which, as explained in Section XI.A.2, is comprised of graphical data including x-y coordinate samples.

251. A person having ordinary skill in the art would have considered the combination to be obvious because it amounted to the use of a known technique (*Collins*' teachings related to rendering graphical data) to a known device (the *Sinden-Fujisaki* combination) ready for improvement (the *Sinden-Fujisaki* device already stores graphical data) to yield predictable results (the *Sinden-Fujisaki-Collins* combination that displays graphical data in accordance with *Collins*' teachings).

252. A person having ordinary skill in the art would have had a reasonable expectation of success in making the combination because it would have been within the skill of an ordinary artisan to program the *Sinden-Fujisaki* combination to render graphical data in accordance with *Collins*' teachings, as corroborated by *Collins* itself. *Collins* expressly states that its disclosure may be applied to handwriting recognition systems, and both *Sinden* and *Fujisaki* are handwriting recognition systems, and *Sinden* already discloses storing its model symbols as a collection of samples of data corresponding to x-y coordinates. *See supra* Section XI.A.2.

2. Claim 3: "The method according to claim 2, wherein the geometrical information comprises information of positions of a number of dots representing the at least one of the plurality of writing symbol patterns, said at least one of the plurality of handwriting symbol patterns being presented by lines drawn between the dots."

253. In my opinion, *Sinden* in combination with *Fujisaki* and *Collins* teaches "[t]he method according to claim 2, wherein the geometrical information comprises information of positions of a number of dots representing the at least one of the plurality of writing symbol patterns, said at least one of the plurality of handwriting symbol patterns being presented by lines drawn between the dots."

254. As explained in Section XI.A.2, a person having ordinary skill in the art would have understood *Sinden* to teach that each model symbol comprises a

vector formed from a sample set of x-y coordinates (“wherein the at least one of the plurality of handwriting symbol patterns of each of the plurality of templates is represented by geometrical information”) and that the x-y coordinates represent a shape or appearance of the symbol in two-dimensional space (“relating to an appearance of said handwriting symbol pattern”).

255. *Sinden* further teaches that sample set of x-y coordinates may be represented as dots. EX1005, 2:30-31 (“FIG. 3 is a diagram showing typical handwritten symbols and the series of dots representing samples taken for such symbols.”). *Sinden* does not expressly disclose that when displaying the pattern represented by closest model symbol, the display is done by drawing lines between the dots. Nevertheless, a person having ordinary skill in the art would have considered it obvious to do so in view of *Collins*. As explained in Section XI.B.1, *Collins* discloses rendering graphical data by straight-line connections between the retained points. A person having ordinary skill in the art would have considered it obvious to apply this teaching to the *Sinden-Fujisaki* combination and would have had a reasonable expectation of success in doing so for the reasons discussed in Section XI.B.1.

256. Accordingly, a person having ordinary skill in the art would have understood the *Sinden-Fujisaki-Collins* combination to teach each model symbol comprises a vector formed from a sample set of x-y coordinates, where each

sample may be represented by dots (“the geometrical information comprises information of positions of a number of dots representing the at least one of the plurality of writing symbol patterns”) and that displaying the handwriting pattern of the closest model symbol involves drawing lines between the dots (“said at least one of the plurality of handwriting symbol patterns being presented by lines drawn between the dots.”).

3. Claim 4: “The method according to claim 1, wherein the step of presenting comprises presenting the whole best handwriting symbol pattern of the best template at once.”

257. In my opinion, *Sinden* in combination with *Fujisaki* and *Collins* teaches “[t]he method according to claim 1, wherein the step of presenting comprises presenting the whole best handwriting symbol pattern of the best template at once.”

258. As explained in Section XI.B.1, *Collins* teaches rendering a bitmap image of a page off-screen, and given sufficient idle time, when the user requests display of the screen, the fully rendered screen will be rendered instantly. Thus, a person having ordinary skill in the art would have understood the *Sinden-Fujisaki-Collins* combination to teach rendering screen 40, including the handwriting pattern of the closest model symbol, off-screen, and displaying the entire handwriting pattern of the closest model symbol instantly.

259. Accordingly, a person having ordinary skill in the art would have understood the *Sinden-Fujisaki-Collins* combination to teach displaying the entire handwriting pattern of the closest model symbol instantly (“wherein the step of presenting comprises presenting the whole best handwriting symbol pattern of the best template at once.”).

4. **Claim 21: “The method according to claim 20, wherein the geometrical information comprises information of positions of a number of dots representing each of the plurality handwriting symbol patterns, said each of the plurality of handwriting symbol patterns being presented by lines drawn between the dots.”**

260. In my opinion, *Sinden* in combination with *Fujisaki* and *Collins* teaches this claim for the reasons discussed in Section XI.B.2.

5. **Claim 22: “The method according to claim 15, wherein the step of presenting comprises presenting the whole best handwriting symbol pattern represented by the best interpretation at once.”**

261. In my opinion, *Sinden* in combination with *Fujisaki* and *Collins* teaches this claim. As explained in Section XI.A.5.c, *Sinden*’s closest model symbol is the claimed “best interpretation,” and the *Sinden-Fujisaki-Collins* combination otherwise teaches this claim for the reasons discussed in Section XI.B.3.

C. Ground 2: *Sinden* in combination with *Fujisaki* and *Sklarew* Renders Obvious Claims 15 and 16

1. Claim 15

262. *Sinden* in combination with *Fujisaki* and *Sklarew* teaches this claim.

As a threshold note, the difference between Ground 2 and Ground 1A with respect to the analysis of claim 15 is that, in Ground 2, I address limitation 15[c] under an interpretation where the “presenting” step in 15[c] occurs after the “retrieving” step recited in dependent claim 16, which states “[t]he method according to claim 15, further comprising, *before the step of presenting*, retrieving as the best interpretation, from a database comprising allographs, a best allograph that is associated with the best handwriting symbol pattern of the best template.” EX1001, 10:39-43. The analysis of limitations 15[pre], 15[a], and 15[b] remains the same as in Ground 1A

a. 15[pre], 15[a], 15[b]

263. In my opinion, *Sinden* teaches 15[pre] and 15[a] for the same reasons discussed in Sections XI.A.5.a, XI.A.5.b, and XI.A.5.c, respectively.

b. 15[c] and Claim 16

264. In my opinion, *Sinden* in combination *Fujisaki* and *Sklarew* teach limitation 15[c] and claim 16.

265. As detailed in Section XI.A.5.c, *Sinden* discloses comparing the user’s handwritten unknown symbol to a library of model symbols and choosing the

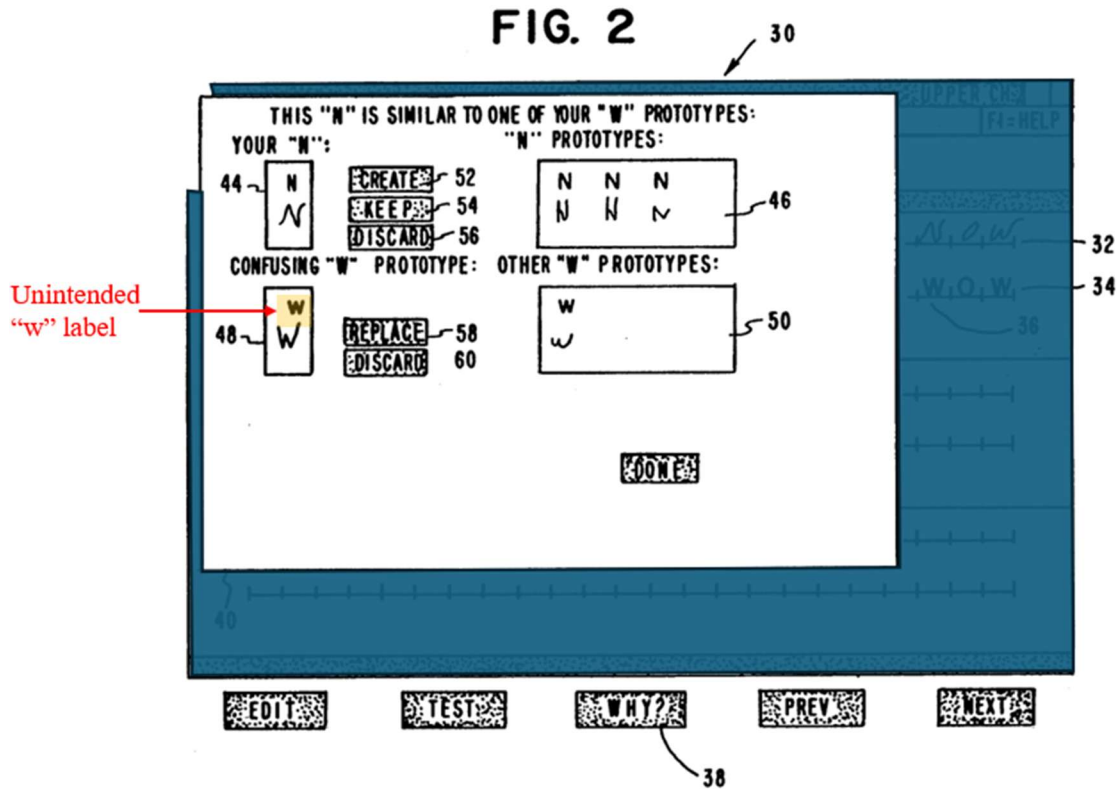
model symbol with the highest correlation value as a closest model symbol (“returning a best interpretation of the handwritten pattern, said best interpretation being based on one of the plurality of handwriting symbol patterns as a best handwriting symbol pattern of a best template”).

266. *Sinden* also discloses that each model symbol is associated with a “corresponding label” or “corresponding letter or number.” EX1005, 3:42-51 (“The system is essentially ‘trained’ by writing in at least one model for each symbol that the system is expected to recognize and associating the samples recorded for that model symbol with a corresponding label. Thus, if it is desired for the system to be able to recognize alphanumeric characters, models for each character are so written and associated with the corresponding letter or number.”).

267. Moreover, *Sinden* discloses that the “closest model symbol” is displayed (EX1005, 8:8-12), but *Sinden* does not detail how the closest model symbol is displayed, or if it includes displaying the label with which the closest model symbol is associated.

268. *Fujisaki* teaches, in a similar handwriting recognition system, that after the recognized character is identified, the recognized character is displayed. EX1006, 4:49-53 (“Recognized characters are output from the matcher 18 via line 19 to tablet and display 12 to display the recognized characters”). And as shown in *Fujisaki* Figure 2, below, *Fujisaki* teaches displaying the unintended

label “w” in the box 48. EX1006, 5:44-46. Thus, a person having ordinary skill in the art would have understood *Fujisaki* to teach displaying the label with which the matched prototype is associated.



Fujisaki FIG. 2 (annotated)

269. *Fujisaki*’s unintended label “w” is consistent with how the ’334 patent describes a “best allograph” that is “associated with the pattern of the best template.” EX1001, 4:5-10. The ’334 patent states that “[t]he word ‘allograph’ denotes a symbol having a particular shape” and that “[a]n allograph is used for presenting an interpretation based on the pattern of a template on a screen.” EX1001, 4:15-20; 7:56-60 (“The best interpretation intended for presentation may

be retrieved from a database of allographs. The best template will return a pointer to the allograph that is to be retrieved. The allographs may be prepared for being presented.”). A person having ordinary skill in the art would have understood that *Fujisaki*’s displayed unintended label “w” is an “allograph” because it a symbol with a particular shape and is used for presenting an interpretation based on the pattern of a prototype.

270. A person having ordinary skill in the art would have considered it obvious to combine the teachings of *Sinden* and *Fujisaki* and would have had a reasonable expectation of success in doing so for the same reasons discussed in Section XI.A.1.d. In sum, a person having ordinary skill in the art would have recognized that *Sinden* provides few implementation details for its training mode, and a person having ordinary skill in the art looking to implement *Sinden*’s training mode would have been motivated to consider references that disclose such details would have readily identified *Fujisaki*’s techniques as a suitable implementation, as *Fujisaki* is specifically directed to techniques for implementing a training program like *Sinden*’s training mode. The *Sinden-Fujisaki* combination teaches displaying the unintended label with which *Sinden*’s closest model symbol is associated.

271. Neither *Sinden* nor *Fujisaki* explicitly describe a “database of allographs” or otherwise detail the mechanism by which the label associated with

Sinden's closest model symbol would be retrieved for display. To the extent a person having ordinary skill in the art required additional implementation details for this feature, a person having ordinary skill in the art would have readily identified *Sklarew*.

272. *Sklarew* is discussed in the background section of *Fujisaki*. EX1006, 3:29-47. It relates to "a keyboardless input system to a computer" (EX1008, 1:25-28), "which has the ability to recognize and display Handwritten Symbols and cause the computer to display Font Symbols" (*id.*, 3:15-20). *Sklarew* discloses establishing a database that stores the association between Handwritten Symbols and font symbols. *Id.*, 5:35-36; *see also id.*, 33:56-67 ("1. A handwritten symbol recognition apparatus comprising: ... a database for storing a characteristic of a handwritten symbol previously written or drawn by an individual user to correspond to a given font symbol."). "For example, if using the Roman alphabet, the ... twenty-six letters of the alphabet and the numerals from 0 to 9 would be inserted into the database." *Id.*, 11:5-8. The computer will also "store a suitable array of Font Symbols for conversion of the Handwritten Symbols." *Id.*, 11:12-14.

273. *Sklarew* explains that, in operation, the user's input is recorded into strokes and compared with "previously entered strokes accumulated into a database, and determines [if] the Stroke is represented by a symbol in the database." *Id.*, 13:2-5. "If a match is found (if the Font Symbol represented by the

Strokes is recognized), ..., microprocessor 50 (FIG. 4) causes the symbol to be sent to display screen 20 (FIG. 4) as indicated in processing box 86.” *Id.*, 13:5-9. A person having ordinary skill in the art would have understood the microprocessor causing the font symbol to be sent to the display to include retrieving the font symbol from the database to display because that is where *Sklarew* teaches that the font symbols are stored.

274. A person having ordinary skill in the art would have understood that *Sklarew*’s “font symbols” correspond to the “label” associated with *Sinden*’s model symbols because they are the alphanumeric character to which each of *Sklarew*’s handwritten symbols correspond, which is the same thing as *Sinden*’s label. A person having ordinary skill in the art would have further understood *Sklarew*’s database associating handwritten symbols to font symbols to be a “database of allographs” because it is a database that stores “symbol[s] having a particular shape,” i.e., the handwritten symbols and font symbols.

275. A person having ordinary skill in the art would have considered it obvious to implement *Sklarew*’s teachings related to establishing a database that associates handwritten symbols to font symbols in the *Sinden-Fujisaki* combination for the purpose of retrieving the label with which *Sinden*’s closest model symbol is associated. Based on my background and experience, a person having ordinary skill in the art would have considered a database, as taught by *Sklarew*, to be a

suitable implementation for storing the association between *Sinden*'s model symbols and their corresponding labels because databases were a common data structures used in software for handwriting recognition systems to maintain the relationship between different data items. Thus a person having ordinary skill in the art found the combination obvious because it amounted to the use of a known technique (a database relating handwritten symbols to font symbols) to improve similar devices (the *Sinden-Fujisaki* combination) in the same way (to provide a database for storing labels and their corresponding model symbols).

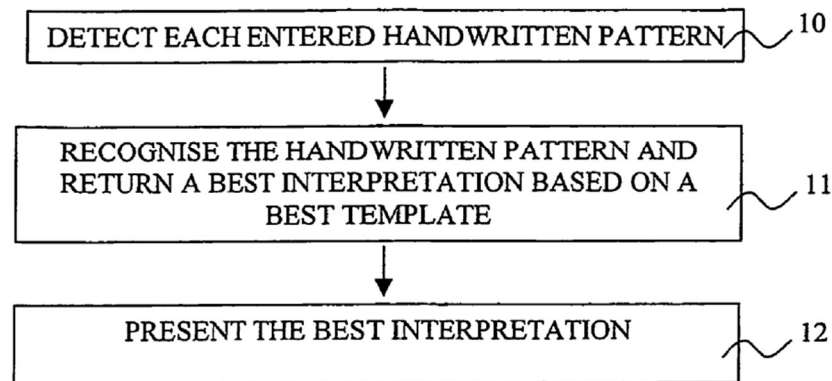
276. A person having ordinary skill in the art would have had a reasonable expectation of success in making the combination because *Sinden* and *Sklarew* disclose similar handwriting recognition systems and *Sklarew* demonstrates that it would have been within the skill of a person having ordinary skill in the art to implement such a database in the *Sinden-Fujisaki* combination.

277. Thus, the *Sinden-Fujisaki-Sklarew* combination teaches a processor that returns a closest model symbol and displays the label associated with the closest model symbol, and before displaying the label, retrieves the label from a database that stores handwriting symbols and associated labels. This is consistent with how the '334 patent describes claims and 15 and 16.

278. In particular, the '334 patent discloses a method in which a handwritten pattern is detected, the pattern is compared to templates in a database,

and a “best interpretation” is returned. EX1001, 7:42-48. “Thereafter, the best interpretation is presented on the screen.” *Id.*, 7:48-49.

Fig 2



EX1001, FIG. 2

279. The '334 patent further states that “[t]he best interpretation intended for presentation may be retrieved from a database of allographs. The best template will return a pointer to the allograph that is to be retrieved.” *Id.*, 7:56-58. The '334 patent also explains that the “‘best interpretation’ may ... imply ‘the pattern of a best template.’” *Id.*, 4:41-43. Thus, taken as a whole, a person having ordinary skill in the art would have understood the '334 patent to disclose an embodiment including the steps of (1) returning the pattern of a best template (i.e., a best interpretation), (2) retrieving an allograph associated with the best template to be the “best interpretation” for purposes of presentation, and (3) presenting the retrieved allograph. A person having ordinary skill in the art would have

understood that this embodiment is encompassed by limitation 15[c] and claim 16 and rendered obvious by the combined teachings of *Sinden*, *Fujisaki*, and *Sklarew*.

280. Accordingly, a person having ordinary skill in the art would have understood the *Sinden-Fujisaki-Sklarew* combination to teach that before displaying the label associated with *Sinden*'s model symbol, the processor obtains from a database of associating *Sinden*'s model symbols and labels ("before the step of presenting, retrieving ..., from a database comprising allographs") the label corresponding to *Sinden*'s closest model symbol ("a best allograph that is associated with the best handwriting symbol pattern of the best template.") and then displaying the label ("presenting the best interpretation").

XII. SECONDARY CONSIDERATIONS

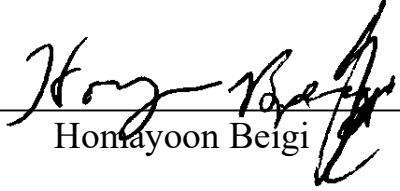
281. I am not aware of any evidence in the '334 patent's prosecution history or elsewhere supporting any secondary considerations arguments, or evidence of nexus of such alleged evidence to the Challenged Claims. *See generally* EX1004. To the extent Patent Owner asserts the existence of any secondary considerations in its responses, I reserve the right to address any such evidence.

XIII. CONCLUSION

I declare that all statements made herein of my knowledge are true, that all statements made on information and belief are believed to be true, and that these

statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Executed on: Feb. 9, 2025



Homayoon Beigi