36/40

DT07 Rec'd PCT/PTO 15 FEB 2005

GOOFORM PTO-1390 U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE
REV. 2/01T

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

CUSTOMER NO. 22,852
ATTORNEY'S DOCKET NUMBER
08806.0174
U.S. APPLICATION NO. (If known, see 37CFR1.5)
10/524430

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/SE2003/001226	18 July 2003	16 August 2002

TITLE OF INVENTION
PRESENTING RECOGNISED HANDWRITTEN SYMBOLS

APPLICANT(S) FOR DO/EO/US
Erika OKNELID and Magnus PERSSON

Applicant(s) herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c)(2)).
   a. ☒ is attached hereto (required only if not communicated by the International Bureau.
   b. ☐ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed with the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U.S.C. 371 (c)(2)).
   a. ☐ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154 (d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3)).
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☐ have been communicated by the International Bureau.
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   d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. ☒ Information Disclosure Statement under 37 CFR 1.97 and 1.98
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A Substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821-1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154 (d)(4).
19. ☐ A second copy of the English language translation of the international application 35 U.S.C. 154 (d)(4).
20. ☒ Other items or information:
   a. ☒ Copy of cover page of International Publication No. WO2004/017253 A1
   b. ☐ Copy of Notification of Missing Requirements.
   c. ☐

Samsung v. Cerence
IPR2025-00457
Exhibit 1004

U.S. APPLICATION NO. (If known, see 37CFR 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
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21. ☒ The following fees are submitted:		Applicant Use	Office Use Only
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):	$300.00	$300.00	
National Stage Search Fee	$500.00	$500.00	
National Stage Examination Fee	$200.00	$200.00	
ENTER APPROPRIATE BASIC FEE AMOUNT =		$1000.00	
☐ Additional fee for specification and drawings filed in paper over 100 sheets (excluding sequence listing or computer program listing filed in an electronic medium). The fee is **$250** for each additional 50 sheets of paper or fraction thereof.			

Total Sheets	Extra Sheets	Number of additional 50 or fraction thereof (rounded **up** to a whole number	Rate		
30 - 100 =	/50=	0	x 250.00	$	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).				$	

CLAIMS	NUMBER FILED		NUMBER EXTRA	RATE		
Total Claims	34	- 20 =	14	x $50.00	$700.00	
Independent Claims	4	-3 =	1	x $200.00	$200.00	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)				+$360.00	$	
TOTAL OF THE ABOVE CALCULATIONS =					$1900.00	
☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by ½.					$	
SUBTOTAL =					$1900.00	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest priority date (37 CFR 1.492(f)).					$	
TOTAL NATIONAL FEE =					$ 1900.00	
Fee for recording the enclosed assignment (37 CFR 1.21 (h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property. +					$	
TOTAL FEES ENCLOSED =					$ 1900.00	
				Amount to be refunded:	$	
				charged:	$	

a. ☒ A check in the amount of $ 1900.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 06-0916. A duplicate copy of this sheet is enclosed.

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P.
1300 I Street, N.W.
Washington, D.C. 20005-3315

DATED: February 15, 2005

David
Reg. No. 34,731
SIGNATURE
for Bryan C. Diner, Reg. No. 32,409
NAME/REGISTRATION NO.

36/40

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Reg. No. 34,731
SIGNATURE
for Bryan C. Diner, Reg. No. 32,409
NAME/REGISTRATION NO.

PRESENTING RECOGNISED HANDWRITTEN SYMBOLS

Technical Field of the Invention

This invention relates to a method for presenting a recognised handwritten symbol. The invention also relates to a method for sequentially presenting a plurality of recognised handwritten symbols. Further, the invention relates to a device for recognition and presentation of a handwritten symbol and a device for sequentially recognising and presenting a plurality of handwritten symbols.

Background of the Invention

Today, portable data handling devices are becoming increasingly popular. These data handling devices are e.g. PDAs (Personal Digital Assistants), mobile phones and portable computers.

In handheld devices, and to some extent even in regular stationary computers, the text insertion unit, such as keyboards, is more and more often replaced by some kind of device for recognition of a handwritten symbol. A common solution is to arrange a pressure-sensitive area on a screen where a user can write characters. The characters are then interpreted and processed by the portable device and thereafter presented on the screen.

Usually, a handwritten character entered on a detection device is interpreted and recognised by means of templates. Every template is associated with an image in a font, which after recognition is presented on the screen. Even though the way of writing a character may vary, a correct recognition is enabled by the use of more than one template for the character. These templates are associated with the same image in the font. Thus, it is always the same image that is presented after interpretation of one handwritten character no matter how

it is written. Such a method is disclosed in US 5,732,152 where the handwritten character that is entered is recognized and the recognition result is displayed in two areas as an image from a font, as shown in Figs 5 and 6 in said US-patent. The recognition will sometimes misinterpret the handwritten character, and an image that visualise an incorrect character will be displayed. In such cases, the user is not able to analyse why the recognition was incorrect. This will cause irritation to the user, especially if a character is commonly being misinterpreted.

Another way of using the above described method of presenting the character on the screen as an image from a font after interpretation is described in US 2001/0026262. A method of presenting a message in a way that reflects the way the user writes is disclosed. The entered message is interpreted and thereafter the recognised characters in the message are displayed as images from a selected font that reflects the handwriting of the user. The selection of the font is done one time for all the characters of the whole message. The selection of a font may be done after the first character or after a number of characters. The latter makes it easier to find the font that gives the best resemblance with the characteristics of the handwritten characters. The font may be a regular font, such as Comic sans MS, or a new font created on the basis of the handwritten input.

This method presents characters in a way that reflects the personal characteristics of a user's handwriting. However, it does not give feedback to the user as to how and why the device interprets the character the way it does.

To conclude, a user will not get any help in understanding why the character was misinterpreted using these methods. As a result, he will never know how to change the way he is writing to fasten the process of receiving the correct interpretation directly. This will

lead to ineffectiveness and time-consuming corrections of the misinterpreted characters.

Summary of the Invention

It is an object of the present invention to remedy at least some of the problems of known techniques. It is a specific object of the invention to provide a presentation of a handwritten symbol on a screen that gives feedback to the user regarding the recognition of the symbol.

The objects of the invention are achieved by methods according to claims 1 and 15 and by devices according to claims 33 and 34. Specific embodiments of the invention are defined by the dependent claims 2-14 and 16-32.

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.

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.

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.

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.

Thanks to the invention, a pattern that is graphically most similar to the pattern entered by a user is presented. Since the user is aware of that each symbol may be presented as one of several patterns representing different ways of writing this symbol, the presented pattern will give feedback to the user as to how the pattern used for recognition looks like, i.e. the appearance of the pattern that was judged to be most similar to the handwritten pattern. If the presented pattern is not representing the symbol the user intended to write the user can see which incorrect pattern that was found to be most similar to the handwritten pattern. Since the user can see how the misinterpretation occurred the irritation to him will reduce. In prior art, when the handwritten pattern is misinterpreted, this presented pattern may often be quite different to the handwritten pattern, but according to the invention the presented pattern may show greater similarities with the handwritten pattern. If the presented pattern represents the symbol the user intended to write he is able to learn how to write a pattern in order for the recognition to correctly interpret the pattern. Accordingly, the user becomes more aware of how the pattern is interpreted and the feedback will thereby make the user improve his skills in entering a pattern in the right way to be sure that the presented pattern as often as possible is the one he intended to write. Thus, entering a handwritten pattern and receiving the correct best interpretation is made more efficient, as the average time period measured from the handwritten pattern being entered until the

correct interpretation is presented is reduced. Further, the handwriting of the user will be reflected in the presented pattern. This will give a more personal touch to the pattern thus making it more pleasing for the user.

In the context of this application, the word "symbol" is defined as any symbol that could be interpreted by the device, i.e. having a meaning to the device. The symbol could thus be an alphabetic character as the ones used in e.g. Latin or Greek, a syllabographic character as e.g. Japanese Hiragana/Katagana character or Korean Hangul character, a logographic character as Chinese Hanzi character, Japanese Kanji character and Korean Hanja character, or any other kind, an Arabic number, a sign, a figure, or any other picture having a meaning to the device. As used herein, the term "character" means a letter, number or other mark or sign used in writing or printing. The symbol could also be a sign or gesture that is interpreted as space, delete or return. The symbol could also be an abbreviation for a longer, commonly entered phrase or word. For example, a symbol of two merged letters which are a person's initials may represent the person's whole name. A pattern is a specific way of writing a symbol, i.e. a pattern has a certain appearance. Thus, for every symbol there may exist many patterns. Further, an arc is defined as a whole or a segment of a pattern. Thus, an arc may be curved or straight, or have any other form needed to provide a pattern. Further, 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. 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. However, a template for every single way of writing a symbol may not be needed in order to correctly recognise the handwritten pattern and to reflect the handwriting of the user.

According to an embodiment of the method according to the second aspect of the invention, the method further comprises, before the step of presenting, retrieving as the best interpretation, from a database comprising allographs, a best allograph that is associated with the pattern of the best template. The database comprises at least two allographs depicting two different ways of writing a single symbol. The at least two allographs correspond to different best interpretations when being most similar to the handwritten pattern. The number of allographs may be the same as or fewer than the number of templates for a certain symbol. The word "allograph" denotes a symbol having a particular shape. Thus, a certain symbol may be represented by several allographs, each representing seperate ways of writing the symbol. An allograph is used for presenting an interpretation based on the pattern of a template on a screen.

According to another embodiment, the step of presenting comprises presenting the best allograph represented by a bitmap image depicting the way of writing the pattern of the best template.

According to a further embodiment, the step of presenting comprises presenting the best allograph represented by a number of arcs depicting the way of writing the pattern of the best template. Thus, the arcs may all be presented at once or may be presented one at a time. Presenting the arcs one at a time may make it possible to present the time information of the pattern. The time information may either be presented as how the user wrote the pattern or how the user should write the pattern to make it easier for the recognition to correctly interpret the pattern.

According to another embodiment, the best interpretation is the pattern of a best template, and wherein the step of presenting comprises presenting the pattern of the best template on the screen. In this case, the best interpretation is directly acquired when a best

template is determined, since the pattern of the best template may be directly output for presentation on the screen. Thus, as used hereinafter, the term "best interpretation" may according to one embodiment imply "the pattern of a best template".

According to an embodiment of the methods according to both the first and the second aspect of the invention, the pattern of a template is represented by geometrical information relating to the appearance of said pattern. The geometrical information allows the template to be compared to a handwritten pattern.

According to an embodiment, the geometrical information comprises information of positions of a number of dots representing the pattern, said pattern being presented by drawing lines between the dots. In this case, the pattern is represented by positions of discrete dots, which may easily be compared to a handwritten pattern. However, the pattern of the template may still be presented on a screen.

According to another embodiment, the step of presenting comprises presenting the whole pattern represented by the best interpretation at once. Thus, the user immediately sees what the interpreted pattern looks like. Consequently, the user does not have to wait for the interpretation to be presented, thereby reducing the time before the user can decide if it was the correct interpretation or not.

Alternatively, the step of presenting comprises presenting the lines one at a time. Thus, the best interpretation may be presented either in the way the user wrote the handwritten pattern or in the way the pattern is represented by the template. According to the latter alternative, the user is shown how the pattern should be written to make it easier for the recognition to correctly interpret the pattern. Consequently, the user will see how he wrote or should write the pattern.

According to an embodiment, the method further comprises, before the step of presenting, manipulating the pattern represented by the best interpretation according to characteristics of the handwritten pattern. Consequently, the presented pattern is looking even more similar to the handwritten pattern. This implies that the interpretation presented to the user will reflect the characteristics of the user's handwriting giving a personal touch to the presented patterns. As long as the manipulated best interpretation is the correct one the recognition tolerates the way the user writes the symbol.

According to a further embodiment, the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling. Thereby, the user may vary the way of writing the symbol with respect to the position of the symbol, the rotation of the symbol, the slant of the symbol and the magnitude of the symbol and still a very similar recognised interpretation may be presented on the screen. This may also show the user how a misinterpretation may occur due to manipulation of the pattern of an incorrect template being very similar to the handwritten pattern.

According to another embodiment, the handwritten pattern is entered on an input area on the screen and the best interpretation is presented in a presentation area on the screen, wherein the presentation area is overlapping the input area. Thus, the user will focus on the input area when he enters the handwritten pattern and will then look at the presentation area to see the best interpretation of the pattern. Since the presentation area overlaps the input area, the user will not have to constantly shift focus between the input area and the interpretation area. Therefore, his eyes will not be wandering during input, which speeds up the input and makes the input more convenient.

According to an embodiment, the step of recognising comprises returning at least one alternative interpretation. Consequently, the invention provides a possibility of choosing an alternative interpretation, if the best interpretation was not correct, without trying to enter the pattern again.

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, re-entering of the pattern could be avoided.

According to an embodiment, each interpretation is associated with a category defining what kind of symbol is represented by the interpretation. A category may for example be numbers, alphabetic characters, syllabographic characters, logographic characters, a combination of numbers and characters, etc.

According to a further embodiment, the step of presenting comprises masking the presentation of the presented interpretation according to which category the presented interpretation is associated with. Thus, it is easier for the user to make sure that the pattern has been correctly identified. This may help a user in distinguishing between e.g. the Latin letter "O" and the Arabic numeral "0" (zero). Since the masking is selected according to the category of the symbol, it may help the user to determine if the correct symbol has been presented.

This is especially helpful in those cases when different symbols may be written in the same way or nearly the same way. Thus, using only the information

from the specific pattern it may be difficult or even impossible to identify the correct symbol. When a number of symbols are presented it may be helpful for a user to be provided with information concerning the categories of symbols presented, so that he can rapidly and easily determine that the correct symbols are presented.

The masking may of course be done on both the best interpretation and on the alternatives to make it even easier to control if the best interpretation is the correct one and to more easily change interpretation if the presented best interpretation is incorrect. The masking may also be done on presented patterns when the handwritten pattern is difficult to interpret. The masking may either be predetermined by the device or the user may select the type of masking that should be applied to the different categories of symbols.

The category may be indicated by a certain colour of a background to the pattern represented by the presented interpretation.

Alternatively, the category may be indicated by a certain colour of the pattern represented by the presented interpretation. Hereby, an easily applicable, and easily recognisable masking is presented, which does not need to imply any manipulation of the pattern per se.

According to an embodiment, the means for detecting the handwritten pattern may be the screen. The screen may then be sensitive to handwriting for detection of a handwritten pattern entered on the screen. This makes it easier and more comfortable for the user to enter the handwritten pattern since he does not need any additional devices for entering the pattern.

The means for detecting may of course be any other means that is capable of detecting a handwritten pattern, such as a separate screen, a scanner for detecting patterns written on a piece of paper, or an intelligent pen incorporating a camera for detection of a handwritten pattern.

Brief description of the Drawings

Other features and advantages of the present invention will become apparent from the following detailed description of presently preferred embodiments, taken in conjunction with the accompanying drawings, which by way of example show embodiments of the invention.

Fig. 1 is a flowchart of a method according to the invention.

Fig. 2 is a flowchart of another method according to the invention.

Figs 3a and 3b show screen views of presenting an interpretation of a handwritten pattern according to the present invention.

Fig. 4 shows a screen view of masking of presented interpretations and displaying alternatives according to the present invention.

Fig. 5 shows a screen view of different ways of manipulation according to the present invention.

Fig. 6 shows a schematic view of a device according to the invention.

Detailed Description of Preferred Embodiments of the Invention

Referring to Fig. 1, a method according to the invention for presenting a recognised handwritten symbol will be described. The symbol may be any symbol that could be interpreted by the device, in which it is to be recognised in, such as a character, a sign, a figure, or any other symbol. All though other characters or other objects may be entered, as previously mentioned, this description is made with reference to Latin characters and Arabic numerals.

The handwritten pattern may be entered in different ways, such as on a screen of a device for recognition, which screen is sensitive to handwriting, on a separate

handwriting sensitive screen or on any other means that is capable of detecting a handwritten pattern. This description is, however, only made with reference to a sensitive screen on the recognition device.

First, a handwritten pattern is entered by the user on the screen of the recognition device. Then, the entered pattern is detected, step 1.

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.

Referring to Fig. 2, a method according to the invention for presenting a plurality of recognised handwritten symbols will be described. Handwritten patterns are entered on the screen of the device. Each handwritten pattern is detected, step 10. Then, each pattern is sequentially and individually recognised by comparing it to templates in a database, whereby a best interpretation is returned, step 11. Thereafter, the best interpretation is presented on the screen, step 12. The best interpretation is based on the pattern of the best template that is most similar to the handwritten pattern according to a predefine rule. 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. 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.

Figs 3a and 3b show screen views 30a, b before and after interpretation of the handwritten pattern, respectively. Fig. 3a shows a handwritten pattern 32a after the user has entered it on the screen in his personal writing style and before the pattern has been interpreted. The pattern is entered on an input area 34a on the screen which is sensitive to handwriting. 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 according to the way the user wrote the pattern, which is explained in further detail below with reference to Fig. 5. After manipulation and recognition, as shown in Fig. 3b, the manipulated best interpretation 32b is presented in a presentation area 34b. As shown in Figs 3a and 3b, the interpretation may be manipulated such that there is almost no difference between the handwritten pattern and the presented interpretation.

In Fig. 4 a screen view 40 is shown depicting how the alternatives 42 may be presented and how the pattern of the best interpretation 44 and/or the alternatives may be masked. 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. The alternative interpretations 42 are displayed

automatically by marking the best interpretation. Thereafter, the user may select the alternative interpretation that is the correct interpretation of his handwritten pattern.

Further, the best interpretation 44 and the alternatives 42 are masked by means of different shadings on the background. In this particular example, the user wrote the Latin character "o", and the best interpretation 44 was returned as a pattern depicting this character "o". The alternatives presented show i.a. an alternative interpretation 42a depicting the numeral "0" (zero), which is similar to the character "o". Since the alternative interpretation 42a, i.e. the numeral "0", is of another category than the best interpretation 44, i.e. the character "o", the interpretations have different shading on their backgrounds. The user will then be able to select between the alternatives and may easily distinguish between similar characters of different category. A different masking may also be used when the recognition returns an interpretation which is not very similar to the handwritten pattern, i.e. when the device has difficulties to interpret the handwritten pattern. Consequently, the user will be aware of the uncertainty of the presented interpretation.

In Fig. 5 a screen view 50 with examples of different ways of manipulating a character is shown. The first pattern 51 shows how a pattern would look like if it was not manipulated. If the user writes patterns that are wide the presented pattern 52 should reflect this. The writer could also write smaller, larger, or slanted patterns and the presented pattern 53, 54 and 55, respectively, will reflect these variations. Referring to Fig. 6, a device 60 according to the invention comprises a means 62 for detecting a handwritten pattern, e.g. a pressure-sensitive screen. The screen 62 is connected to a processor 64 for recognition of the detected handwritten pattern. The processor 64 uses a database 66

of templates for comparison to the handwritten pattern, and the recognition returns a best template. The processor 64 then returns a best interpretation based on this template as described above. Further, the device 60 may present the best interpretation on a screen 68, which may be the same screen that is used for detecting the handwritten pattern. In another embodiment the database may also comprise allographs that may be presented on the screen as the best interpretation.

It should be emphasised that the embodiments described herein is in no way limiting and that many alternative embodiments are possible within the scope of protection defined by the appended claims. For example, the alternative interpretations must not be displayed only when marking the best interpretation. They may automatically be displayed together with the best interpretation or they may be displayed after the user has used a means for requesting a presentation of the alternatives.

CLAIMS

1. A method for presenting a recognised handwritten symbol, comprising the steps of:

detecting a handwritten pattern that is entered by a user,

recognising the detected handwritten pattern, wherein said step of recognising comprises comparing the handwritten pattern to templates representing ways of writing symbols, and 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 comprise different patterns which represent different ways of writing a single symbol, and

presenting the pattern of the best template on a screen.

2. The method according to claim 1, wherein the pattern of a template is represented by geometrical information relating to the appearance of said pattern.

3. The method according to claim 2, wherein the geometrical information comprises information of positions of a number of dots representing the pattern of the template, said pattern being presented by lines drawn between the dots.

4. The method according to any one of claims 1-3, wherein the step of presenting comprises presenting the whole pattern of the best template at once.

5. The method according to claim 3, wherein the step of presenting comprises presenting lines one at a time.

6. The method according to any one of the preceding claims, further comprising, before the step of

presenting, manipulating the pattern of the best template according to characteristics of the handwritten pattern.

7. The method according to claim 6, wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slantand scaling.

8. The method according to any one of the preceding claims, wherein the handwritten pattern is entered on an input area on the screen and the pattern of the best template is presented in a presentation area on the screen, wherein said presentation area is overlapping the input area.

9. The method according to any one of the preceding claims, wherein the step of recognising comprises returning at least one alternative template.

10. The method according to claim 9, wherein the step of presenting comprises presenting the pattern of the at least one alternative template at the request of a user.

11. The method according to any one of the preceding claims, wherein each template is associated with a category defining what kind of symbol is represented by the template.

12. The method according to any one of the preceding claims, wherein the step of presenting comprises masking the presentation of the presented template pattern according to which category the template is associated with.

13. The method according to claim 12, wherein the category is indicated by a certain colour of a background to the presented template pattern .

14. The method according to claim 12, wherein the category is indicated by a certain colour of the presented template pattern.

15. A method for sequentially presenting a plurality of recognised handwritten symbols, comprising for each handwritten pattern the steps of:

detecting the handwritten pattern that is entered by a user,

recognising the detected handwritten pattern, wherein said step of recognising comprises comparing the handwritten pattern to templates representing ways of writing symbols and returning a best interpretation of the handwritten pattern, said 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 comprise different patterns which represent different ways of writing a single symbol, and wherein the patterns of said at least two templates return different best interpretations when being most similar to the handwritten pattern, and

presenting the best interpretation on a screen.

16. The 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 pattern of the best template.

17. The method according to claim 16, wherein the step of presenting comprises presenting the best

allograph represented by a bitmap image depicting the way of writing the pattern of the best template.

18. The method according to claim 16, wherein the step of presenting comprises presenting the best allograph represented by a number of arcs depicting the way of writing the pattern of the best template.

19. The method according to claim 15, wherein the best interpretation is the pattern of a best template, and wherein the step of presenting comprises presenting the pattern of the best template on the screen.

20. The method according to claim 19, wherein the pattern of a template is represented by geometrical information relating to the appearance of said pattern.

21. The method according to claim 20, wherein the geometrical information comprises information of positions of a number of dots representing the pattern, said pattern being presented by lines drawn between the dots.

22. The method according to any one of claims 15-21, wherein the step of presenting comprises presenting the whole pattern represented by the best interpretation at once.

23. The method according to claim 21, wherein the step of presenting comprises presenting the lines one at a time.

24. The method according to any one of claims 15-23, further comprising, before the step of presenting, manipulating the pattern represented by the best interpretation according to characteristics of the handwritten pattern.

25. The method according to claim 24, wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling.

26. The method according to any one of claims 15-25, wherein the handwritten pattern is entered on an input area on the screen and the best interpretation is presented in a presentation area on the screen, whereby said presentation area is overlapping the input area.

27. The method according to any one of claims 15-26, wherein the step of recognising comprises returning at least one alternative interpretation.

28. The method according to claim 27, wherein the step of presenting comprises presenting the at least one alternative interpretation at the request of a user.

29. The method according to any one of claims 15-28, wherein each interpretation is associated with a category defining what kind of symbol is represented by the interpretation.

30. The method according to any one of claims 15-29, wherein the step of presenting comprises masking the presentation of the presented interpretation according to which category the best interpretation is associated with.

31. The method according to claim 30, wherein the category is indicated by a certain colour of a background to the pattern represented by the presented interpretation.

32. The method according to claim 30, wherein the category is indicated by a certain colour of the pattern represented by the presented interpretation.

33. A device for recognition of a handwritten symbol, said device comprising

a screen,

means for detecting a handwritten pattern,

a database comprising templates that comprises patterns representing ways of writing symbols, wherein at least two templates comprising different patterns which represent different ways of writing a single symbol,

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,

wherein said device is arranged to present the pattern of the best template on the screen.

34. A device for recognition of a plurality of handwritten symbols, said device comprising

a screen,

means for detecting a handwritten pattern,

a database comprising templates that comprises patterns representing ways of writing symbols, wherein at least two templates comprising different patterns which represent different ways of writing a single symbol,

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, wherein the patterns of said at least two templates return different best interpretations when being most similar to the handwritten pattern,

wherein said device is arranged to present the best interpretation on the screen.

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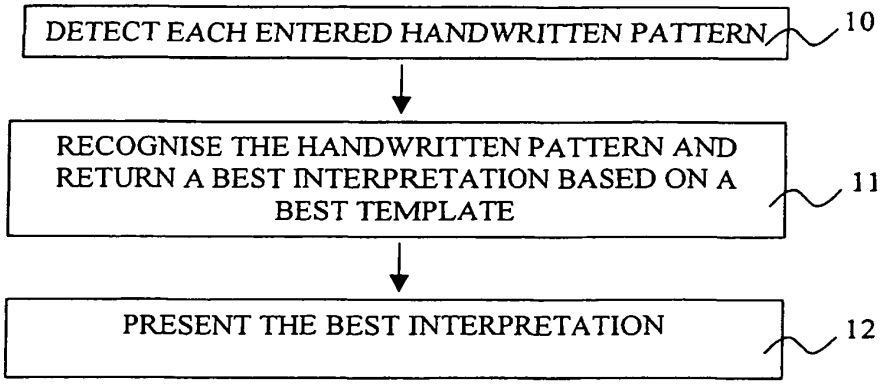
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Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE,*

[Continued on next page]

(54) Title: PRESENTING RECOGNISED HANDWRITTEN SYMBOLS



(57) Abstract: A method for presenting recognised handwritten symbols comprises the steps of recognising the detected handwritten pattern. The step of recognising comprises comparing the handwritten pattern to templates representing ways of writing symbols and returning a best interpretation of the handwritten pattern, said best interpretation being based on the pattern of a best template. At least two templates comprise different patterns which represent different ways of writing a single symbol, and the patterns of the at least two templates return different best interpretations when being most similar to the handwritten pattern. The method further comprises the step of presenting the pattern of the best template on a screen. A device for implementing the method is also disclosed.

WO 2004/017253 A1

DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

— *of inventorship (Rule 4.17(iv)) for US only*

Published:

— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Fig 1

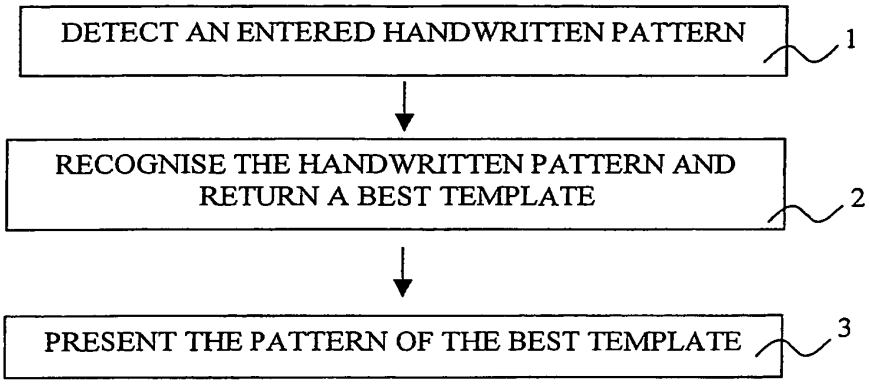

DETECT AN ENTERED HANDWRITTEN PATTERN
1
RECOGNISE THE HANDWRITTEN PATTERN AND RETURN A BEST TEMPLATE
2
PRESENT THE PATTERN OF THE BEST TEMPLATE
3

Fig 2

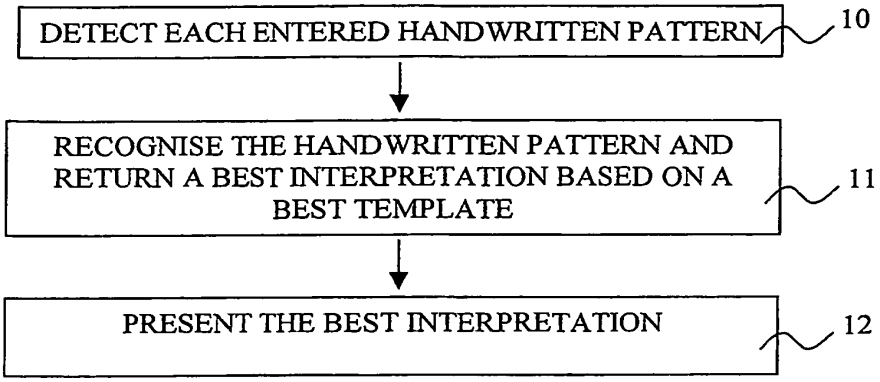

DETECT EACH ENTERED HANDWRITTEN PATTERN
10
RECOGNISE THE HANDWRITTEN PATTERN AND RETURN A BEST INTERPRETATION BASED ON A BEST TEMPLATE
11
PRESENT THE BEST INTERPRETATION
12

Fig 3a

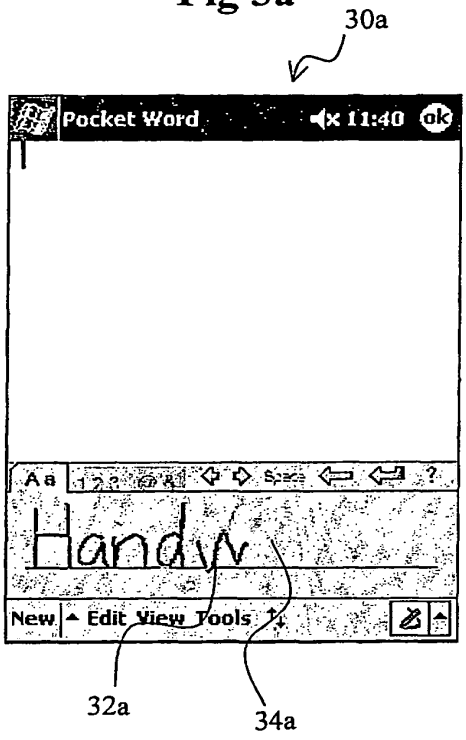

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New
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View
Tools
32a
34a

Fig 3b

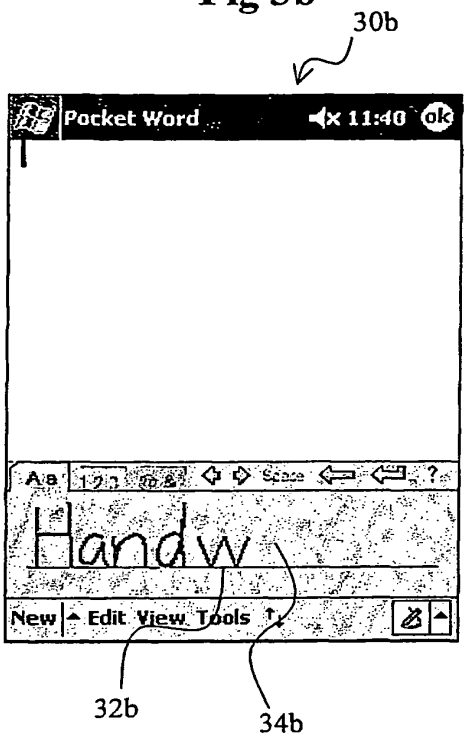
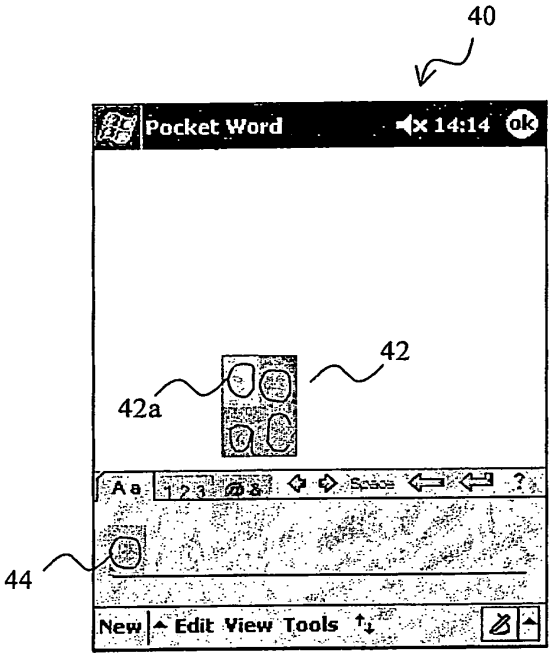
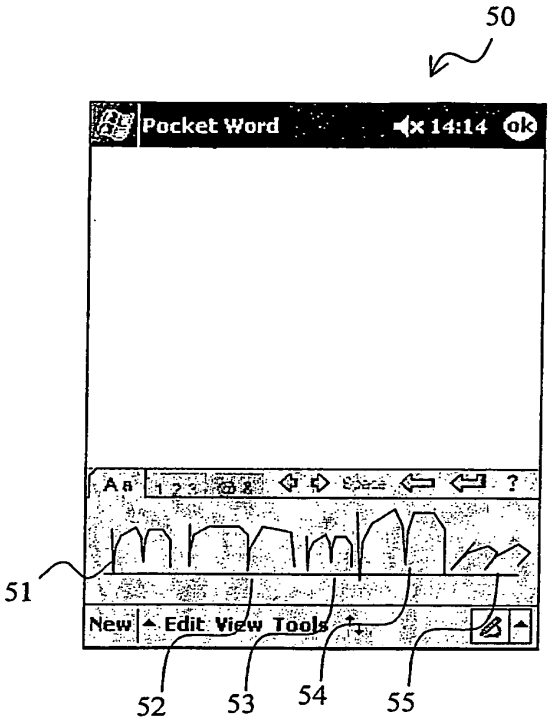

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View
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32b
34b

Fig 4



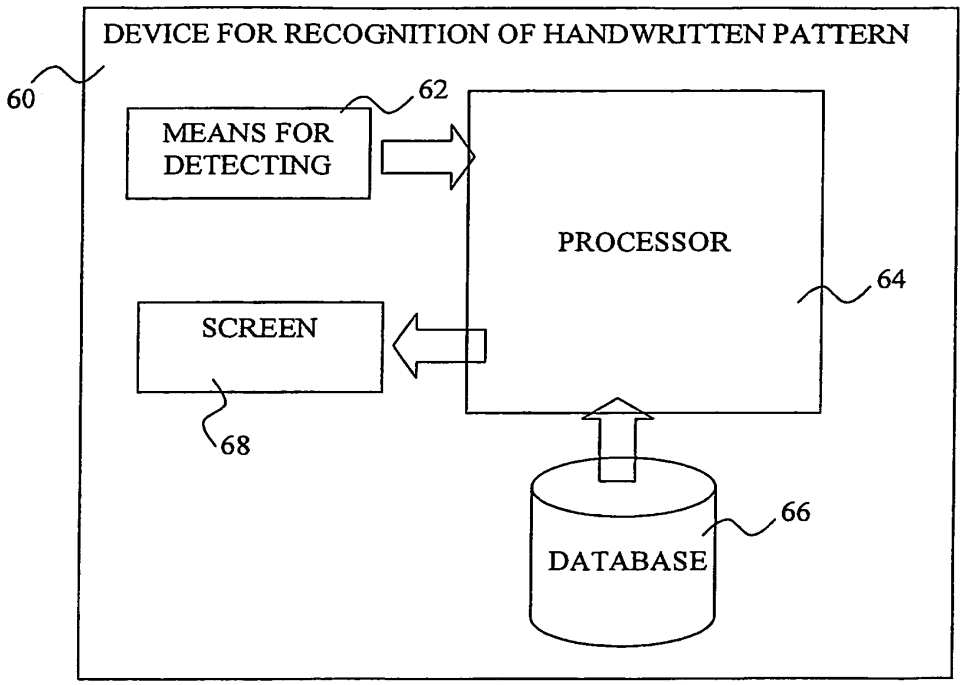
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Fig 5



BEST AVAILABLE COPY

Fig 6


DEVICE FOR RECOGNITION OF HANDWRITTEN PATTERN
60
62
MEANS FOR DETECTING
PROCESSOR
64
SCREEN
68
66
DATABASE

PATENT APPLICATION SERIAL NO. 10/524430

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

02/18/2005 SNAJARRO 00000126 10524430

01 FC:1631	300.00	OP
02 FC:1632	500.00	OP
03 FC:1633	200.00	OP
04 FC:1615	700.00	OP
05 FC:1614	200.00	OP

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01 FC:1462 270.00 DA 130.00 OP

02 FC:1632 -500.00 OP

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01 FC:1642 400.00 DA

PTO-1556
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10/524430

PATENT APPLICATION FEE DETERMINATION RECORD
Effective December 8, 2004

Application or Docket Number: 08806.074

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)	SMALL ENTITY TYPE ☐		OR	OTHER THAN SMALL ENTITY	
			RATE	FEE		RATE	FEE
U.S. NATIONAL STAGE FEES							
BASIC FEE	SMALL ENT. = $ 150	LARGE ENT. = $ 300	BASIC FEE		OR	BASIC FEE	300
EXAMINATION FEE	Satisfies PCT Article 33(1)-(4) = $ 50 / $ 100	All other situations = $ 100 / $ 200	EXAM. FEE			EXAM. FEE	200
SEARCH FEE	U.S. is ISA = $ 50 / $ 100 ALL other countries = $ 200 / $ 400	All other situations = $ 250 / $ 500	SEARCH FEE			SEARCH FEE	400
FEE FOR EXTRA SPEC. PGS.	29 minus 100 =	/ 50 =	X $ 125 =			X $ 250 =	
TOTAL CHARGEABLE CLAIMS	34 minus 20 =	* 14	X $ 25 =		OR	X $ 50 =	700
INDEPENDENT CLAIMS	4 minus 3 =	* 1	X $ 100 =		OR	X $ 200 =	200
MULTIPLE DEPENDENT CLAIM PRESENT		☐	+ $ 180 =		OR	+ $ 360 =	
* If the difference in column 1 is less than zero, enter "0" in column 2			TOTAL		OR	TOTAL	1802

CLAIMS AS AMENDED - PART II

AMENDMENT A	(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE	ADDI-TIONAL FEE		RATE	ADDI-TIONAL FEE
Total	*	Minus	**	=	X $ 25 =		OR	X $ 50 =	
Independent	*	Minus	***	=	X $ 100 =		OR	X $ 200 =	
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐					+ $ 180 =		OR	+ $ 360 =	
					TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT B	(Column 1)		(Column 2)	(Column 3)	RATE	ADDI-TIONAL FEE		RATE	ADDI-TIONAL FEE
	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA					
Total	*	Minus	**	=	X $ 25 =		OR	X $ 50 =	
Independent	*	Minus	***	=	X $ 100 =		OR	X $ 200 =	
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐					+ $ 180 =		OR	+ $ 360 =	
					TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than '20', enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than '3', enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

10/524430
DT05 Rec'd PCT/PTO 15 FEB 2005

PATENT
Customer No. 22,852
Attorney Docket No. 08806.0174

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	
Erika OKNELID et al.	Group Art Unit: Unassigned
Application No.: Unassigned	Examiner: Unassigned
Filed: February 15, 2005	
For: PRESENTING RECOGNISED HANDWRITTEN SYMBOLS	Confirmation No.: Unassigned

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26 JAN 2006
Legal Staff
International Division

U.S. National Phase of PCT/SE2003/001226, filed July 18, 2003

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

BOX: PCT

Sir:

PRELIMINARY AMENDMENT

Prior to the examination of the above application, please amend this application as follows:

Amendments to the Claims are reflected in the listing of claims in this paper.

Remarks/Arguments follow the Amendment sections of this paper.

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently amended) A method for presenting a ~~recognised~~ recognized handwritten symbol, comprising the steps of:

detecting a handwritten pattern that is entered by a user[[,]];

~~recognising~~ recognizing the detected handwritten pattern, wherein said step of ~~recognising~~ 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 ~~representing~~ writing symbol patterns of ways of writing symbols, and returning a best template selected from the plurality of templates that represents [[a]] one of the plurality of writing symbol patterns as a best writing 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 writing symbol patterns which represent different ways of writing a single symbol[[,]]; and

presenting the best writing symbol pattern of the best template on a screen.

2. (Currently amended) The method according to claim 1, wherein the at least one of the plurality of writing symbol patterns of [[a]] each of the plurality of templates is represented by geometrical information relating to [[the]] an appearance of said writing symbol pattern.

3. (Currently amended) 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 ~~of the template~~,

Exhibit 1004
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said at least one of the plurality of writing symbol patterns being presented by lines drawn between the dots.

4. (Currently amended) The method according to ~~any one of claims 1-3~~ claim 1, wherein the step of presenting comprises presenting the whole best writing symbol pattern of the best template at once.

5. (Original) The method according to claim 3, wherein the step of presenting comprises presenting lines one at a time.

6. (Currently amended) The method according to ~~any one of the preceding claims~~ claim 1, further comprising, before the step of presenting, manipulating the best writing symbol pattern of the best template according to characteristics of the handwritten pattern.

7. (Original) The method according to claim 6, wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling.

8. (Currently amended) The method according to ~~any one of the preceding claims~~ claim 1, wherein the handwritten pattern is entered on an input area on the screen and the best writing symbol pattern of the best template is presented in a presentation area on the screen, wherein said presentation area ~~is overlapping~~ overlaps the input area.

9. (Currently amended) The method according to ~~any one of the preceding claims~~ claim 1, wherein the step of ~~recognising~~ recognizing comprises returning at least one alternative template selected from the plurality of templates.

10. (Currently amended) The method according to claim 9, wherein the step of presenting comprises presenting the at least one of the plurality of writing symbol patterns of the at least one alternative template at [[the]] a request of a user.

11. (Currently amended) The method according to ~~any one of the preceding claims~~ claim 1, wherein each of the plurality of templates is associated with a category defining what kind of symbol is represented by ~~the~~ each of the plurality templates.

12. (Currently amended) The method according to ~~any one of the preceding claims~~ claim 11, wherein the step of presenting comprises masking the presentation of the presented ~~template~~ pattern according to which category the best template is associated with.

13. (Currently amended) The method according to claim 12, wherein the category is indicated by a certain ~~colour~~ color of a background to the presented ~~template~~ pattern.

14. (Currently amended) The method according to claim 12, wherein the category is indicated by a certain ~~colour~~ color of the presented ~~template~~ pattern.

15. (Currently amended) The method for sequentially presenting a plurality of ~~recognised~~ recognized handwritten symbols, comprising for each handwritten pattern the steps of:

detecting the handwritten pattern that is entered by a user[[,]]; ~~recognising~~ recognizing the detected handwritten pattern, wherein said step of ~~recognising~~ recognizing comprises comparing the handwritten pattern to a plurality of templates, wherein each of the plurality of templates represents at least one of a ~~representing~~

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plurality of writing symbol patterns of ways of writing symbols and returning a best interpretation of the handwritten pattern, said best interpretation being based on ~~the~~ one of the plurality of writing symbol patterns as a best writing symbol pattern ~~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 one of the plurality of writing symbol patterns which represent different ways of writing a single symbol, and wherein the different ones of the plurality of writing 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 on a screen.

16. (Currently amended) The 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 writing symbol pattern of the best template.

17. (Currently amended) The method according to claim 16, wherein the step of presenting comprises presenting the best allograph represented by a bitmap image depicting the way of writing ~~the pattern~~ symbols of the best template.

18. (Currently amended) The method according to claim 16, wherein the step of presenting comprises presenting the best allograph represented by a number of arcs depicting the way of writing ~~the pattern~~ symbols of the best template.

19. (Currently amended) The method according to claim 15, wherein the best interpretation is the writing symbol pattern of [[a]] the best template, and wherein

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the step of presenting comprises presenting the best writing symbol pattern of the best template on the screen.

20. (Currently amended) The method according to claim 19, wherein each of the plurality of writing symbol patterns of a template is represented by geometrical information relating to [[the]] an appearance of each of said plurality of writing symbol patterns.

21. (Currently amended) The method according to claim 20, wherein the geometrical information comprises information of positions of a number of dots representing each of the plurality writing symbol patterns, said each of the plurality of writing symbol patterns being presented by lines drawn between the dots.

22. (Currently amended) The method according to ~~any one of claims 15-21~~ claim 15, wherein the step of presenting comprises presenting the whole best writing symbol pattern represented by the best interpretation at once.

23. (Original) The method according to claim 21, wherein the step of presenting comprises presenting the lines one at a time.

24. (Currently amended) The method according to ~~any one of claims 15-23~~ claim 15, further comprising, before the step of presenting, manipulating the best writing symbol pattern represented by the best interpretation according to characteristics of the handwritten pattern.

25. (Original) The method according to claim 24, wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling.

26. (Currently amended) The method according to ~~any one of claims 15-25~~ claim 15, wherein the handwritten pattern is entered on an input area on the screen and the best interpretation is presented in a presentation area on the screen, whereby said presentation area ~~is overlapping~~ overlaps the input area.

27. (Currently amended) The method according to ~~any one of claims 15-26~~ claim 15, wherein the step of ~~recognising~~ recognizing comprises returning at least one alternative interpretation.

28. (Original) The method according to claim 27, wherein the step of presenting comprises presenting the at least one alternative interpretation at the request of a user.

29. (Currently amended) The method according to ~~any one of claims 15-28~~ claim 15, wherein ~~each~~ the best interpretation is associated with a category defining what kind of symbol is represented by the best interpretation.

30. (Currently amended) The method according to ~~any one of claims 15-29~~ claim 29, wherein the step of presenting comprises masking the presentation of the presented interpretation according to which category the best interpretation is associated with.

31. (Currently amended) The method according to claim 30, wherein the category is indicated by a certain ~~colour~~ color of a background to the at least one of the plurality of writing symbol patterns represented by the presented interpretation.

32. (Currently amended) The method according to claim 30, wherein the category is indicated by a certain ~~colour~~ color of the at least one of the plurality of writing symbol patterns represented by the presented interpretation.

33. (Currently amended) A device for recognition of a handwritten symbol, said device comprising

a screen[[,]];

means for detecting a handwritten pattern[[,]];

a database comprising templates that comprise[[s]] a plurality of writing symbol patterns representing ways of writing symbols, wherein at least two of the templates comprising different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol[[,]]; and

means for ~~recognising~~ recognizing the detected handwritten pattern and returning ~~the~~ one of the plurality of patterns of a best template of the handwritten pattern, said best template ~~pattern~~ being most similar to the handwritten pattern,

wherein said device is arranged to present the one of the plurality of writing symbol patterns of the best template on the screen.

34. (Currently amended) A device for recognition of a plurality of handwritten symbols, said device comprising

a screen[[,]];

means for detecting a handwritten pattern[[,]];

a database comprising templates that comprise[[s]] a plurality of writing symbol patterns representing ways of writing symbols, wherein at least two of the templates comprising different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol[[,]]; and

means for ~~recognising~~ recognizing the detected handwritten patterns and individually returning for each handwritten pattern a best interpretation of the

handwritten pattern~~, said best interpretation of the handwritten pattern,~~ said best interpretation being based on ~~the~~ one of the plurality of writing symbol patterns of a best template selected from the templates that is most similar to the handwritten pattern, wherein the one of the plurality writing symbol patterns of said at least two of the templates return different best interpretations when being most similar to the handwritten pattern,

wherein said device is arranged to present the best interpretation on the screen.

REMARKS

By this amendment, applicants have amended claims 1-5, 6, 8-22-24, 26-27, and 29-34. The specification and originally filed claims support this amendment, thereby presenting no issue of new matter.

If there is any fee due in connection with the filing of this Preliminary Amendment, please charge the fee to our Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, L.L.P.

David Dort
Reg. No. 34,731

Dated: February 15, 2005

By: _____
for Bryan C. Diner
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Rec'd PCT/PTO 15 FEB 2005

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	
Erika OKNELID et al.	Group Art Unit: Unassigned
Application No.: Unassigned	Examiner: Unassigned
Filed: February 15, 2005	
For: PRESENTING RECOGNISED HANDWRITTEN SYMBOLS	Confirmation No.: Unassigned

U.S. National Phase of PCT/SE2003/001226, filed July 18, 2003

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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Sir:

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. § 1.97(b)

Pursuant to 37 C.F.R. §§ 1.56 and 1.97(b), Applicants bring to the attention of the Examiner the documents on the attached listing. This Information Disclosure Statement is being filed within three months of the date of entry of the national stage in an international application.

Copies of the listed foreign and non-patent literature documents are attached. Copies of the U.S. patent publications are not enclosed.

Applicants respectfully request that the Examiner consider the listed documents and indicate that they were considered by making appropriate notations on the attached form.

The listed documents were cited in a Search Report in a foreign counterpart application. A copy of the Search Report is enclosed for the Examiner's convenience. Applicants do not necessarily endorse the conclusions set forth in the Search Report.

This submission does not represent that a search has been made or that no better art exists and does not constitute an admission that each or all of the listed documents are material or constitute "prior art." If the Examiner applies any of the documents as prior art against any claim in the application and Applicants determine that the cited documents do not constitute "prior art" under United States law, Applicants reserve the right to present to the office the relevant facts and law regarding the appropriate status of such documents.

Applicants further reserve the right to take appropriate action to establish the patentability of the disclosed invention over the listed documents, should one or more of the documents be applied against the claims of the present application.

If there is any fee due in connection with the filing of this Statement, please charge the fee to our Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
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IDS Form PTO/SB/08: Substitute for form 1 PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet | 1 | of | 1

Complete if Known	
Application Number	Unassigned
Filing Date	February 15, 2005
First Named Inventor	Erika OKNELID
Art Unit	Unassigned
Examiner Name	Unassigned
Attorney Docket Number	08806.0174

15 FEB 2005

U.S. PATENTS AND PUBLISHED U.S. PATENT APPLICATIONS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-5,732,152	03/24/1998	Sakai et al.	
		US-2001/0026262 A1	10/04/2001	Van Gestel et al.	
		US-			
		US-			
		US-			
		US-			

Note: Copies of the U.S. Patent Documents are not Required in IDS filed after October 21, 2004

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	Translation[6]
		EP 0 254 561	01/27/1988	Linus Technologies Limited		
		WIPO 98/33141	07/301988	Co-Operwrite Limited		

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	Translation[6]
		J.R. Parker, "Vector Templates and Handprinted Digit Recognition", IEEE, Vol. 2, pp. 457-459, 1994.	

Examiner Signature		Date Considered	

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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This is to certify that the annexed is a true copy of the documents as originally filed with the Patent- and Registration Office in connection with the following patent application.

(71) *Sökande* *Decuma AB Ideon Research Park, Lund SE*
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For the Patent- and Registration Office

Gunilla Larsson

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Vår referens
SE-2024217

PRESENTING RECOGNISED HANDWRITTEN SYMBOLS

Technical Field of the Invention

This invention relates to a method for presenting a recognised handwritten symbol. The invention also relates to a method for sequentially presenting a plurality of recognised handwritten symbols. Further, the invention relates to a device for recognition and presentation of a handwritten symbol and a device for sequentially recognising and presenting a plurality of handwritten symbols.

Background of the Invention

Today, portable data handling devices are becoming increasingly popular. These data handling devices are e.g. PDAs (Personal Digital Assistants), mobile phones and portable computers.

In handheld devices, and to some extent even in regular stationary computers, the text insertion unit, such as keyboards, is more and more often replaced by some kind of device for recognition of a handwritten symbol. A common solution is to arrange a pressure-sensitive area on a screen where a user can write characters. The characters are then interpreted and processed by the portable device and thereafter presented on the screen.

Usually, a handwritten character entered on a detection device is interpreted and recognised by means of templates. Every template is associated with an image in a font, which after recognition is presented on the screen. Even though the way of writing a character may vary, a correct recognition is enabled by the use of more than one template for the character. These templates are associated with the same image in the font. Thus, it is

always the same image that is presented after interpretation of one handwritten character no matter how it is written. Such a method is disclosed in US 5,732,152 where the handwritten character that is entered is recognized and the recognition result is displayed in two areas as an image from a font, as shown in Figs 5 and 6 in said US-patent. The recognition will sometimes misinterpret the handwritten character, and an image that visualise an incorrect character will be displayed. In such cases, the user is not able to analyse why the recognition was incorrect. This will cause irritation to the user, especially if a character is commonly being misinterpreted.

Another way of using the above described method of presenting the character on the screen as an image from a font after interpretation is described in US 2001/0026262. A method of presenting a message in a way that reflects the way the user writes is disclosed. The entered message is interpreted and thereafter the recognised characters in the message are displayed as images from a selected font that reflects the handwriting of the user. The selection of the font is done one time for all the characters of the whole message. The selection of a font may be done after the first character or after a number of characters. The latter makes it easier to find the font that gives the best resemblance with the characteristics of the handwritten characters. The font may be a regular font, such as Comic sans MS, or a new font created on the basis of the handwritten input.

This method presents characters in a way that reflects the personal characteristics of a user's handwriting. However, it does not give feedback to the user as to how and why the device interprets the character the way it does.

To conclude, a user will not get any help in understanding why the character was misinterpreted using these methods. As a result, he will never know how to

change the way he is writing to fasten the process of receiving the correct interpretation directly. This will lead to ineffectiveness and time-consuming corrections of the misinterpreted characters.

Summary of the Invention

It is an object of the present invention to remedy at least some of the problems of known techniques. It is a specific object of the invention to provide a presentation of a handwritten symbol on a screen that gives feedback to the user regarding the recognition of the symbol.

The objects of the invention are achieved by methods according to claims 1 and 15 and by devices according to claims 33 and 34. Specific embodiments of the invention are defined by the dependent claims 2-14 and 16-32.

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.

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.

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.

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.

Thanks to the invention, a pattern that is graphically most similar to the pattern entered by a user is presented. Since the user is aware of that each symbol may be presented as one of several patterns representing different ways of writing this symbol, the presented pattern will give feedback to the user as to how the pattern used for recognition looks like, i.e. the appearance of the pattern that was judged to be most similar to the handwritten pattern. If the presented pattern is not representing the symbol the user intended to write the user can see which incorrect pattern that was found to be most similar to the handwritten pattern. Since the user can see how the misinterpretation occurred the irritation to him will reduce. In prior art, when the handwritten pattern is misinterpreted, this presented pattern may often be quite different to the handwritten pattern, but according to the invention the presented pattern may show greater similarities with the handwritten pattern. If the presented pattern represents the symbol the user intended to write he is able to learn how to write a pattern in order for the recognition to correctly interpret the pattern. Accordingly, the user becomes more aware of how the pattern is interpreted and the feedback will thereby make the user improve his skills in entering a pattern in the right way to be sure that the presented pattern as often as possible is the one he intended to write. Thus, entering a handwritten pattern and receiving the correct best interpretation is

made more efficient, as the average time period measured from the handwritten pattern being entered until the correct interpretation is presented is reduced. Further, the handwriting of the user will be reflected in the presented pattern. This will give a more personal touch to the pattern thus making it more pleasing for the user.

In the context of this application, the word "symbol" is defined as any symbol that could be interpreted by the device, i.e. having a meaning to the device. The symbol could thus be an alphabetic character as the ones used in e.g. Latin or Greek, a syllabographic character as e.g. Japanese Hiragana/Katagana character or Korean Hangul character, a logographic character as Chinese Hanzi character, Japanese Kanji character and Korean Hanja character, or any other kind, an Arabic number, a sign, a figure, or any other picture having a meaning to the device. As used herein, the term "character" means a letter, number or other mark or sign used in writing or printing. The symbol could also be a sign or gesture that is interpreted as space, delete or return. The symbol could also be an abbreviation for a longer, commonly entered phrase or word. For example, a symbol of two merged letters which are a person's initials may represent the person's whole name. A pattern is a specific way of writing a symbol, i.e. a pattern has a certain appearance. Thus, for every symbol there may exist many patterns. Further, an arc is defined as a whole or a segment of a pattern. Thus, an arc may be curved or straight, or have any other form needed to provide a pattern.

According to an embodiment of the method according to the second aspect of the invention, the method further comprises, before the step of presenting, retrieving as the best interpretation, from a database comprising allographs, a best allograph that is associated with the pattern of the best template. The database comprises at least two allographs depicting two different ways of

writing a single symbol. The at least two allographs correspond to different best interpretations when being most similar to the handwritten pattern. The number of allographs may be the same as or fewer than the number of templates for a certain symbol.

According to another embodiment, the step of presenting comprises presenting the best allograph represented by a bitmap image depicting the way of writing the pattern of the best template.

According to a further embodiment, the step of presenting comprises presenting the best allograph represented by a number of arcs depicting the way of writing the pattern of the best template. Thus, the arcs may all be presented at once or may be presented one at a time. Presenting the arcs one at a time may make it possible to present the time information of the pattern. The time information may either be presented as how the user wrote the pattern or how the user should write the pattern to make it easier for the recognition to correctly interpret the pattern.

According to another embodiment, the best interpretation is the pattern of a best template, and wherein the step of presenting comprises presenting the pattern of the best template on the screen. In this case, the best interpretation is directly acquired when a best template is determined, since the pattern of the best template may be directly output for presentation on the screen. Thus, as used hereinafter, the term "best interpretation" may according to one embodiment imply "the pattern of a best template".

According to an embodiment of the methods according to both the first and the second aspect of the invention, the pattern of a template is represented by geometrical information relating to the appearance of said pattern. The geometrical information allows the template to be compared to a handwritten pattern.

According to an embodiment, the geometrical information comprises information of positions of a number of dots representing the pattern, said pattern being presented by drawing lines between the dots. In this case, the pattern is represented by positions of discrete dots, which may easily be compared to a handwritten pattern. However, the pattern of the template may still be presented on a screen.

According to another embodiment, the step of presenting comprises presenting the whole pattern represented by the best interpretation at once. Thus, the user immediately sees what the interpreted pattern looks like. Consequently, the user does not have to wait for the interpretation to be presented, thereby reducing the time before the user can decide if it was the correct interpretation or not.

Alternatively, the step of presenting comprises presenting the lines one at a time. Thus, the best interpretation may be presented either in the way the user wrote the handwritten pattern or in the way the pattern is represented by the template. According to the latter alternative, the user is shown how the pattern should be written to make it easier for the recognition to correctly interpret the pattern. Consequently, the user will see how he wrote or should write the pattern.

According to an embodiment, the method further comprises, before the step of presenting, manipulating the pattern represented by the best interpretation according to characteristics of the handwritten pattern. Consequently, the presented pattern is looking even more similar to the handwritten pattern. This implies that the interpretation presented to the user will reflect the characteristics of the user's handwriting giving a personal touch to the presented patterns. As long as the manipulated best interpretation is the correct one the recognition tolerates the way the user writes the symbol.

According to a further embodiment, the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling. Thereby, the user may vary the way of writing the symbol with respect to the position of the symbol, the rotation of the symbol, the slant of the symbol and the magnitude of the symbol and still a very similar recognised interpretation may be presented on the screen. This may also show the user how a misinterpretation may occur due to manipulation of the pattern of an incorrect template being very similar to the handwritten pattern.

According to another embodiment, the handwritten pattern is entered on an input area on the screen and the best interpretation is presented in a presentation area on the screen, wherein the presentation area is overlapping the input area. Thus, the user will focus on the input area when he enters the handwritten pattern and will then look at the presentation area to see the best interpretation of the pattern. Since the presentation area overlaps the input area, the user will not have to constantly shift focus between the input area and the interpretation area. Therefore, his eyes will not be wandering during input, which speeds up the input and makes the input more convenient.

According to an embodiment, the step of recognising comprises returning at least one alternative interpretation. Consequently, the invention provides a possibility of choosing an alternative interpretation, if the best interpretation was not correct, without trying to enter the pattern again.

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, re-entering of the pattern could be avoided.

According to an embodiment, each interpretation is associated with a category defining what kind of symbol is represented by the interpretation. A category may for example be numbers, alphabetic characters, syllabographic characters, logographic characters, a combination of numbers and characters, etc.

According to a further embodiment, the step of presenting comprises masking the presentation of the presented interpretation according to which category the presented interpretation is associated with. Thus, it is easier for the user to make sure that the pattern has been correctly identified. This may help a user in distinguishing between e.g. the Latin letter "O" and the Arabic numeral "0" (zero). Since the masking is selected according to the category of the symbol, it may help the user to determine if the correct symbol has been presented.

This is especially helpful in those cases when different symbols may be written in the same way or nearly the same way. Thus, using only the information from the specific pattern it may be difficult or even impossible to identify the correct symbol. When a number of symbols are presented it may be helpful for a user to be provided with information concerning the categories of symbols presented, so that he can rapidly and easily determine that the correct symbols are presented.

The masking may of course be done on both the best interpretation and on the alternatives to make it even easier to control if the best interpretation is the correct one and to more easily change interpretation if the presented best interpretation is incorrect. The masking may also be done on presented patterns when the

handwritten pattern is difficult to interpret. The masking may either be predetermined by the device or the user may select the type of masking that should be applied to the different categories of symbols.

The category may be indicated by a certain colour of a background to the pattern represented by the presented interpretation.

Alternatively, the category may be indicated by a certain colour of the pattern represented by the presented interpretation. Hereby, an easily applicable, and easily recognisable masking is presented, which does not need to imply any manipulation of the pattern per se.

According to an embodiment, the means for detecting the handwritten pattern may be the screen. The screen may then be sensitive to handwriting for detection of a handwritten pattern entered on the screen. This makes it easier and more comfortable for the user to enter the handwritten pattern since he does not need any additional devices for entering the pattern.

The means for detecting may of course be any other means that is capable of detecting a handwritten pattern, such as a separate screen, a scanner for detecting patterns written on a piece of paper, or an intelligent pen incorporating a camera for detection of a handwritten pattern.

Brief description of the Drawings

Other features and advantages of the present invention will become apparent from the following detailed description of presently preferred embodiments, taken in conjunction with the accompanying drawings, which by way of example show embodiments of the invention.

Fig. 1 is a flowchart of a method according to the invention.

Fig. 2 is a flowchart of another method according to the invention.

Figs 3a and 3b show screen views of presenting an interpretation of a handwritten pattern according to the present invention.

Fig. 4 shows a screen view of masking of presented interpretations and displaying alternatives according to the present invention.

Fig. 5 shows a screen view of different ways of manipulation according to the present invention.

Fig. 6 shows a schematic view of a device according to the invention.

Detailed Description of Preferred Embodiments of the Invention

Referring to Fig. 1, a method according to the invention for presenting a recognised handwritten symbol will be described. The symbol may be any symbol that could be interpreted by the device, in which it is to be recognised in, such as a character, a sign, a figure, or any other symbol. All though other characters or other objects may be entered, as previously mentioned, this description is made with reference to Latin characters and Arabic numerals.

The handwritten pattern may be entered in different ways, such as on a screen of a device for recognition, which screen is sensitive to handwriting, on a separate handwriting sensitive screen or on any other means that is capable of detecting a handwritten pattern. This description is, however, only made with reference to a sensitive screen on the recognition device.

First, a handwritten pattern is entered by the user on the screen of the recognition device. Then, the entered pattern is detected, step 1.

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.

Referring to Fig. 2, a method according to the invention for presenting a plurality of recognised handwritten symbols will be described. Handwritten patterns are entered on the screen of the device. Each handwritten pattern is detected, step 10. Then, each pattern is sequentially and individually recognised by comparing it to templates in a database, whereby a best interpretation is returned, step 11. Thereafter, the best interpretation is presented on the screen, step 12. The best interpretation is based on the pattern of the best template that is most similar to the handwritten pattern according to a predefine rule. 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. 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.

Figs 3a and 3b show screen views 30a, b before and after interpretation of the handwritten pattern,

respectively. Fig. 3a shows a handwritten pattern 32a after the user has entered it on the screen in his personal writing style and before the pattern has been interpreted. The pattern is entered on an input area 34a on the screen which is sensitive to handwriting. 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 according to the way the user wrote the pattern, which is explained in further detail below with reference to Fig. 5. After manipulation and recognition, as shown in Fig. 3b, the manipulated best interpretation 32b is presented in a presentation area 34b. As shown in Figs 3a and 3b, the interpretation may be manipulated such that there is almost no difference between the handwritten pattern and the presented interpretation.

In Fig. 4 a screen view 40 is shown depicting how the alternatives 42 may be presented and how the pattern of the best interpretation 44 and/or the alternatives may be masked. 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. The alternative interpretations 42 are displayed automatically by marking the best interpretation. Thereafter, the user may select the alternative interpretation that is the correct interpretation of his handwritten pattern.

Further, the best interpretation 44 and the alternatives 42 are masked by means of different shadings on the background. In this particular example, the user wrote the Latin character "o", and the best interpretation 44 was returned as a pattern depicting this character "o". The alternatives presented show i.a. an alternative interpretation 42a depicting the numeral "0" (zero), which is similar to the character "o". Since

the alternative interpretation 42a, i.e. the numeral "0", is of another category than the best interpretation 44, i.e. the character "o", the interpretations have different shading on their backgrounds. The user will then be able to select between the alternatives and may easily distinguish between similar characters of different category. A different masking may also be used when the recognition returns an interpretation which is not very similar to the handwritten pattern, i.e. when the device has difficulties to interpret the handwritten pattern. Consequently, the user will be aware of the uncertainty of the presented interpretation.

In Fig. 5 a screen view 50 with examples of different ways of manipulating a character is shown. The first pattern 51 shows how a pattern would look like if it was not manipulated. If the user writes patterns that are wide the presented pattern 52 should reflect this. The writer could also write smaller, larger, or slanted patterns and the presented pattern 53, 54 and 55, respectively, will reflect these variations. Referring to Fig. 6, a device 60 according to the invention comprises a means 62 for detecting a handwritten pattern, e.g. a pressure-sensitive screen. The screen 62 is connected to a processor 64 for recognition of the detected handwritten pattern. The processor 64 uses a database 66 of templates for comparison to the handwritten pattern, and the recognition returns a best template. The processor 64 then returns a best interpretation based on this template as described above. Further, the device 60 may present the best interpretation on a screen 68, which may be the same screen that is used for detecting the handwritten pattern. In another embodiment the database may also comprise allographs that may be presented on the screen as the best interpretation.

It should be emphasised that the embodiments described herein is in no way limiting and that many alternative embodiments are possible within the scope of

protection defined by the appended claims. For example, the alternative interpretations must not be displayed only when marking the best interpretation. They may automatically be displayed together with the best interpretation or they may be displayed after the user has used a means for requesting a presentation of the alternatives.

CLAIMS

1. A method for presenting a recognised handwritten symbol, comprising the steps of:

detecting a handwritten pattern that is entered by a user,

recognising the detected handwritten pattern, wherein said step of recognising comprises comparing the handwritten pattern to templates representing ways of writing symbols, and 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 comprise different patterns which represent different ways of writing a single symbol, and

presenting the pattern of the best template on a screen.

2. The method according to claim 1, wherein the pattern of a template is represented by geometrical information relating to the appearance of said pattern.

3. The method according to claim 2, wherein the geometrical information comprises information of positions of a number of dots representing the pattern of the template, said pattern being presented by lines drawn between the dots.

4. The method according to any one of claims 1-3, wherein the step of presenting comprises presenting the whole pattern of the best template at once.

5. The method according to claim 3, wherein the step of presenting comprises presenting lines one at a time.

6. The method according to any one of the preceding claims, further comprising, before the step of

presenting, manipulating the pattern of the best template according to characteristics of the handwritten pattern.

7. The method according to claim 6, wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slantand scaling.

8. The method according to any one of the preceding claims, wherein the handwritten pattern is entered on an input area on the screen and the pattern of the best template is presented in a presentation area on the screen, wherein said presentation area is overlapping the input area.

9. The method according to any one of the preceding claims, wherein the step of recognising comprises returning at least one alternative template.

10. The method according to claim 9, wherein the step of presenting comprises presenting the pattern of the at least one alternative template at the request of a user.

11. The method according to any one of the preceding claims, wherein each template is associated with a category defining what kind of symbol is represented by the template.

12. The method according to any one of the preceding claims, wherein the step of presenting comprises masking the presentation of the presented template pattern according to which category the template is associated with.

13. The method according to claim 12, wherein the category is indicated by a certain colour of a background to the presented template pattern .

14. The method according to claim 12, wherein the category is indicated by a certain colour of the presented template pattern.

15. A method for sequentially presenting a plurality of recognised handwritten symbols, comprising for each handwritten pattern the steps of:

detecting the handwritten pattern that is entered by a user,

recognising the detected handwritten pattern, wherein said step of recognising comprises comparing the handwritten pattern to templates representing ways of writing symbols and returning a best interpretation of the handwritten pattern, said 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 comprise different patterns which represent different ways of writing a single symbol, and wherein the patterns of said at least two templates return different best interpretations when being most similar to the handwritten pattern, and

presenting the best interpretation on a screen.

16. The 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 pattern of the best template.

17. The method according to claim 16, wherein the step of presenting comprises presenting the best

allograph represented by a bitmap image depicting the way of writing the pattern of the best template.

18. The method according to claim 16, wherein the step of presenting comprises presenting the best allograph represented by a number of arcs depicting the way of writing the pattern of the best template.

19. The method according to claim 15, wherein the best interpretation is the pattern of a best template, and wherein the step of presenting comprises presenting the pattern of the best template on the screen.

20. The method according to claim 19, wherein the pattern of a template is represented by geometrical information relating to the appearance of said pattern.

21. The method according to claim 20, wherein the geometrical information comprises information of positions of a number of dots representing the pattern, said pattern being presented by lines drawn between the dots.

22. The method according to any one of claims 15-21, wherein the step of presenting comprises presenting the whole pattern represented by the best interpretation at once.

23. The method according to claim 21, wherein the step of presenting comprises presenting the lines one at a time.

24. The method according to any one of claims 15-23, further comprising, before the step of presenting, manipulating the pattern represented by the best interpretation according to characteristics of the handwritten pattern.

25. The method according to claim 24, wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant [JEP2]and scaling.

26. The method according to any one of claims 15-25, wherein the handwritten pattern is entered on an input area on the screen and the best interpretation is presented in a presentation area on the screen, whereby said presentation area is overlapping the input area.

27. The method according to any one of claims 15-26, wherein the step of recognising comprises returning at least one alternative interpretation.

28. The method according to claim 27, wherein the step of presenting comprises presenting the at least one alternative interpretation at the request of a user.

29. The method according to any one of claims 15-28, wherein each interpretation is associated with a category defining what kind of symbol is represented by the interpretation.

30. The method according to any one of claims 15-29, wherein the step of presenting comprises masking the presentation of the presented interpretation according to which category the best interpretation is associated with.

31. The method according to claim 30, wherein the category is indicated by a certain colour of a background to the pattern represented by the presented interpretation.

32. The method according to claim 30, wherein the category is indicated by a certain colour of the pattern represented by the presented interpretation.

33. A device for recognition of a handwritten symbol, said device comprising

a screen,

means for detecting a handwritten pattern,

a database comprising templates that comprises patterns representing ways of writing symbols, wherein at least two templates comprising different patterns which represent different ways of writing a single symbol,

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,

wherein said device is arranged to present the pattern of the best template on the screen.

34. A device for recognition of a plurality of handwritten symbols, said device comprising

a screen,

means for detecting a handwritten pattern,

a database comprising templates that comprises patterns representing ways of writing symbols, wherein at least two templates comprising different patterns which represent different ways of writing a single symbol,

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, wherein the patterns of said at least two templates return different best interpretations when being most similar to the handwritten pattern,

wherein said device is arranged to present the best interpretation on the screen.

ABSTRACT

A method for presenting recognised handwritten symbols comprises the steps of recognising the detected handwritten pattern. The step of recognising comprises comparing the handwritten pattern to templates representing ways of writing symbols and returning a best interpretation of the handwritten pattern, said best interpretation being based on the pattern of a best template. At least two templates comprise different patterns which represent different ways of writing a single symbol, and the patterns of the at least two templates return different best interpretations when being most similar to the handwritten pattern. The method further comprises the step of presenting the pattern of the best template on a screen.

A device for implementing the method is also disclosed.

Elected for publication: Fig. 2

Fig 1

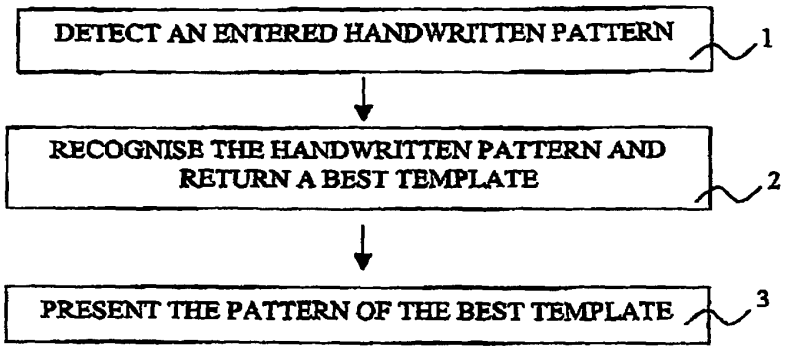

DETECT AN ENTERED HANDWRITTEN PATTERN
1
RECOGNISE THE HANDWRITTEN PATTERN AND RETURN A BEST TEMPLATE
2
PRESENT THE PATTERN OF THE BEST TEMPLATE
3

Fig 2

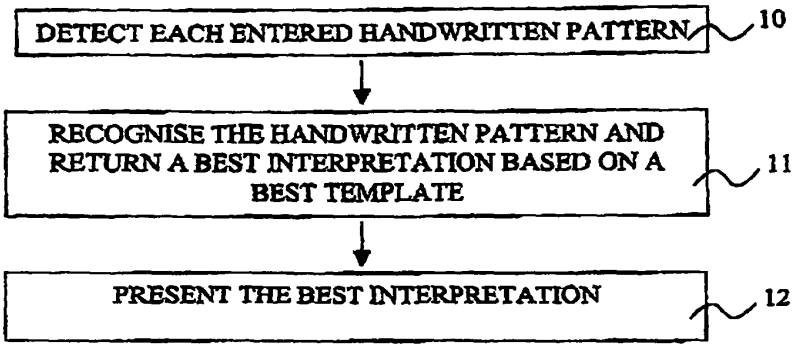

DETECT EACH ENTERED HANDWRITTEN PATTERN
10
RECOGNISE THE HANDWRITTEN PATTERN AND RETURN A BEST INTERPRETATION BASED ON A BEST TEMPLATE
11
PRESENT THE BEST INTERPRETATION
12

Fig 3a

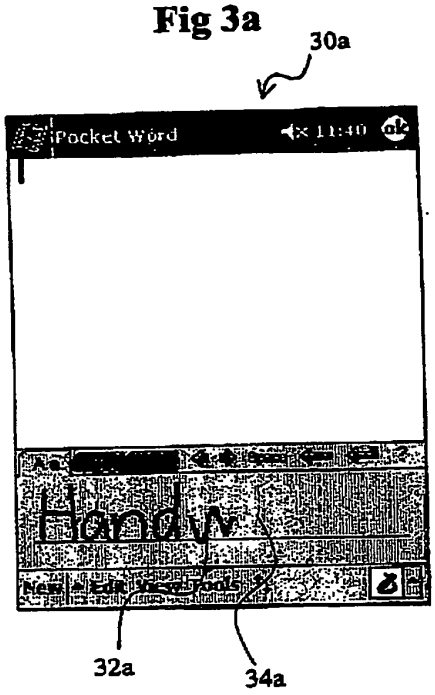


Fig 3b

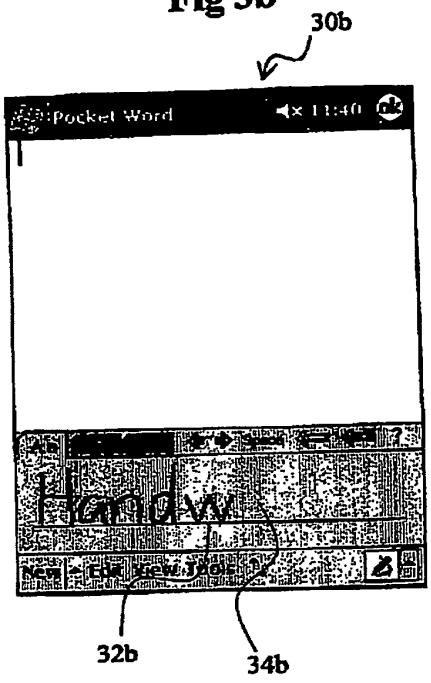
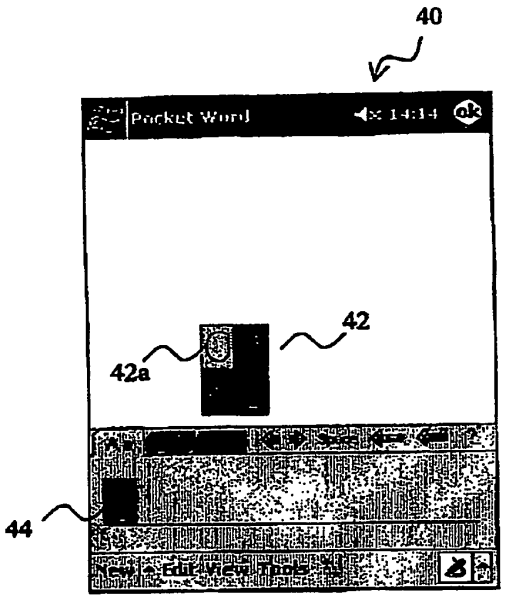


Fig 4



5/6

Fig 5

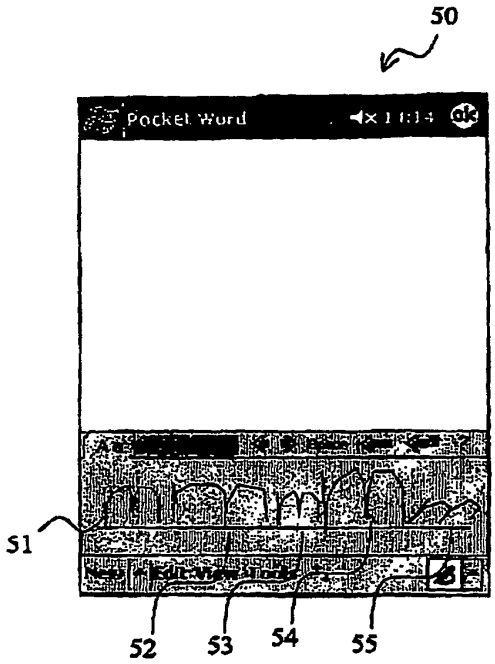
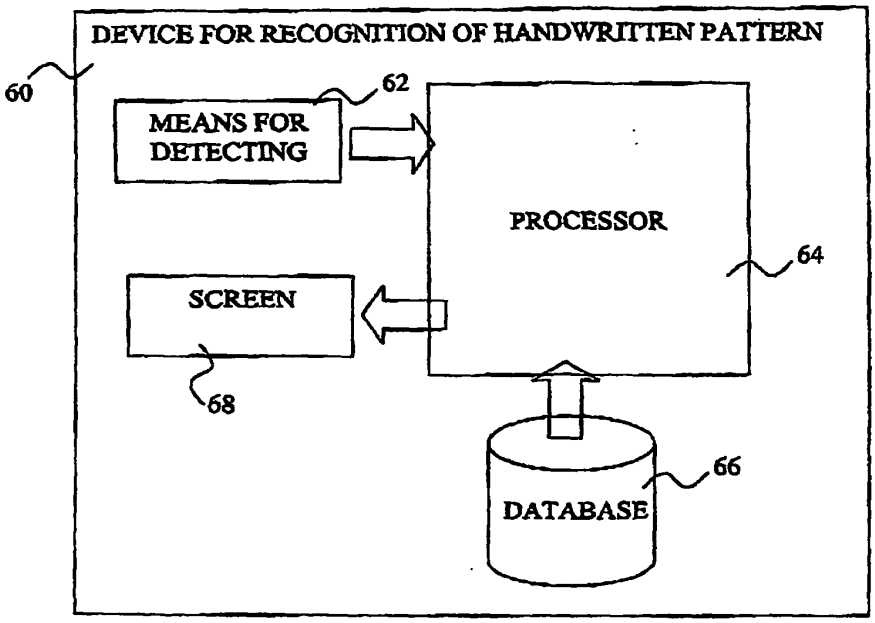


Fig 6


DEVICE FOR RECOGNITION OF HANDWRITTEN PATTERN
60
62
MEANS FOR DETECTING
PROCESSOR
64
SCREEN
68
66
DATABASE

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U.S. Appl. No. 10/524429 International Appl. No. SE2003/001226

Application filed by : ☐ 20 months ☑ 30 months

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INTERNATIONAL APPLICATION PAPERS IN THE APPLICATION FILE :

- ☑ International Application *(RECORD COPY)*
- ☑ Article 19 Amendments
- ☑ PCT/IPEA/409 IPER : ☐ EP ☐ JP ☑ SE ☐ AU ☐ US ☐ FR ☐ CN ☐ ES ☐ RU ☐ AT ☐ KR ☐ ___
  - ☐ PCT/IPEA/409 IPER was NOT AVAILABLE at the time of paralegal review
- ☐ Annexes to 409
- ☑ Priority Document (s) No. _____
- ☐ PCT/IB/331
- ☐ Request form PCT/RO/101
- ☑ PCT/ISA/210 - Search Report : ☐ EP ☐ JP ☑ SE ☐ AU ☐ US ☐ FR ☐ CN ☐ ES ☐ RU ☐ AT ☐ KR ☐ OTHER ___ ☐ NONE
- ☐ Search Report References
- ☐ Other : _____

RECEIPTS FROM THE APPLICANT *(other than checked above) :*

- ☑ Basic National Fee *(or authorization to charge)*
- ☑ Description ☑ Claims ☑ Abstract
- ☑ Drawing Figure(s) - (# of drwgs. 6)
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- ☑ Application Data Sheet
- ☑ Power of Attorney/ Change of Address
- ☑ Preliminary Amendment(s) Filed on : 1. 15Feb05 2. _____ 3. _____
- ☑ Information Disclosure Statement(s) Filed on : 1. 15Feb05 2. _____ 3. _____
- ☑ Assignment Document (forwarded to Assignment Branch) 1. 15Feb05
- ☐ Assignee PG Publication Notice
- ☐ Substitute Specification Filed on : 1. _____ 2. _____
- ☑ Verified Small Status Statement 1. _____
- ☑ Oath/ Declaration (executed) ☐ unsigned ☐ no citizenship
- ☐ DNA Diskette ☐ Sequence Listing
- ☐ Other : _____

NOTES : ☐ I.A. used as Specification ☐ Other :

35 U.S.C. 371 - Receipt of Request (PTO-1390)	15 Feb05
Date Acceptable Oath/ Declaration Received	09/14/05
Date of Completion of requirements under 35 U.S.C. 371	
Date of Completion of ALL requirements	
Date of Completion of DO/ EO 903 - Notification of Acceptance	10/-11-06
Date of Completion of DO/ EO 905 - Notification of Missing Requirements	6/08/05
Date of Completion of DO/ EO 909 - Notification of Abandonment	
Date of Completion of DO/ EO 916 - Notification of Defective Response	
Date of Completion of DO/ EO 922 - Notification to Comply w/ Requirements for Patent Applications Containing Nucleotide and/or Amino Acid Sequence Disclosures	
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Box No. VIII (iv) DECLARATION: INVENTORSHIP (only for the purposes of the designation of the United States of America)

The declaration must conform to the following standardized wording provided for in Section 214; see Notes to Boxes Nos. VIII, VIII(i) to (v) (in general) and the specific Notes to Box No. VIII (iv). If this Box is not used, this sheet should not be included in the request.

Declaration of inventorship (Rules 4.17(iv) and 51*bis*.1(a)(iv)) for the purposes of the designation of the United States of America:

I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought.

This declaration is directed to the international application of which it forms a part (if filing declaration with application).

This declaration is directed to international application No. PCT/ SE03/01226 (if furnishing declaration pursuant to Rule 26*ter*).

I hereby declare that my residence, mailing address, and citizenship are as stated next to my name.

I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications," by application number, country or Member of the World Trade Organization, day, month and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.

Prior Applications:

I hereby acknowledge the duty to disclose information that is known by me to be material to patentability as defined by 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the PCT international filing date of the continuation-in-part application.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further 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 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name: Erika Oknelid

Residence: Sweden

(city and either US state, if applicable, or country)

Mailing Address: Aspgatan 1, SE-230 40 BARA

Citizenship: Swedish

Inventor's Signature: Erika Oknelid Date: 2003-08-08

(if not contained in the request, or if declaration is corrected or added under Rule 26*ter* after the filing of the international application. The signature must be that of the inventor, not that of the agent)

(of signature which is not contained in the request, or of the declaration that is corrected or added under Rule 26*ter* after the filing of the international application)

Name: Magnus Persson

Residence: Sweden

(city and either US state, if applicable, or country)

Mailing Address: Ostindiefararegatan 18, SE-211 33 MALMÖ

Citizenship: Swedish

Inventor's Signature: Date: 2003-08-07

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference PC-21004624	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/SE 2003/001226	International filing date *(day/month/year)* 18-07-2003	Priority date *(day/month/year)* 16-08-2002
International Patent Classification (IPC) or national classification and IPC G06K9/68		
Applicant ~~DECUMA AB ET AL~~ ZI DECUMA AB etal		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☐ *(sent to the applicant and to the International Bureau)* a total of _____ sheets, as follows:
      ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s))
      _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
4. This report contains indications relating to the following items:
   - ☒ Box No. I Basis of the report
   - ☐ Box No. II Priority
   - ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - ☐ Box No. IV Lack of unity of invention
   - ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - ☐ Box No. VI Certain documents cited
   - ☐ Box No. VII Certain defects in the international application
   - ☐ Box No. VIII Certain observations on the international application

Date of submission of the demand	Date of completion of this report
05-03-2004	16-11-2004
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88	Authorized officer Alexander Lakic /LR Telephone No. +46 8 782 25 00

Form PCT/IPEA/409 (cover sheet) (January 2004)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/SE 2003/001226

Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of:

☐ international search (under Rules 12.3 and 23.1(b))
☐ publication of the international application (under Rule 12.4)
☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

☒ the international application as originally filed/furnished

☐ the description:

pages _____ as originally filed/furnished
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pages* _____ received by this Authority on _____

☐ the claims:

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pages* _____ as amended (together with any statement) under Article 19
pages* _____ received by this Authority on _____
pages* _____ received by this Authority on _____

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☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____
☐ the claims, Nos. _____
☐ the drawings, sheets/figs _____
☐ the sequence listing *(specify)*: _____
☐ any table(s) related to the sequence listing *(specify)*: _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages _____
☐ the claims, Nos. _____
☐ the drawings, sheets/figs _____
☐ the sequence listing *(specify)*: _____
☐ any table(s) related to the sequence listing *(specify)*: _____

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/SE 2003/001226

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-34	YES
	Claims		NO
Inventive step (IS)	Claims	1-34	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-34	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

Relevant documents cited in the International Search Report:

D1: PARKER, J.R.: "Vector Templates and handprinted digit recognition" Pattern Recognition, 1994. Vol. 2 Conference B: Computer Vision & Image Processing. Proc. Of the 12th IAPR International Conf. on 9-13 October 1994, Jerusalem, Israel, pages 457-459.
D2: US 2001026262 A
D3: WO 9833141 A1

D1 discloses a method for matching handprinted characters (in this case digits). The handprinted digit is matched with a number of templates. A digit is associated with several templates in order to capture the variation in shape, size and orientation.

D2 discloses an apparatus and method for recognising inputted handwritten characters. The apparatus includes a selection unit for selecting a font on the basis of the handwritten characters. Also in D2, multiple templates are associated with each character.

D3 also discloses a method for recognising handwritten characters. The method also include means for giving the user feedback on how a character should be written.

The applied invention relates to a method and device for recognising and presenting inputted handwritten character. The invention seeks to solve the problem of having mismatches between handwritten characters and stored templates due to the variation in shape, location and size for the handwritten

.../...

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of: Box V

characters. The problem is solved by associating each character with several different reference templates, each template representing different ways of writing a symbol. For example, the letter 'a' can have three different templates which reflect the differences in how the letter 'a' can be written.

Referring to claims 1-34:

The invention according to claims 1-34 differs from D1-D3 in the way the reference templates are used. First of all, none of the cited documents describe several reference templates representing different ways of writing a symbol. Secondly, the matching result obtained after inputting a handwritten symbol is affected when having a database which contains several templates representing different ways of writing a symbol. The probability of correct matching should increase when having several alternative reference templates for each symbol as described in claims 1-34. The invention also differs from D1-D3 by displaying a symbol (after recognition is performed) which shows a way of writing said symbol. Although D3 describes a process which gives the user visual feedback of how to write a symbol (while the user writes), the document does not provide any information about that there a several ways of writing one single symbol and still get a positive recognition result.

Therefore, the claimed invention stated in claims 1-34 is not considered to be anticipated by documents D1-D3. None of these documents or any relevant combination of them reveals a method and device for recognizing handwritten symbols, including a plurality of reference templates representing different ways of writing a character, and outputting the reference template that best matches the inputted symbol, said outputted template provides information of how the symbol is written.

In view of the aforementioned, the invention according to claims 1-34 is novel, involves an inventive step and has industrial applicability.

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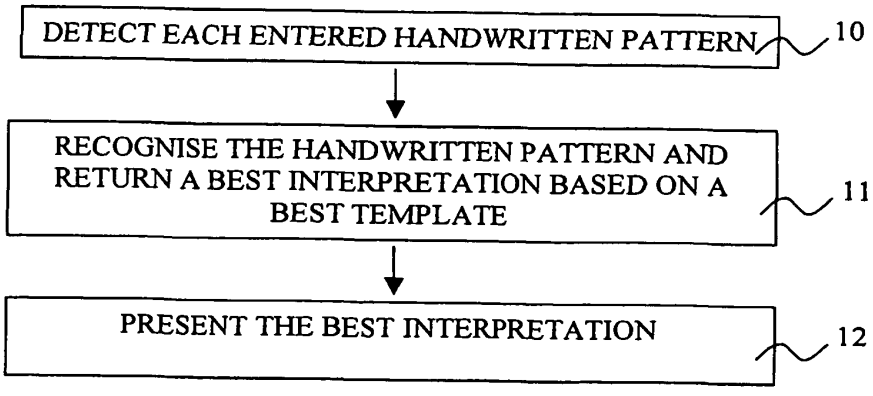
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Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE,*

[Continued on next page]

(54) Title: PRESENTING RECOGNISED HANDWRITTEN SYMBOLS



(57) Abstract: A method for presenting recognised handwritten symbols comprises the steps of recognising the detected handwritten pattern. The step of recognising comprises comparing the handwritten pattern to templates representing ways of writing symbols and returning a best interpretation of the handwritten pattern, said best interpretation being based on the pattern of a best template. At least two templates comprise different patterns which represent different ways of writing a single symbol, and the patterns of the at least two templates return different best interpretations when being most similar to the handwritten pattern. The method further comprises the step of presenting the pattern of the best template on a screen. A device for implementing the method is also disclosed.

WO 2004/017253 A1

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PRESENTING RECOGNISED HANDWRITTEN SYMBOLS

Technical Field of the Invention

This invention relates to a method for presenting a recognised handwritten symbol. The invention also relates to a method for sequentially presenting a plurality of recognised handwritten symbols. Further, the invention relates to a device for recognition and presentation of a handwritten symbol and a device for sequentially recognising and presenting a plurality of handwritten symbols.

Background of the Invention

Today, portable data handling devices are becoming increasingly popular. These data handling devices are e.g. PDAs (Personal Digital Assistants), mobile phones and portable computers.

In handheld devices, and to some extent even in regular stationary computers, the text insertion unit, such as keyboards, is more and more often replaced by some kind of device for recognition of a handwritten symbol. A common solution is to arrange a pressure-sensitive area on a screen where a user can write characters. The characters are then interpreted and processed by the portable device and thereafter presented on the screen.

Usually, a handwritten character entered on a detection device is interpreted and recognised by means of templates. Every template is associated with an image in a font, which after recognition is presented on the screen. Even though the way of writing a character may vary, a correct recognition is enabled by the use of more than one template for the character. These templates are associated with the same image in the font. Thus, it is always the same image that is presented after interpretation of one handwritten character no matter how

it is written. Such a method is disclosed in US 5,732,152 where the handwritten character that is entered is recognized and the recognition result is displayed in two areas as an image from a font, as shown in Figs 5 and 6 in said US-patent. The recognition will sometimes misinterpret the handwritten character, and an image that visualise an incorrect character will be displayed. In such cases, the user is not able to analyse why the recognition was incorrect. This will cause irritation to the user, especially if a character is commonly being misinterpreted.

Another way of using the above described method of presenting the character on the screen as an image from a font after interpretation is described in US 2001/0026262. A method of presenting a message in a way that reflects the way the user writes is disclosed. The entered message is interpreted and thereafter the recognised characters in the message are displayed as images from a selected font that reflects the handwriting of the user. The selection of the font is done one time for all the characters of the whole message. The selection of a font may be done after the first character or after a number of characters. The latter makes it easier to find the font that gives the best resemblance with the characteristics of the handwritten characters. The font may be a regular font, such as Comic sans MS, or a new font created on the basis of the handwritten input.

This method presents characters in a way that reflects the personal characteristics of a user's handwriting. However, it does not give feedback to the user as to how and why the device interprets the character the way it does.

To conclude, a user will not get any help in understanding why the character was misinterpreted using these methods. As a result, he will never know how to change the way he is writing to fasten the process of receiving the correct interpretation directly. This will

lead to ineffectiveness and time-consuming corrections of the misinterpreted characters.

Summary of the Invention

It is an object of the present invention to remedy at least some of the problems of known techniques. It is a specific object of the invention to provide a presentation of a handwritten symbol on a screen that gives feedback to the user regarding the recognition of the symbol.

The objects of the invention are achieved by methods according to claims 1 and 15 and by devices according to claims 33 and 34. Specific embodiments of the invention are defined by the dependent claims 2-14 and 16-32.

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.

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.

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.

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.

Thanks to the invention, a pattern that is graphically most similar to the pattern entered by a user is presented. Since the user is aware of that each symbol may be presented as one of several patterns representing different ways of writing this symbol, the presented pattern will give feedback to the user as to how the pattern used for recognition looks like, i.e. the appearance of the pattern that was judged to be most similar to the handwritten pattern. If the presented pattern is not representing the symbol the user intended to write the user can see which incorrect pattern that was found to be most similar to the handwritten pattern. Since the user can see how the misinterpretation occurred the irritation to him will reduce. In prior art, when the handwritten pattern is misinterpreted, this presented pattern may often be quite different to the handwritten pattern, but according to the invention the presented pattern may show greater similarities with the handwritten pattern. If the presented pattern represents the symbol the user intended to write he is able to learn how to write a pattern in order for the recognition to correctly interpret the pattern. Accordingly, the user becomes more aware of how the pattern is interpreted and the feedback will thereby make the user improve his skills in entering a pattern in the right way to be sure that the presented pattern as often as possible is the one he intended to write. Thus, entering a handwritten pattern and receiving the correct best interpretation is made more efficient, as the average time period measured from the handwritten pattern being entered until the

correct interpretation is presented is reduced. Further, the handwriting of the user will be reflected in the presented pattern. This will give a more personal touch to the pattern thus making it more pleasing for the user.

In the context of this application, the word "symbol" is defined as any symbol that could be interpreted by the device, i.e. having a meaning to the device. The symbol could thus be an alphabetic character as the ones used in e.g. Latin or Greek, a syllabographic character as e.g. Japanese Hiragana/Katagana character or Korean Hangul character, a logographic character as Chinese Hanzi character, Japanese Kanji character and Korean Hanja character, or any other kind, an Arabic number, a sign, a figure, or any other picture having a meaning to the device. As used herein, the term "character" means a letter, number or other mark or sign used in writing or printing. The symbol could also be a sign or gesture that is interpreted as space, delete or return. The symbol could also be an abbreviation for a longer, commonly entered phrase or word. For example, a symbol of two merged letters which are a person's initials may represent the person's whole name. A pattern is a specific way of writing a symbol, i.e. a pattern has a certain appearance. Thus, for every symbol there may exist many patterns. Further, an arc is defined as a whole or a segment of a pattern. Thus, an arc may be curved or straight, or have any other form needed to provide a pattern. Further, 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. 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. However, a template for every single way of writing a symbol may not be needed in order to correctly recognise the handwritten pattern and to reflect the handwriting of the user.

According to an embodiment of the method according to the second aspect of the invention, the method further comprises, before the step of presenting, retrieving as the best interpretation, from a database comprising allographs, a best allograph that is associated with the pattern of the best template. The database comprises at least two allographs depicting two different ways of writing a single symbol. The at least two allographs correspond to different best interpretations when being most similar to the handwritten pattern. The number of allographs may be the same as or fewer than the number of templates for a certain symbol. The word "allograph" denotes a symbol having a particular shape. Thus, a certain symbol may be represented by several allographs, each representing seperate ways of writing the symbol. An allograph is used for presenting an interpretation based on the pattern of a template on a screen.

According to another embodiment, the step of presenting comprises presenting the best allograph represented by a bitmap image depicting the way of writing the pattern of the best template.

According to a further embodiment, the step of presenting comprises presenting the best allograph represented by a number of arcs depicting the way of writing the pattern of the best template. Thus, the arcs may all be presented at once or may be presented one at a time. Presenting the arcs one at a time may make it possible to present the time information of the pattern. The time information may either be presented as how the user wrote the pattern or how the user should write the pattern to make it easier for the recognition to correctly interpret the pattern.

According to another embodiment, the best interpretation is the pattern of a best template, and wherein the step of presenting comprises presenting the pattern of the best template on the screen. In this case, the best interpretation is directly acquired when a best

template is determined, since the pattern of the best template may be directly output for presentation on the screen. Thus, as used hereinafter, the term "best interpretation" may according to one embodiment imply "the pattern of a best template".

According to an embodiment of the methods according to both the first and the second aspect of the invention, the pattern of a template is represented by geometrical information relating to the appearance of said pattern. The geometrical information allows the template to be compared to a handwritten pattern.

According to an embodiment, the geometrical information comprises information of positions of a number of dots representing the pattern, said pattern being presented by drawing lines between the dots. In this case, the pattern is represented by positions of discrete dots, which may easily be compared to a handwritten pattern. However, the pattern of the template may still be presented on a screen.

According to another embodiment, the step of presenting comprises presenting the whole pattern represented by the best interpretation at once. Thus, the user immediately sees what the interpreted pattern looks like. Consequently, the user does not have to wait for the interpretation to be presented, thereby reducing the time before the user can decide if it was the correct interpretation or not.

Alternatively, the step of presenting comprises presenting the lines one at a time. Thus, the best interpretation may be presented either in the way the user wrote the handwritten pattern or in the way the pattern is represented by the template. According to the latter alternative, the user is shown how the pattern should be written to make it easier for the recognition to correctly interpret the pattern. Consequently, the user will see how he wrote or should write the pattern.

According to an embodiment, the method further comprises, before the step of presenting, manipulating the pattern represented by the best interpretation according to characteristics of the handwritten pattern. Consequently, the presented pattern is looking even more similar to the handwritten pattern. This implies that the interpretation presented to the user will reflect the characteristics of the user's handwriting giving a personal touch to the presented patterns. As long as the manipulated best interpretation is the correct one the recognition tolerates the way the user writes the symbol.

According to a further embodiment, the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling. Thereby, the user may vary the way of writing the symbol with respect to the position of the symbol, the rotation of the symbol, the slant of the symbol and the magnitude of the symbol and still a very similar recognised interpretation may be presented on the screen. This may also show the user how a misinterpretation may occur due to manipulation of the pattern of an incorrect template being very similar to the handwritten pattern.

According to another embodiment, the handwritten pattern is entered on an input area on the screen and the best interpretation is presented in a presentation area on the screen, wherein the presentation area is overlapping the input area. Thus, the user will focus on the input area when he enters the handwritten pattern and will then look at the presentation area to see the best interpretation of the pattern. Since the presentation area overlaps the input area, the user will not have to constantly shift focus between the input area and the interpretation area. Therefore, his eyes will not be wandering during input, which speeds up the input and makes the input more convenient.

According to an embodiment, the step of recognising comprises returning at least one alternative interpretation. Consequently, the invention provides a possibility of choosing an alternative interpretation, if the best interpretation was not correct, without trying to enter the pattern again.

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, re-entering of the pattern could be avoided.

According to an embodiment, each interpretation is associated with a category defining what kind of symbol is represented by the interpretation. A category may for example be numbers, alphabetic characters, syllabographic characters, logographic characters, a combination of numbers and characters, etc.

According to a further embodiment, the step of presenting comprises masking the presentation of the presented interpretation according to which category the presented interpretation is associated with. Thus, it is easier for the user to make sure that the pattern has been correctly identified. This may help a user in distinguishing between e.g. the Latin letter "O" and the Arabic numeral "0" (zero). Since the masking is selected according to the category of the symbol, it may help the user to determine if the correct symbol has been presented.

This is especially helpful in those cases when different symbols may be written in the same way or nearly the same way. Thus, using only the information

from the specific pattern it may be difficult or even impossible to identify the correct symbol. When a number of symbols are presented it may be helpful for a user to be provided with information concerning the categories of symbols presented, so that he can rapidly and easily determine that the correct symbols are presented.

The masking may of course be done on both the best interpretation and on the alternatives to make it even easier to control if the best interpretation is the correct one and to more easily change interpretation if the presented best interpretation is incorrect. The masking may also be done on presented patterns when the handwritten pattern is difficult to interpret. The masking may either be predetermined by the device or the user may select the type of masking that should be applied to the different categories of symbols.

The category may be indicated by a certain colour of a background to the pattern represented by the presented interpretation.

Alternatively, the category may be indicated by a certain colour of the pattern represented by the presented interpretation. Hereby, an easily applicable, and easily recognisable masking is presented, which does not need to imply any manipulation of the pattern per se.

According to an embodiment, the means for detecting the handwritten pattern may be the screen. The screen may then be sensitive to handwriting for detection of a handwritten pattern entered on the screen. This makes it easier and more comfortable for the user to enter the handwritten pattern since he does not need any additional devices for entering the pattern.

The means for detecting may of course be any other means that is capable of detecting a handwritten pattern, such as a separate screen, a scanner for detecting patterns written on a piece of paper, or an intelligent pen incorporating a camera for detection of a handwritten pattern.

Brief description of the Drawings

Other features and advantages of the present invention will become apparent from the following detailed description of presently preferred embodiments, taken in conjunction with the accompanying drawings, which by way of example show embodiments of the invention.

Fig. 1 is a flowchart of a method according to the invention.

Fig. 2 is a flowchart of another method according to the invention.

Figs 3a and 3b show screen views of presenting an interpretation of a handwritten pattern according to the present invention.

Fig. 4 shows a screen view of masking of presented interpretations and displaying alternatives according to the present invention.

Fig. 5 shows a screen view of different ways of manipulation according to the present invention.

Fig. 6 shows a schematic view of a device according to the invention.

Detailed Description of Preferred Embodiments of the Invention

Referring to Fig. 1, a method according to the invention for presenting a recognised handwritten symbol will be described. The symbol may be any symbol that could be interpreted by the device, in which it is to be recognised in, such as a character, a sign, a figure, or any other symbol. All though other characters or other objects may be entered, as previously mentioned, this description is made with reference to Latin characters and Arabic numerals.

The handwritten pattern may be entered in different ways, such as on a screen of a device for recognition, which screen is sensitive to handwriting, on a separate

handwriting sensitive screen or on any other means that is capable of detecting a handwritten pattern. This description is, however, only made with reference to a sensitive screen on the recognition device.

First, a handwritten pattern is entered by the user on the screen of the recognition device. Then, the entered pattern is detected, step 1.

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.

Referring to Fig. 2, a method according to the invention for presenting a plurality of recognised handwritten symbols will be described. Handwritten patterns are entered on the screen of the device. Each handwritten pattern is detected, step 10. Then, each pattern is sequentially and individually recognised by comparing it to templates in a database, whereby a best interpretation is returned, step 11. Thereafter, the best interpretation is presented on the screen, step 12. The best interpretation is based on the pattern of the best template that is most similar to the handwritten pattern according to a predefine rule. 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. 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.

Figs 3a and 3b show screen views 30a, b before and after interpretation of the handwritten pattern, respectively. Fig. 3a shows a handwritten pattern 32a after the user has entered it on the screen in his personal writing style and before the pattern has been interpreted. The pattern is entered on an input area 34a on the screen which is sensitive to handwriting. 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 according to the way the user wrote the pattern, which is explained in further detail below with reference to Fig. 5. After manipulation and recognition, as shown in Fig. 3b, the manipulated best interpretation 32b is presented in a presentation area 34b. As shown in Figs 3a and 3b, the interpretation may be manipulated such that there is almost no difference between the handwritten pattern and the presented interpretation.

In Fig. 4 a screen view 40 is shown depicting how the alternatives 42 may be presented and how the pattern of the best interpretation 44 and/or the alternatives may be masked. 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. The alternative interpretations 42 are displayed

automatically by marking the best interpretation. Thereafter, the user may select the alternative interpretation that is the correct interpretation of his handwritten pattern.

Further, the best interpretation 44 and the alternatives 42 are masked by means of different shadings on the background. In this particular example, the user wrote the Latin character "o", and the best interpretation 44 was returned as a pattern depicting this character "o". The alternatives presented show i.a. an alternative interpretation 42a depicting the numeral "0" (zero), which is similar to the character "o". Since the alternative interpretation 42a, i.e. the numeral "0", is of another category than the best interpretation 44, i.e. the character "o", the interpretations have different shading on their backgrounds. The user will then be able to select between the alternatives and may easily distinguish between similar characters of different category. A different masking may also be used when the recognition returns an interpretation which is not very similar to the handwritten pattern, i.e. when the device has difficulties to interpret the handwritten pattern. Consequently, the user will be aware of the uncertainty of the presented interpretation.

In Fig. 5 a screen view 50 with examples of different ways of manipulating a character is shown. The first pattern 51 shows how a pattern would look like if it was not manipulated. If the user writes patterns that are wide the presented pattern 52 should reflect this. The writer could also write smaller, larger, or slanted patterns and the presented pattern 53, 54 and 55, respectively, will reflect these variations. Referring to Fig. 6, a device 60 according to the invention comprises a means 62 for detecting a handwritten pattern, e.g. a pressure-sensitive screen. The screen 62 is connected to a processor 64 for recognition of the detected handwritten pattern. The processor 64 uses a database 66

of templates for comparison to the handwritten pattern, and the recognition returns a best template. The processor 64 then returns a best interpretation based on this template as described above. Further, the device 60 may present the best interpretation on a screen 68, which may be the same screen that is used for detecting the handwritten pattern. In another embodiment the database may also comprise allographs that may be presented on the screen as the best interpretation.

It should be emphasised that the embodiments described herein is in no way limiting and that many alternative embodiments are possible within the scope of protection defined by the appended claims. For example, the alternative interpretations must not be displayed only when marking the best interpretation. They may automatically be displayed together with the best interpretation or they may be displayed after the user has used a means for requesting a presentation of the alternatives.

CLAIMS

1. A method for presenting a recognised handwritten symbol, comprising the steps of:

detecting a handwritten pattern that is entered by a user,

recognising the detected handwritten pattern, wherein said step of recognising comprises comparing the handwritten pattern to templates representing ways of writing symbols, and 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 comprise different patterns which represent different ways of writing a single symbol, and

presenting the pattern of the best template on a screen.

2. The method according to claim 1, wherein the pattern of a template is represented by geometrical information relating to the appearance of said pattern.

3. The method according to claim 2, wherein the geometrical information comprises information of positions of a number of dots representing the pattern of the template, said pattern being presented by lines drawn between the dots.

4. The method according to any one of claims 1-3, wherein the step of presenting comprises presenting the whole pattern of the best template at once.

5. The method according to claim 3, wherein the step of presenting comprises presenting lines one at a time.

6. The method according to any one of the preceding claims, further comprising, before the step of

presenting, manipulating the pattern of the best template according to characteristics of the handwritten pattern.

7. The method according to claim 6, wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slantand scaling.

8. The method according to any one of the preceding claims, wherein the handwritten pattern is entered on an input area on the screen and the pattern of the best template is presented in a presentation area on the screen, wherein said presentation area is overlapping the input area.

9. The method according to any one of the preceding claims, wherein the step of recognising comprises returning at least one alternative template.

10. The method according to claim 9, wherein the step of presenting comprises presenting the pattern of the at least one alternative template at the request of a user.

11. The method according to any one of the preceding claims, wherein each template is associated with a category defining what kind of symbol is represented by the template.

12. The method according to any one of the preceding claims, wherein the step of presenting comprises masking the presentation of the presented template pattern according to which category the template is associated with.

13. The method according to claim 12, wherein the category is indicated by a certain colour of a background to the presented template pattern .

14. The method according to claim 12, wherein the category is indicated by a certain colour of the presented template pattern.

15. A method for sequentially presenting a plurality of recognised handwritten symbols, comprising for each handwritten pattern the steps of:

detecting the handwritten pattern that is entered by a user,

recognising the detected handwritten pattern, wherein said step of recognising comprises comparing the handwritten pattern to templates representing ways of writing symbols and returning a best interpretation of the handwritten pattern, said 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 comprise different patterns which represent different ways of writing a single symbol, and wherein the patterns of said at least two templates return different best interpretations when being most similar to the handwritten pattern, and

presenting the best interpretation on a screen.

16. The 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 pattern of the best template.

17. The method according to claim 16, wherein the step of presenting comprises presenting the best

allograph represented by a bitmap image depicting the way of writing the pattern of the best template.

18. The method according to claim 16, wherein the step of presenting comprises presenting the best allograph represented by a number of arcs depicting the way of writing the pattern of the best template.

19. The method according to claim 15, wherein the best interpretation is the pattern of a best template, and wherein the step of presenting comprises presenting the pattern of the best template on the screen.

20. The method according to claim 19, wherein the pattern of a template is represented by geometrical information relating to the appearance of said pattern.

21. The method according to claim 20, wherein the geometrical information comprises information of positions of a number of dots representing the pattern, said pattern being presented by lines drawn between the dots.

22. The method according to any one of claims 15-21, wherein the step of presenting comprises presenting the whole pattern represented by the best interpretation at once.

23. The method according to claim 21, wherein the step of presenting comprises presenting the lines one at a time.

24. The method according to any one of claims 15-23, further comprising, before the step of presenting, manipulating the pattern represented by the best interpretation according to characteristics of the handwritten pattern.

25. The method according to claim 24, wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling.

26. The method according to any one of claims 15-25, wherein the handwritten pattern is entered on an input area on the screen and the best interpretation is presented in a presentation area on the screen, whereby said presentation area is overlapping the input area.

27. The method according to any one of claims 15-26, wherein the step of recognising comprises returning at least one alternative interpretation.

28. The method according to claim 27, wherein the step of presenting comprises presenting the at least one alternative interpretation at the request of a user.

29. The method according to any one of claims 15-28, wherein each interpretation is associated with a category defining what kind of symbol is represented by the interpretation.

30. The method according to any one of claims 15-29, wherein the step of presenting comprises masking the presentation of the presented interpretation according to which category the best interpretation is associated with.

31. The method according to claim 30, wherein the category is indicated by a certain colour of a background to the pattern represented by the presented interpretation.

32. The method according to claim 30, wherein the category is indicated by a certain colour of the pattern represented by the presented interpretation.

33. A device for recognition of a handwritten symbol, said device comprising

a screen,

means for detecting a handwritten pattern,

a database comprising templates that comprises patterns representing ways of writing symbols, wherein at least two templates comprising different patterns which represent different ways of writing a single symbol,

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,

wherein said device is arranged to present the pattern of the best template on the screen.

34. A device for recognition of a plurality of handwritten symbols, said device comprising

a screen,

means for detecting a handwritten pattern,

a database comprising templates that comprises patterns representing ways of writing symbols, wherein at least two templates comprising different patterns which represent different ways of writing a single symbol,

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, wherein the patterns of said at least two templates return different best interpretations when being most similar to the handwritten pattern,

wherein said device is arranged to present the best interpretation on the screen.

Fig 1

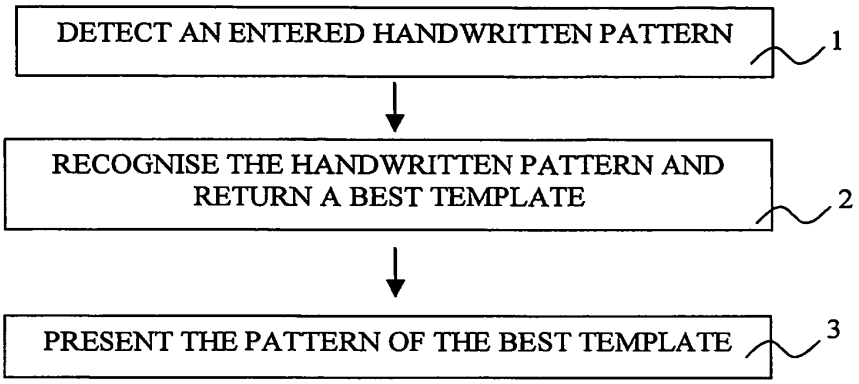

DETECT AN ENTERED HANDWRITTEN PATTERN
1
RECOGNISE THE HANDWRITTEN PATTERN AND RETURN A BEST TEMPLATE
2
PRESENT THE PATTERN OF THE BEST TEMPLATE
3

Fig 2

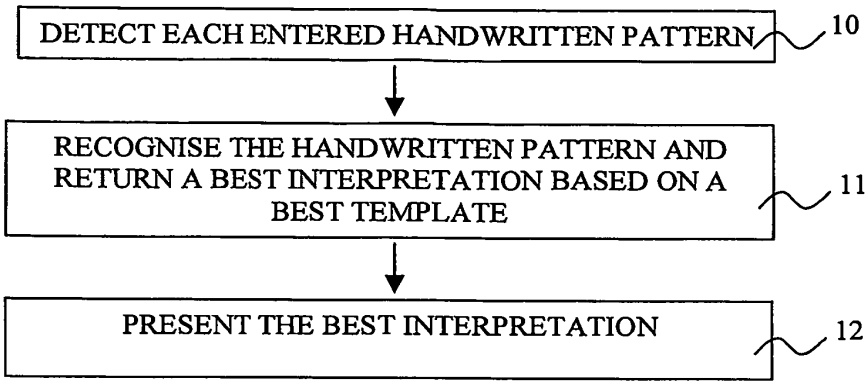

DETECT EACH ENTERED HANDWRITTEN PATTERN
10
RECOGNISE THE HANDWRITTEN PATTERN AND RETURN A BEST INTERPRETATION BASED ON A BEST TEMPLATE
11
PRESENT THE BEST INTERPRETATION
12

Fig 3a

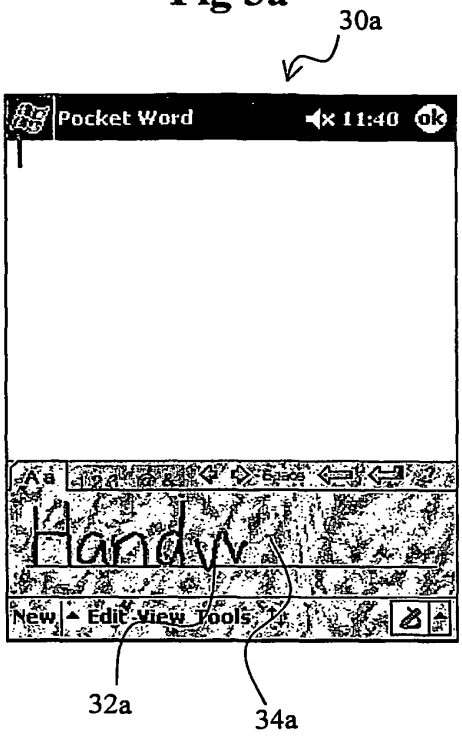

30a
Pocket Word
11:40
ok
Handw
New
Edit
View
Tools
32a
34a

Fig 3b

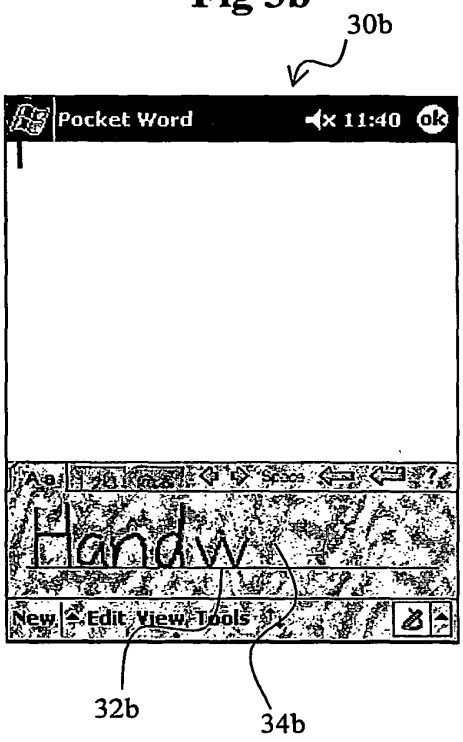

30b
Pocket Word
11:40
ok
Handw
New
Edit
View
Tools
32b
34b

Fig 4

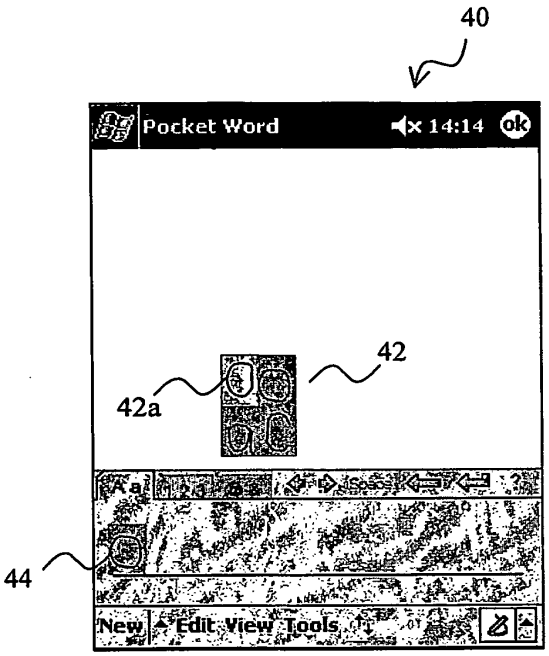


Fig 5

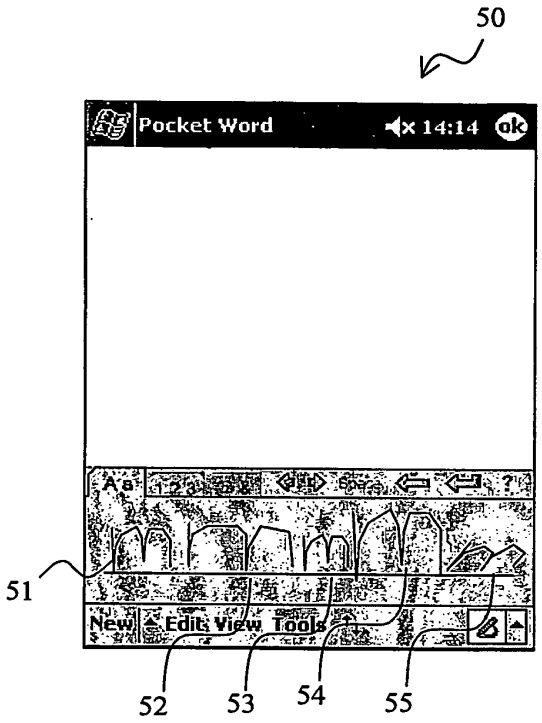
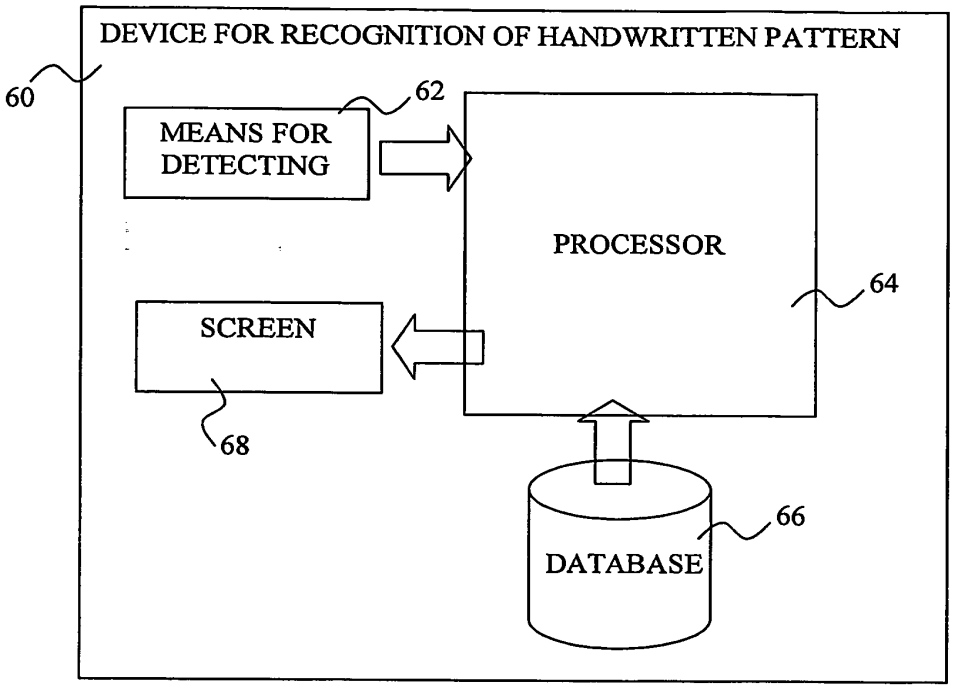


Fig 6


DEVICE FOR RECOGNITION OF HANDWRITTEN PATTERN
60
62
MEANS FOR DETECTING
PROCESSOR
64
SCREEN
68
66
DATABASE

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 03/01226

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G06K 9/68
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G06K, G06T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ, INSPEC, COMPENDEX, TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	PARKER, J.R.: Vector Templates and handprinted digit recognition. Pattern Recognition, 1994. Vol.2 - Conference B: Computer Vision & Image Processing. Proc. of the 12th IAPR International Conf. on 9-13 October 1994, Jerusalem, Israel, pages 457-459. Figures 1,3, abstract --	1-34
Y	US 2001026262 A (VAN GESTEL, H.A.W. ET AL), 4 October 2001 (04.10.01), figure 5, abstract, page 2, [0021] - [0022]; page 4, [0038] --	1-34

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 October 2003	28 -10- 2003
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Alexander Lakic /LR Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 03/01226

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 9833141 A1 (CO-OPERWRITE LTD), 30 July 1998 (30.07.98), page 6, line 3 - line 16; page 7, line 2 - line 16; page 29, line 9 - page 30, line 14, figures 18,27, abstract, page 38, line 7 - line 8	1-34
	--	
A	US 5732152 A (SAKAI, S. ET AL), 24 March 1998 (24.03.98), abstract	1-34
	--	
A	EP 254561 A2 (LINUS TECHNOLOGIES, INC), 27 January 1988 (27.01.88), abstract	1-34
	--	

Form PCT/ISA/210 (continuation of second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT
Information on patent family members

06/09/03

International application No.
PCT/SE 03/01226

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2001026262 A	04/10/01	EP 1192519 A	03/04/02
		JP 2003517669 T	27/05/03
		WO 0144885 A	21/06/01
WO 9833141 A1	30/07/98	AU 748968 B	13/06/02
		AU 5773398 A	18/08/98
		CN 1249831 T	05/04/00
		DE 69707478 D,T	16/05/02
		DK 922180 T	19/11/01
		EP 0922180 A,B	16/06/99
		SE 0922180 T3	
		EP 1012780 A	28/06/00
		GB 9701793 D	00/00/00
		JP 2001509288 T	10/07/01
		NO 986212 A	03/03/99
		TW 469400 B	00/00/00
US 5732152 A	24/03/98	DE 69529703 D	00/00/00
		EP 0690405 A,B	03/01/96
		JP 7325881 A	12/12/95
		KR 238911 B	15/01/00
EP 254561 A2	27/01/88	NONE	

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G 06 K 9/22

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(54) Handwritten keyboardless-entry computer system.

(57) A keyboardless-entry computer system includes a transparent input screen (18) that generates positional information when contacted by a stylus, and a display screen (20) 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 (14) 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 recognise the symbol drawn by the stylus. Key features of the system are: (A) transparent position sensing subsystem; (B) underlying display on which to mimic drawing of sensed positions and to shown characters or symbols; (C) means to convert sensed positions first into plotted Points and then into recognised characters or symbols; and (D) means to "learn" to associate sensed input positions with a character or symbol.

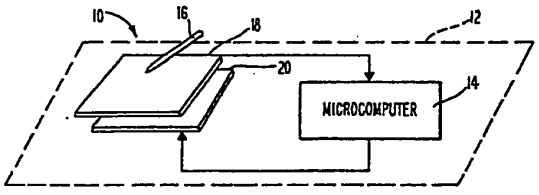


Fig. 1

EP 0 254 561 A2

Bundesdruckerei Berlin

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Description

HANDWRITTEN KEYBOARDLESS-ENTRY COMPUTER SYSTEM

The present invention relates generally to a keyboardless input system to a computer, and when combined with a central processing unit, to a keyboardless-entry computer system. More particularly, the present invention relates to an information storage, manipulation and transfer device on which text, data, computer commands and functions can be entered by writing alphanumeric or any other characters and symbols by hand with a penlike stylus on an input/Output (I/O) screen. In a preferred embodiment the I/O screen includes a transparent touch screen incorporated over a substantially flat output display. The present invention in its preferred embodiment is a self-contained computer system but can also function as a peripheral to a host computer.

Large amounts of information and sophisticated applications software are now available on conventional keyboard computers. The utility of this information and of application software could be greatly increased if text and data could be entered and applications software manipulated by writing in a normal fashion directly on a flat display. Thus, there is a need to allow the utility of computer technology to be extended for use by non-keyboard oriented individuals. There is also a need for a portable computer system that is lightweight, reliable, accurate, inexpensive and permits use while standing or walking. One way to reduce expense and size and increase utility is to employ a keyboardless entry system, such as a touch screen. However, this type of input device does not easily allow accurate detailed input within a real time framework with high resolution in a manner which is familiar and natural to the user.

Many positioning technologies can be used to meet the requirements of the position sensing input technology. Essentially these requirements include accuracy, resolution and speed. The technologies include: mechanical, electrostatic, electromagnetic, acoustic, optical, and inertial. The desire in this system is to have its use as similar as possible to writing with pen or pencil on paper. One problem is proximity -- a pen on paper only leaves a trail when actually in contact. Many of these technologies require an additional "pen down" sensor which is awkward to use in many commercial pens. Another problem is writing angle -- a pen leaves the same trail independent of writing angle. Many of these technologies have the position detector displaced from the pen tip, so pen angle causes erroneous displacements. Beyond these general problems, each technology has numerous advantages and disadvantages in (1) the pen: size, weight, shape and whether it needs to be powered and/or wired, and (2) the writing surface: transparency, smoothness, "feel", and whether or not physical contact is needed (as opposed to pressure transmitted through overlaying sheets of paper).

A number of self-contained devices for viewing and processing large amounts of information are known. Most employ optical, magnetic or solid-state electronic storage means to store data. Illustrative of this body of art is U.S. Patent 4,159,417 to Rubincam which discloses a portable electronic book configured to provide selective page by page call-up of large amounts of digital data and displays it on a flat, solid-state screen. The preferred embodiment in the Rubincam patent uses an insertable holographic card, which may contain several hundred pages of text in digital form, as the main storage means. Rubincam's device, however, does not allow new information or text to be entered or manipulated.

In U.S. Patent 4,016,542 to Azure an electronic data collection system is disclosed which employs a solid state Random Access Memory (RAM) for its primary memory. This patent, which discloses a conventional keyboard for data entry, is directed to a hand-held portable data storage and transmission system, as well as an LED display and various Input/Output (I/O) connectors.

U.S. Patent 3,487,731 to Frank discloses a means of converting handwriting into character data through the use of a computer system. The disclosed invention is based on matrix pattern matching and does not employ any coincident display technology.

U.S. Patent No. 4,491,960 to Brown shows a handwritten symbol recognition system in which an array of image Points, in the form of a raster line sampling, is converted into segment-oriented lists which are filtered and compressed to obtain topologic features which are then analyzed with a logic tree decision mechanism.

U.S. Patent No. 4,262,281 to Buckle et al. discloses a handwriting recognition device. The disclosed embodiment is for use with a host computer and does not employ coincident display technology.

U.S. Patent No. 4,475,239 to Van Raamsdonk discloses a text editing apparatus. The '239 patent calls for the use of paper as a medium for the entering of editing functions and requires a conventional keyboard for the inputting of text.

U.S. Patent 4,521,909 to Wang shows a dual level pattern recognition system. The system is designed for use with an optical instrument.

U.S. Patent 4,520,357 to Castleberry et al. discloses an electroscopic information display and entry system with writing stylus. The disclosed embodiment does not claim to have the speed or accuracy to enable handwritten character recognition.

Additional prior art which discloses portable electronic devices that provide large amounts of various types of stored information include U.S. Patents 4,218,760 to Levy; 4,4115,486 to Laine; and 3,932,859 to Kriakides et al. The Levy and Kriakides et al. patents pertain to electronic dictionaries, while the Laine patent discloses a programmable television reminder system. None of these devices disclose the use of a handwritten input.

In U.S. Patents 4,071,691, 4,129,747, 4,198,539, 4,293,734, 4,302,011, 4,353,552, 4,371,746 and 4,430,917 to William Pepper, Jr. various methods or machine-human interfaces using finger touch are disclosed. The

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preferred embodiments in each of these inventions lack sufficient speed and resolution to allow handwritten character recognition with a stylus and are designed for other purposes. U.S. Patent 4,318,096 to Pepper teaches the use of a conductive stylus. The '096 patent pertains to graphic design and allows line width and line intensity to vary by applying pressure on the stylus with the results displayed on a conventional CRT screen. U.S. Patent 3,699,439 to Turner and U.S. Patent 4,055,726 to Turner et al discloses two methods for electronic position sensing through the use of a probe.

The invention in its various aspects is defined in the appended claims to which reference should now be made.

A preferred embodiment of the invention which is described in more detail below with reference to the drawings comprises a unique keyboardless computer system which has the ability to recognise and display Handwritten Symbols and cause the computer to display Font Symbols and, if desired, to execute editing functions pursuant to Editing Symbols, quickly, easily and at reasonable cost.

This preferred embodiment includes a computer housing with a flat display panel on which a user may "write" with a stylus, and has a capability to recognise Handwritten Symbols written on the panel with the Stylus and convert them to displayed Font Symbols, and/or to execute Editing Functions with Editing Symbols, all with a minimum of technical complexity for the user. Once the keyboardless, portable computer is loaded with the desired information and applications software, information and software can be used and responded to without requiring skills or knowledge related to state-of-the-art computers or other data source. The ease-of-use of the input technology of the apparatus enhances the utility of the computer for keyboard oriented individuals. Its portability also allows it to be used in applications and settings in which portable keyboard computers are awkward, difficult or impossible to use. For example, a multiplicity of blank, full or partly completed forms may be stored in the portable computer memory. In a hospital, "sheets" of patient data can be stored in the memory of the portable computer, called up by a nurse as the nurse makes rounds and relevant data, such as blood pressure, temperature, etc., can then be entered manually with a stylus. These corrected or expanded forms can then be down-loaded into a central computer memory.

The requirements of the position sensing input technology are accuracy (Point to Point), resolution (absolute position) and speed (Points per unit time) to adequately define the written Stroke for recognition analysis. For the recognition apparatus and methods presently used, as described below, the present minimum requirements are: accuracy of 0.125mm (0.005 inch), resolution of 0.375mm (0.015 inch) and speed of 150 Points per second. This accuracy allows a 6mm (1/4") high writing line with over 10 raw input Points along a Stroke of a small letter. The resolution provides positioning of the symbol to within two pixels on a present display of 640 pixels to 225mm (9 inches). The speed permits about 50 raw input Points for a rapidly written single letter (1/3 second).

One embodiment of the present invention comprises a transparent input screen. As the user writes alphanumeric or other characters or symbols on the input screen, the character is represented as a stream of Points emulating written input with pen on paper. Once the discrete alphanumeric and other characters or symbols are complete, they are translated into computer text or computer commands that can be displayed on a display screen at a location that is preferably beneath the area on the input screen where they are entered. The embodiment also comprises a pattern recognition algorithm which allows the translation of any written character or symbol, such as ideographs and scientific symbols, into computer text.

In a particular, presently preferred embodiment, a keyboardless computer is configured as a manipulation and display device comprising a transparent touch screen and associated electronics placed over an 80 column by 25 line or larger display screen; a stylus for entry of data; a microprocessor and storage means; artificial intelligence/pattern recognition software and editing software; and a battery power system; and other I/O means.

As used herein, "Handwritten Symbols" are any symbols capable of being handwritten and having communicative effect. By way of example, and not limitation, numbers, letters, "Kanji" (Japanese ideograms) or other language symbols, editing symbols and engineering, scientific, architectural and mathematical symbols are Handwritten Symbols. Other examples of Handwritten Symbols are free-hand drawings or signatures or any other such written information uniquely configured by a particular writer. Handwritten Symbols may also include Editing Symbols (defined below).

As used herein, "Font Symbols" are computer-generated symbols which are displayed in a predetermined font format. By way of example and not limitation, alphanumeric symbols may be Font Symbols and displayed in numerous font formats. Japanese or Chinese "ideograms" may also be Font Symbols, as may be engineering, scientific, mathematical, architectural or other such characters. Other examples of Font symbols include any form which can be stored and displayed by a computer, e.g., a drawing of a car or a house.

As used herein, an "Editing Symbol" is a symbol (such as a caret, horizontal line, short vertical line, long vertical line, etc.) which is intended, when recognized, to cause the computer to execute a particular Editing Function (defined below), such as insert text (caret), delete text (horizontal line) delete a letter (short vertical line) or move a margin (long vertical line), to list a few representative examples.

"Editing Function" means any computer-generated text editing operation, such as by way of example and not limitation, insert text, delete text, move text and substitute text. Some primary Editing Functions are listed towards the end of the description below.

The preferred embodiment of a keyboardless entry computer system will now be described that includes a transparent input screen that generates positional information when contacted by a styles, and a display

Exhibit 1004
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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 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 recognise the symbol drawn by the stylus. Key features of the system are: (A) transparent position sensing subsystem; (B) underlying display on which to mimic drawing of sensed positions and to shown characters or symbols; (C) means to convert sensed positions first into plotted Points and then into recognised characters or symbols; and (D) means to "learn" to associate sensed input positions with a character or symbol. The apparatus can be housed in a portable unit having dimensions up to about 400mm by 400mm by 100mm (16" x 16" x 4") and a weight of up to about 7 kilograms (15 pounds), with a self-contained power supply.

Brief Description of the Drawings

The preferred embodiment of the invention will be described in more detail by way of example with reference to the drawings, in which:

Fig. 1 is a schematic system block diagram of an embodiment of the present invention;

Fig. 2 is a perspective view of the housing containing the operating elements of the system;

Fig. 2A is an enlarged portion of Fig. 2, with parts removed to show the positional relationship between the touch input screen and the display screen.

Fig. 3 is a schematic diagrammatic view of the input screen, stylus and associated electronics;

Fig. 4 is an overall schematic system block diagram of the apparatus of a keyboardless entry computer system according to the present invention;

Fig. 5 is a schematic block diagram depicting the movement of data within the system when modified by handwritten characters and commands;

Fig. 6 is an overall system block diagram depicting the hierarchy of software used to operate the system;

Fig. 7 is a generalized block diagram of the character and pattern recognition algorithm

Figs. 8A and 8B together are a detailed block diagram of the pattern recognition algorithm

Fig. 9 is a schematic block diagram of the Stroke characterization subroutine.

Fig. 10 is a top plan view of a screen illustrating the "initializing" of the database for Handwritten Symbols.

Figs. 11A through 11I are a series of top plan views of screens depicting the operation of a text editing system.

Figs. 12A through 12G are a series of top plan views of screens depicting the operation of a data entry system.

Fig. 13 is a generalized block diagram of the Linus Editor.

Detailed Description of the Preferred Embodiments:

With reference now to the figures, wherein like numerals indicate like elements throughout the several views, and in particular with reference to Fig. 1, an overall block diagram of a portable handwritten, keyboardless entry computer system 10 is depicted. The complete computer system is encased in a housing 12, indicated graphically by the dashed line, and includes a conventional, general purpose digital microcomputer 14, described in greater detail hereinbelow. Input information is provided to microcomputer 14 by stylus 16 "writing" on writing or input screen 18. Stylus 16 (Fig. 2) is connected to the computer of system 10 with wire 17 (Fig. 2). As stylus 16 "writes" on input screen 18, a plurality of locating signals representative of a plurality of corresponding positional coordinates are transmitted to microcomputer 14. Microcomputer 14 has been programmed in accordance with a computer program described hereinbelow, to recognize the stream of locating signals and to store these signals in a computer memory. The programmed microcomputer 14 also provides a corresponding plurality of display signals to a display screen 20. Both input screen 18 and display screen 20 are described in greater detail hereinbelow.

Referring now to Fig. 2, there is shown a perspective view of keyboardless computer system 10 embodying the features of the present invention. Keyboardless computer system 10 is contained in housing 12, which is a rectangular enclosed casing having a sloped top surface 22 with a multi-line, solid state display area 24. Input screen 18 is depicted in Fig. 2A as being positioned over display screen 20. In this example, display screen 20 displays a plurality of horizontal lines 25 with the following indicia:

Name _____
Address _____
_____

Handwritten entries are made above each line 25. The distance or space between two lines 25, denoted 26, is used by the system to normalize all distances, and lines 25 themselves serve as a reference axis or base line.

Below display area 24 on top surface 22 is a key input section 26 comprised of a plurality of "Softkeys" 28. Softkeys 28 can be programmed by the operator for any purpose, such as to enter computer commands. Exemplary commands for Softkeys 28 are "store," "recall," and "delete." In addition, Softkeys 28 can be used

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to switch between different programs or between modes (e.g. data entry mode and edit mode). However, Softkeys 28 are optional and are used to supplement the input obtained by handwriting the entries. Stylus 16, used for writing input data and commands in display area 24, also is used to activate the selected Softkey 28. An ON-OFF switch 30 is positioned on the side of housing 12 adjacent to Softkeys 28. A data output or peripheral connector 31 is located on the upper right side of housing 12.

Input screen 18 can be a conventional resistive type touch screen in which a voltage is applied to the screen edges and a stylus detects the voltage at the touched location. The writing surface is a transparent material, typically glass, coated with a thin, uniform, conductive layer (presently, vacuum deposited indium tin oxide). Vertical bus bars or conducting strips (not shown) are used along the two sides to apply the reference voltage to determine the "X" coordinates of the stylus position and horizontal bus bars or conducting strips (not shown) are used along the bottom and top to apply the reference voltage to determine the "Y" coordinates of the stylus position. In this embodiment, stylus 16 is merely an electric probe that, when physically in contact with the conductive layer, detects the local voltage at the Point of contact, which will vary with the distance from the conducting strips or bus bars. With the origin at the Point of voltage application, the X, Y coordinates are inversely proportional to the impressed voltage. Stylus 16 must make good contact to minimize adding resistance that would lower the voltage detected, and thus add an erroneous distance increment. In a presently preferred embodiment, a soft graphite tip is used. The voltage is conducted from the pen through a wire, such as wire 17 in Fig. 2, to an analog to digital converter for use in the computations described below. The stylus may be a charged "pen" as described herein, a light pen as is well known in the art, or any other hand-held device which can outline Handwritten Symbols on a screen.

An example of a conventional electrostatic screen is disclosed in the aforementioned 4,318,096 Pepper patent. This resistive type screen has the advantage that the interference caused by the user's hand touching the screen is minimized.

Both horizontal and vertical position sensing is provided by alternately switching the voltage impressed on a conductive layer between the pairs of horizontal and vertical bus bars by an interface and multiplexer controlled by a microcomputer or microcontroller. In one commercially available input or touch screen, the bus bars are broken into a series of short strips with diodes to prevent the horizontal strips from shorting out vertical strips and vice versa. This technique is used in a commercially available touch screen from Touch Technologies of Annapolis, MD. and Elographics of Oak Ridge, Tenn.

Referring now to Fig. 3, an alternate embodiment of a low power position sensing novel input screen 33 is described in greater detail. Input screen 33 is also for determining an X,Y position on an electrically resistive plate 34. A stylus 35 containing a voltage source, such as battery 36 or a voltage transmitted to stylus 35 from an external source such as the system power supply, is used to touch screen 34 and apply a voltage at the touched position. When the touched position is charged by stylus 35 with a positive voltage with respect to a plurality of plate measurement Points 37, the voltages at these Points will vary with the distance to the pen position, such as position X_1, Y_1, indicated at 38. These voltages are sequentially measured in the X and Y directions by using conventional means, such as disclosed in the aforementioned prior art patents. In Fig. 3 these means are a conventional interface/multiplexer 42. A conventional Analog-to-Digital converter 43 converts the detected voltages into a digital signal. A microcontroller 44 receives the digital signal, performs standard checks to insure the signal's numerical value is "valid" (e.g. is within the possible range of voltages), and then converts the voltages to X and Y distances in the manner described herein. Microcontroller 44 is conventional, but could be replaced by a system computer. Microcontroller 44 provides a digital signal representative of the X and Y distances to measuring Point 38 to an output port 46. Port 46 can be a conventional RS 232 port. Alternatively, microcontroller 44 could translate Point X_1, Y_1 to any other reference Point, such as a Point on base line 25 (Fig. 2).

As long as there is no contact by stylus 35 at position 38 or any other position on plate 34, no current flows and power consumption is minimal. An incident measurement of the voltage at the measurement Points may occur by using ramped voltage at the positioning Point and timing when the measuring Point voltage exceeds a preset back voltage.

There are various options for the input or touch screens 18 and 33, resistive plate 34 or its equivalent for screen 18 can be transparent or translucent and the position Point can be made by a stylus or a finger of the user, or a connecting Point of an overlapping conductive screen (such as the commercially available touch screens from Touch Technology, Annapolis, MD.). Input screens 18 and 33 can be a physical solid surface which is transparent or translucent and can be glass or plastic such as Mylar. The surface can be coated with a conductive/resistive substance like indium tin oxide. Other physical surfaces can use sound or electromagnetic radiation transmission from the touched position to a reference Point or Points and the distance is determined by the time delay or phase shift. Alternatively, input screens 18 and 33 can use an ethereal or geometric surface defined by an electromagnetic, optical or sonic field.

Position detection can be accomplished with electrical contact closure by resistive, capacitive or inductive coupling, remote sensing by sonic, electric or magnetic fields or by light (UV, IR, or microwave) scanning.

The advantages of the low power position sensing input arrangement over other such screens are: 1) it makes stand-by power requirements minimal; 2) it eliminates distortion due to opposing parallel "bus" bars in conventional touch screens; and 3) when a ramped voltage is employed, it eliminates the need for an A/D chip which is a major cost factor in state-of-the-art touch screen technology.

The coefficient of friction of the screen 18 is desirably selected to be "rough" enough to offer some

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resistance to the movement of stylus 16 on the screen. If the screen were too smooth, the stylus would slide too easily and would be difficult to control.

Reference is now made to Fig. 4 which discloses and overall system block diagram of the major electronic circuitry used in the preferred embodiment of the present invention. Microcomputer 14 includes a microprocessor 50, interconnected to a plurality of other electronic elements by means of data path or bus 52. A Read-Only-Memory (ROM) 54 which is programmed with the operating and application programs and a battery powered Random Access Memory (RAM) 56 is connected for bidirectional data flow onto bus 52. Microprocessor 50 may be a conventional single-chip eight-bit or sixteen-bit device which functions to execute the fixed control programs residing in ROM 54, and further receives control programs from and provides control signals to the other electronic elements via bus 52. Microprocessor 50 may be of the type commercially designated Z80 (manufactured by Zilog Microcomputers of Cupertino, California), of a type 8088 device (manufactured by Intel Corp. of Santa Clara, California) or any similar or more powerful microprocessor. ROM 54 may be of the type 2564 or 4764, both manufactured by Texas Instruments of Dallas, Texas. The storage capacity of RAM 56 is determined in part by the sizes of the application programs, the operating program and the database. As discussed below, RAM 56 may be of the static SRAM or dynamic DRAM type. The primary requirements of RAM 56 are that it have sufficient storage capacity and that it require a minimum of input power.

A battery 58, such as a lithium battery, provides power for making the memory of RAM 56 non-volatile for extended periods of time. A battery pack 60 containing the well-known rechargeable types of batteries is used to provide the various voltage levels required by the other electronic elements of microcomputer 14.

Alternately, the storage function of RAM 56 may be served by a non-volatile device which requires no power for maintaining storage, such as an electronically erasable and reprogrammable memory (EEPROM), or devices using magnetic bubbles or capacitance. State-of-the-art disk or tape may also be used for mass storage. Suitable bubble memory devices include types 7110 and 7114 which have storage capacities of 1 megabit and 4 megabits respectively. (Both are manufactured by Intel Corp.). Furthermore, it is possible to use a single integrated circuit chip which includes microprocessor 50, at least part of ROM 54 and at least part of RAM 56.

Also connected to bus 52 is an EIA RS-232 serial interface 62 which provides a means for inputting and outputting data. Data is provided to bus 52, (usually to RAM 56) by interconnecting an external data source to RS-232 port 62 directly to the microprocessor 50 and other elements of the microcomputer 14. Offloading data from RAM 56 can also be done by microprocessor 50 to an external computer, other data gathering device, a mass data storage device (e.g. floppy and hard disk drives) or an electronic telecommunications system. In like manner data can be communicated through port 62 to a printer (not shown) from interconnecting bus 52.

Stylus 16 is used to write on input screen 18 and to cause the generation of X,Y coordinate information by conventional touch screen interface electronics circuitry. The coordinate information is communicated via the bus 52 for control use by system 10. The solid state display 20 consisting of a multi-line display -- illustratively 80 columns by 25 lines --is interconnected to bus 52 through a display interface 66. The fundamental requirements for the display are that it be substantially flat and sufficiently thin for use in the present invention. The display may be of the following types: scanning types such as a cathode ray tube, projected types such as a rear-view projector, light emitting array of Point types (e.g., electroluminescent or plasma discharge) and light blocking array of Points types (e.g., liquid crystal displays, solid state PLTZ or magneto-optical). In addition, it is preferable that the display be compatible with input screen 18 in size, configuration and transparency, and that both be low power consuming types.

The X,Y coordinates are input to keyboardless computer 14 via input screen interface electronics 64 and communicated via bus 52 to microprocessor 50 which executes programs stored in ROM 54 and RAM 56.

The number of Points (i.e., sets of X,Y coordinates) used in defining each Handwritten Symbol and the speed at which Points are identified are important for practical utility. It is desirable to use at least about 4 Points per millimetre (100 Points per inch) and at least about 100 Points per second to define Handwritten Symbols. It is to be noted that the more Points per unit length that are identified, the greater the accuracy of the system in identifying Handwritten Symbols -- however, more Points being identified will slow down the speed of identification and require more computer memory. Accordingly, a balance will have to be achieved, based on the size (available memory and processing ability) of the computer system and the requirement for speed of response and accuracy. For most purposes, standards in the range from about 4 Points per mm (100 Points per inch) and 100 Points per second to about 8 Points per mm (200 Points per inch) and 200 Points per second will be suitable.

It is also to be noted that the greater the precision of the system in identifying the X,Y coordinates of each Point the fewer the number of Points needed to be identified per unit length and per second to accurately identify Handwritten Symbols. Conversely the less the accuracy, the more Points that are needed.

Point resolution is needed to place Points where intended, e.g., to write an editing symbol precisely between the two characters. Ideally, resolution to a single display pixel is desirable. However, operationally, resolution within two displayed pixels is sufficient for a display with 640 pixels in a 225mm (nine inch) horizontal scanline.

When switch 30 (Fig. 2) is positioned to "power on", the basic display mode is activated and microcomputer 14 (Fig. 4) programmed by the operating system, causes a menu to be displayed on display screen 20 (Fig. 1). The menu presents various software options. A primary software function, editing, functions in a manner similar to conventional word processing software with the difference being that handwritten characters,

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symbols and commands are interpreted by the system as if they were entered from a conventional keyboard. The system is capable of learning the editing symbols used by a particular writer for functions such as indent, insert, delete, move and reformat and translates those symbols into digital command functions. Optionally, Softkeys 28 (Fig. 2), activated by touching those areas on the input screen with stylus 16, function like conventional hard function keys on a computer keyboard.

The system is particularly adapted for use as an interactive screen editor or word processor. After a writer retrieves a document by (for example) touching the displayed name of an existing file with the stylus or by writing the name of the file on the screen, all usual editing functions can be performed with stylus entry. When the user wishes to change a displayed character or symbol, he may simply write over the display character or symbol and as described hereinbelow the pattern recognition algorithm will translate the written entry into computer text. For example, the editing software allows text to be eliminated by simply drawing a line through it and a conventional caret symbol may be used to change the operating mode to the insert mode. In the insert mode, display screen 20 provides additional space for entry of handwritten characters or symbols which are inserted in the text after the Point where a caret was written in. Text can be moved simply by placing brackets or other user-defined delimiters around a displayed phrase or word and writing a caret or other user-defined symbol in the area of the text in which the user wishes this material to appear. New margins can be set by drawing vertical lines down the side of the displayed text where the new margins should appear.

The basic editor software also allows new documents to be created by simply writing Handwritten Symbols on the screen. All documents can be stored, changed and communicated in the manner in which these functions are accomplished on a conventional word processing system with the difference that these functions are accomplished with handwritten Editing Symbols on the (optional) screen or by touching the Softkeys with the stylus. The composite text thus produced and stored can be subsequently offloaded through the RS 232 port 62 (Fig. 4) to another computer, a similar device, an external data gathering device or recording device, into a printer or through a telecommunications system.

In addition to these major operating modes, a number of ancillary elements and features add to the utility of the system. A conventional alphanumeric keyboard (not shown) containing a full set of keys can be connected to a conventional keyboard interface (not shown) to support the entry of alphanumeric characters. An AC/DC power connector may also be used in those applications when portability is not needed and when needed to meet the power requirements of screen technologies such as gas plasma displays and electroluminescent displays.

In actual use the keyboardless computer can function in any application or environment in which handwritten input translated into computer text is useful or necessary. Illustratively, the device can function as a new generation word processor, or for use in fields such as sales, nursing, inventory control, census taking, claims adjusting, to name just a few of its many uses or as a general learning and testing device in education. Since the pattern recognition software can learn and translate into computer text from languages which are not made up of a small or limited set of alphanumeric characters (e.g., Japanese, Korean, and Chinese), it has particular utility for word processing and telecommunications in these languages.

In practice, it is particularly desirable to use a single computer screen to display any initial forms, Font Symbols or other displays to be edited, and to create a nearby "window" of blank space where Handwritten Symbols are to be written, displayed and identified, and where the Font Symbols corresponding to the Handwritten Symbols are to be displayed. In this way, the user can view the text being edited and the proposed insert or change without significant movement (if any) of the head and eyes. This is illustrated in Figs. 11A to 11D. This feature (proximity on one screen of text to be edited and the window into which new text is to be handwritten) is very important to the simple, rapid, comfortable use of the system.

In a preferred embodiment of this invention, the system "learns" the handwriting of a particular user prior to actual use. 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. Punctuation symbols, such as periods, commas, question marks, colons, semi-colons, hyphens and the like could also be inserted. There is virtually no limit to the Handwritten Symbols which can be recognized and stored in the database. Of course, the computer will have to store a suitable array of Font Symbols for conversion of the Handwritten Symbols. Different sets of Font Symbols could be created and stored in the permanent memory of the computer, as in ROM chip 54. For example, in English language usage, a chip could contain one (or more) fonts of numbers and letters, suitable punctuation symbols and appropriate mathematical symbols. Other chips could have stored Font Symbols for the Arabic, Cyrillic or Greek alphabets, Japanese, Chinese or Korean "Konji", symbols for use by architects or engineers, or chemical symbols (e.g., benzene rings and the like).

In Fig. 10, one of a series of learning screens is displayed and the user is prompted to write the numbers 0 through 4. The computer will attempt to match the written numbers with the existing database (if any). If it cannot be matched because there is no existing database or because there is a poor match with an existing database, the character is added to the database. This learning process continues until all of the alphanumeric (or other) characters and symbols to be used are entered into the database. The system has the capability of storing multiple Stroke characterization databases for systems used by more than one user. The existence of a unique Stroke characterization database for each user has the further advantage of making the writing angle irrelevant. As a result, the system is adaptable to all handwriting styles and is usable by right-handed and left-handed persons. One feature may desirably by incorporated into the apparatus to accommodate left-handed and right-handed persons. This feature is a receptacle (not shown) for the stylus connector on

either side of housing 12, so that the stylus 16 may be connected on the left side for left-handed persons and on the right side for right-handed persons.

Fig. 10 also provides an example of the use of "Softkeys". In addition to the input line, a variety of Softkeys appear. Each Softkey corresponds to a function that can be performed by the system. In order to execute the funtion, the user merely touches the indicated Point with the pen. The Softkey will then appear in reverse video and the selected function is performed. There are numerous advantages to Softkeys over traditional function keys. Some of the more significant of these are that the user is no longer required to memorize what function key performs what function; the need for keyboard overlays is eliminated: and different Softkeys can be made available (displayed and made operational) at different Points within a program.

Figures 11A to 11I demonstrates some of the simplifications in word processing made possible through the use of this invention. In Fig. 11A a standard screen of text is displayed. The user of the keyboardless entry system decides that additional information needs to be added and draws an insert symbol (e.g., caret) on the screen at the desired position. A data entry "window" then appears. (Fig. 11B). The text is written in as Handwritten Symbols (Fig. 11C), matched (converted to Font Symbols) (Fig. 11D), and then inserted (Fig. 11E). The operator reconsiders the addition and draws a horizontal line through the new material. (Fig. 11F). It is immediately erased. (Fig. 11G). Next, the operator decides that a larger right-hand margin would be more appropriate for the text. A vertical line is drawn on the screen (Fig. 11H) and the margin is automatically adjusted (Fig. 11I).

A generalized block diagram of the editing process is provided in Fig. 13 and a description of that figure appears hereinbelow.

Figures 12A-12G illustrate how a blank form may be used for a hospital patient. The user of the system first calls up the proper blank form (Fig. 12A). This may be done, for example, by touching an appropriate Softkey. The area where the information, in this case a pulse observation, is to be inserted is touched with the pen (Fig. 12B). After the desired location is highlighted, a "window" appears directly below the space where the observation is to be recorded (Fig. 12C). The nurse then touches the pen on the match box which appears highlighted (Fig. 12D). The software then matches the handwritten input to the corresponding Font Symbols and displays the result (Fig. 12E). If there is an accurate match, the "insert" block is touched (Fig. 12F), and the new observation is added to the patient's records (Fig. 12G). This mechanism is clearly applicable to a wide variety of "blank forms" in which data is inserted into a form or corrected. For example, it could be used to correct or update financial information in a spreadsheet program. Other information can be recorded in the same manner.

The reason for using a black background and white letters for the newly entered Font Symbols is to facilitate checking the accuracy of the inputted characters. Although this is preferable, it is not essential and a white background and black letters is also acceptable.

The ability to create a window and input data on the same screen and in physical proximity to the text being edited or space for data to be input is an important feature of the apparatus, for it permits ease and speed in the use of the apparatus. The user's eye may focus on the space where the data will be inserted and the ability to contemporaneously display Handwritten Symbols and the corresponding Font Symbols makes it easy to see errors, when the system "misreads" a Handwritten Symbol, and then correct errors quickly and easily.

Referring first to Fig. 5, the overall operation and functioning of the pattern recognition software will now be described. When the operating system calls the pattern recognition program, the program begins in terminal 75 where a number of variables and counters are initialized. The software then proceeds to decision diamond 76 where the program determines if stylus 16 (Fig. 2) is in contact with input screen 18 (Fig. 2A). The system provides a "pen-down" signal, as shown in processing box 78, as well as the X,Y coordinate voltages as locating signals, as described above. Microcomputer 14 (Fig.4) converts the X,Y coordinate locating signals into Stroke characteristics using programs stored in ROM 54 (Fig. 4), or a separate microcomputer can do the conversion, such as microcontroller 44. If a pen down signal is received, the software proceeds to processing box 80 where the individual locating signals are combined into "Strokes," a Stroke being defined as the Point locating signals produced between a "pen down" signal and a "pen up" signal.

The system then calculates a transform, as described below, for each Point, transforming the Point coordinates from the X,Y cartesian coordinate system to a relational coordinate system. The software next proceeds to processing box 82, where it compares the Stroke with previously entered Strokes accumulated into a database, and determines if the Stroke is represented by a symbol in the database. 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. If a match is not found, microprocessor 50 (Fig. 4) causes a message to be displayed, as indicated in processing box 88, which requests further input from stylus on input screen 18 (Fig. 4) by either flashing an entry which is close to a match or a non-recognition symbol.

As mentioned above, the software compares the Stroke characteristics of each Handwritten Symbol to data entries previously stored in a database. In a preferred embodiment, the database is arranged into sections of characters or symbols by the number of Strokes needed to make the character or symbol. Within each section, the entries are randomly arranged at first, but after use, as explained herein, the most frequently used entries "rise" to the top of the database. It should be noted that each user will have his or her own particular style of writing a Handwritten Symbol and that each Handwritten Symbol may have a number of different variations.

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For example, many people write the lower case letter "h" using a single Stroke. They do this by starting the pen on the writing tablet at a Point where they wish to place the top of the letter, drawing a vertical line downwardly to the base line, then without removing the pen from the paper, proceeding back up to the midPoint of the previously drawn vertical line, over to the right and down to the base line when the pen is picked up from the paper. On the other hand, these same people may draw the upper case letter "H" using two Strokes. They do this by drawing the left hand vertical line and horizontal line as is done for the lower case "h", picking the pen up from the tablet, and then drawing the right hand vertical line. Appendix I displays the data of the Stroke data Points for these two letters as the data is stored in memory after having been generated by an embodiment of the present invention.

As shown in Appendix I, the letter "h" as drawn at one particular time by one user has one Stroke (ns = 1) with 20 Points (np = 20) and x and y coordinate characteristics for the minimum, mean and maximum normalized values (1/80th of a line width) as follows: -17 and -6; 0 and 18; and 19 and 60, respectively. The values in the first vertical column are the Point-to-Point slopes, normalized to 360°/256. The values in the second vertical column are the Point-to-Point average vertical positions above the base line, normalized to 1/80 of the line width. A typical line width is about 1mm (0.04 inches).

Referring now to Fig. 6, a software hierarchy of programs is depicted. At the top, overseeing the entire operation of computer system 10 (Fig. 1), is an operating system as indicated by box 90. Applications programs shown in boxes 92 and 94, residing in RAM 56 (Fig. 4) and ROM 54 (Fig. 4) can be executed by microprocessor 50 (Fig. 4) under control of the operating systems. When a Handwritten Character is required or is indicated by an interrupt, handwriting recognition software 96 is called. A first subroutine, indicated in box 98, encodes the X,Y coordinates into Strokes. The characteristics of the Strokes are then defined by a subroutine 100 followed by comparisons of the Strokes with a database that has been loaded from ROM 54 (Fig. 4) into RAM 56 (Fig. 4). The comparison is made by a subroutine 102. When the operating system is in the "learning" mode, the database is updated with the new Stroke data and symbols, as indicated in box 104. Similarly, a previously stored document can be edited by applications program 92 by using edit function 94 as called by the operator, who provides the instructions as input using the subroutines 98, 100 and 102 of handwriting recognition program 92.

Referring now also to Fig. 7, operating system 90 (Fig. 6) executes the Handwritten Character recognition software 96 (Fig. 6) by accepting as input the X,Y coordinate Points, depicted in box 110, of the position of stylus 16 (Fig. 2) on input screen 18 (Fig. 2) and encodes these Points into Strokes as depicted in box 112. The program then characterizes the Strokes by some description set, such as considering the length, curvature, slope, and position of the Stroke, as depicted in box 114. In box 116 the best comparison is then found of the characterized Stroke or sequence of Strokes with those in the database. If a sufficiently close match is found, the character is identified in box 118 and the database entry is swapped with the entry above it as shown in box 120. In this way, the most frequently identified characters will "rise" to the top of the database and the overall system performance, as measured in time to find a match, will be increased, if a match is not found, the user can add to the bottom of the database, as indicated in box 122.

With reference now to Figs. 8 and 9, a flowchart of the computer program to recognize a particular Stroke sequence is set forth. The computer program begins in terminal 150 and proceeds to process the X,Y voltages from processing box 152, the voltages having been converted to a digital signal. The program then proceeds to decision box 154 where the program determines whether the pen or stylus 16 (Fig. 2) is out of contact with input screen 18. This determination is made by both the X voltage and the Y voltage being zero. If the program determines that the pen is up, then the Stroke is determined as having been completed and the program branches to decision box 156. In decision box 156, the program determines whether there are less than three Points in the Stroke and if so the program branches to decision box 158. In decision box 158, the program determines whether there are zero Points in the Stroke. If there are zero Points in the Stroke, then the program loops back to the beginning of processing box 152 where another set of Points is read. If the Points counter (incremented in processing box 164) indicates that there are more than zero Points, the program branches to processing box 172. In processing box 172 the Stroke is identified as a dot and its height above the base line (HABL) is calculated in processing box 173. From processing box 173 the program proceeds to processing box 171.

However, if the pen down signal is received, the program branches to processing box 160 where the voltages are scaled to determine the coordinate Point using the following formulas:

$$X = a_1 v_1 + b_1$$

$$Y = a_2 v_2 + b_2$$

The constants a_1 and b_1 are scaling parameters that are determined from calibrating the input surface of the particular display.

Once the voltages are scaled, the program proceeds to decision diamond 162 where the program determines whether it is an erroneous Point. This is done by comparing the distance between Points and eliminating a Point if the distance is to great (greater than 2.5mm or 0.10 inches is presently used). On the other hand, a Point is also eliminated if the Points are too close together. Points are presently thinned out if they are within about 0.4mm (0.015 inches).

The comparison problem that exists for the first Point is resolved by determining if a Point is the first Point after a pen is down and then that Point is used only to check the next Point which is accepted, assuming that that Point is within the maximum distance of 2.5mm (0.10 inches).

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If the distance between Points is determined as being outside the two criteria, the program drops the Point and branches back to the top of processing box 152 to read another pair of coordinate Point voltages.

On the other hand, if the Points fall within the criteria, the program continues to processing box 164 where a Point counter is incremented to keep track of the number of Points. This number is used in decision diamond 156, as mentioned hereinabove. The program then continues to processing box 166 where the Points are smoothed according to any one of a number of formulae. Smoothing is used to minimize noise from digitization, from erratic hand motion and from electronic noise. The simplest smoothing technique is a multiple Point average which results in calculating new Points $x_j'y_j'$) as follows:

$$x_j' = \sum_{i=n_1}^{n_2} x_i/(n_2 - n_1 + 1)$$

And similarly for y_j, smoothed over Points n_1 - n_2.

Another simple method is called the running weighted average method and utilizes the following formula:

$$x_j' = \alpha\, x_j + (1 - \alpha)\, x_j' - 1$$

Alpha is a weighting constant that is usually positive (and less than one) and has been used at 0.25. The summations have been taken with n_2 minus n_1 equal to one. A third method involves what is called a spline fit wherein the following formula is used:

$$x_j' - (x_{j-1} + 4\, x_j + x_{j+1})$$

Any of the foregoing methods can be applied either before or after filtering. The filtering is done so as to reduce the number of input Points and to space data so that difference and/or angle calculations can be made within acceptable random error bounds. A simple process of thinning a sequence of Points by excluding the acceptance of subsequent Points within a set distance of the previously accepted Points has been found to be an effective filter.

From processing box 166, the program proceeds to processing box 168 where the Point is stored in an array that is incremented for each new Point since the last pen down signal. Thus, an addressable array of Points is created for each sequence of Points obtained from a pen down to a pen up signal. This sequence of Points is called a Stroke. From processing box 168, the program loops back to the top of processing box 152 where another Point is obtained until a pen up signal ends the Stroke.

In decision diamond 156, a determination was made as to whether there were less than three Points in a Stroke. By definition, if there are three or more Points in a Stroke, the Stroke is a line end and not a dot. If there are three or more Points in the Stroke, the program branches to subroutine box 170. In subroutine box 170, discussed in greater detail hereinbelow with respect to Fig. 9, the Stroke is characterized as to its slope and base line height.

As can be seen from the foregoing, the segmentation of the stream of coordinate Points into a Stroke is based primarily on the determining when stylus 16 is "up" or not in contact with the surface of input screen 18. Alternatively, a stream of Points can be segmented to form Strokes on the basis of other considerations. For example they can be segmented based upon changes in a locally calculated curvature or upon a large local curvature. Local curvature is calculated by the change in distance along the input coordinates divided into the change in slope. This produces radius of curvature. When the radius of curvature changes rapidly with respect to distance along the input coordinates, or if the radius is too small, then a segmentation Stroke is assumed to end, and a new Stroke begun. Further segmentation techniques can look at the relative maximum and minimum in one or both coordinates and/or the curve crossings in the coordinates. However, these latter two methods have been determined to be less effective.

Characterizing a Stroke reduces the sequence of coordinates defining the Stroke or segment to a set of characteristics that are unique, generalized and minimal. Unique ness refers to both factors that the same characteristics are generated by the same coordinates and that the characteristics are sufficient to regenerate an approximation to the original coordinate sequence. The term "generalized" is used to mean that the characterization is invariant under such transformations so that the symbols are invariant (e.g., translation and scaling or stretching or small tilt). The scaling of all distances is accomplished by taking a ratio of the distance to a writing entry line width.

The minimal set of segment characteristics have the following features:

(1) Stroke position: one or more of centroid/average, extent extreme or beginning and ending Points determined relative to the writing entry line, to previous Strokes, or to character extent or center;

(2) Stroke shape is characterized by one or more of average slope, change in slope (which is a measure of average curvature) and/or a change in curvature, by sequence of slopes over specific length segments or over fractional lengths, or by a gross description of linear direction or circular completion and opening

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direction;

(3) And Stroke length as characterized by distance along the curve and/or the extent extremum along the coordinate system.

In one embodiment of the present invention, positioning by centroid, extent extremum, and starting and ending coordinates have been successfully used. The Stroke shape is encoded as a sequence of slopes and vertical positions (relative to Stroke centroid). The Stroke length can be approximated by the number of filtered Points. Alternatively, the average curvature can be encoded in total slope change (along with length), change in starting to ending slope or fitting the slope angle versus length curve for rate of change of slope angle. Additional characteristics that could be used include location of coordinate relative extrema, curve crossing, cusps, and Stroke direction. A particular method used to determine the unique characteristics is set forth below.

1. The numerical values of the Criteria for each Stroke of the Handwritten Symbol are determined.

2. The database values for each stroke of the previously learned Handwritten Symbol is determined and subtracted from the newly determined values respectively.

3. The absolute values of each difference are scaled, to make each of the five measurements reasonably equivalent to the others such as lengths scaled to height between lines.

4. The five thus-determined values are added.

5. A predetermined threshold is used as "goodness" test of recognition -- too high a value and Font Symbols are infrequently recognized and too low a value causes Font Symbols to be misidentified. Thresholds of approximately 1,000 are used initially and then switched to approximately 100 for improved recognition. If the threshold is exceeded, the comparison is discarded and an error message is created and displayed.

6. The database is searched to find a numerical minimum difference. If the minimum difference is below the acceptable threshold for recognition, the corresponding Font Symbol is displayed on the screen or the command is performed, as the case may be.

It has also been found that the preferred classification of a Stroke is a continuous one, rather than one that is grossly discrete. For example, determining a slope by angle in 256 directions rather than in 8 is desirable. Other non-continuous classifications can include bars/arches/hooks, number and closure of cusps or horizontal or vertical Strokes.

From subroutine 170, the program proceeds to processing box 171 where both an individual Stroke and one or more preceding Strokes are compared with a database entry that is stored in RAM 56 (Fig. 4).

This comparison initially begins with three eliminating questions that are asked by the program in decision diamonds 174, 176, and 178. In each case, if the database entry is eliminated, the program proceeds to a processing box 180 where the address of the next data entry is received and from which the program loops back to the top of processing box 171. In decision diamond 174, the first eliminator is asked by seeking if the number of Strokes are different. If the number of Strokes are the same, the program proceeds to decision diamond 176 where the average Height Above Base Line (HABL) is calculated and compared with the HABL of the data entry. The entry is eliminated if the difference in the average HABL's is greater than one-half the height of the entry line. From a negative determination in decision diamond 176, the program proceeds to decision diamond 178 where the number of Points per Stroke are compared and the database entry is eliminated if the difference in number of Points is greater than ten. This determination varies from that made in decision diamond 174 because it is concerned only with the number of Points for each Stroke. However, in decision diamond 174, certain letters, such as the capital letters "E" and "A", have more than one Stroke per letter.

If a data entry is not eliminated by decision diamond 178, then the program proceeds to processing box 182 where the program calculates a gauge to be used to determine the closeness of the match below the selected entry in the database and the drawn Stroke. A presently preferred gauge is the sum of the absolute values of the differences between the Stroke values and the database entry values of: a) distances or lengths n units of 1/80th of the line height (e.g., space 26, Fig. 2); and

b) the slopes in units of 1/256th of 360° over all the Points along the diagonal of the comparison matrix. Alternatively, Dynamic Programming Techniques can be used to optimize the comparison using off-diagonal elements as well.

From processing box 182, the program proceeds to decision diamond 186 where a match is determined. In actuality, a match is determined by the application of an arbitrary gauge (maximum allowable variance), which is the sum of absolute values of the differences between the entered Stroke characterization and that of the stored database entry. In processing box 183, the lower of the present gauge and the previous lower gauge is saved as the best match. The program then goes to decision diamond 184 where a determination is made whether the present entry is the last database entry. If it is not, the program branches to processing box 180 where the next entry is selected. If it is the last entry, the program proceeds to decision diamond 185 where a determination of a match is made on the basis of the gauge being below a predetermined threshold. This threshold is set by the user based on experience with the system.

If no match is obtained, the program branches to decision diamond 188 where a determination is made whether all Strokes have been checked. If the last Stroke has been checked, then the present Stroke is compared in sequence with a previous Stroke to all two Stroke entries. As in the comparison with all one Stroke dictionary entries, the best fit comparison for all entered Strokes is the recognized symbol or sequence of symbols.

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However, if the last Stroke has been read and there still is not a match, then the program proceeds to processing box 190 where a question is displayed on display screen 20 asking the user if a new Font Symbol should be added to the database. The user responds and that response is used in decision diamond 192. Either the Stroke sequence is added to the database in processing box 194 and the program branches back to the top of processing box 152, or the program branches immediately to the top of processing box 152.

On the other hand, if a match is determined in decision diamond 186, the program branches to processing box 195 where the program shuffles the database by interchanging the serial location of the matched entry with the entry above it. The program then proceeds to processing box 196 where the program zeros the Point counter and the increment counter. The program next proceeds to processing box 198 where the matched and characterized Stroke or Strokes are displayed by the computer as the identified Font Symbol. This display is located at the position in which the entry was made on input screen 18 (Fig. 2).

From processing box 198, the program proceeds to processing box 200 where the program can act on any commands which it has interpreted. An alternative characterization of the Stroke uses the Points themselves rather than the length, scope, curvature and position.

With reference now to Fig. 9, this Stroke characterization is depicted in greater detail. Stroke characterization subroutine 170 essentially performs a mathematical transformation of each Point on a Point-by-Point basis to transform the Points from an X,Y Cartesian coordinate system to one in which the coordinates are the normalized slope of each Point and the normalized height of each Point above the base line (HABL).

Subroutine 170 first calculates the Point to Point slope in processing box 220 and then calculates the height of each Point above the base line in processing box 222. The slope and HABL of each Point are then normalized respectively to 1/256th of 2 PI and to 1/80th of the width of the entry line in processing box 224. From processing box 224, the system proceeds to processing box 226 where the calculated normalized values for each Point are stored in an addressable array. The subroutine then returns to the program through terminal 228.

When the comparison is made between each Stroke and the stored values, the comparison is made by the normalized Point slope and Point height above base line. As mentioned above, a match is determined by an arbitrary gauge which is the sum of absolute values of the difference between the written Stroke and the stored or dictionary Stroke. The system learns by adding new Strokes to the dictionary database. Once the database fills up, those Font Symbols that are infrequently used are replaced by new entries.

In a working embodiment of the present invention, the algorithm successfully identified upper and lower case letters and numbers when written discretely from one another. For Handwritten Symbols that are written such that they are continuous, direct extrapolation would require searching a database sequentially for one, two, three, etc. Stroke symbols and looking for the best fit. Upon identification of a Stroke fit, a "new" letter is tenatively recognized, except that the next few Strokes are analyzed to check if they change the previous symbol for a better fit. For example, two Strokes that have been identified as "ones" would be combined and changed to the capital letter "H" once a cross bar was identified.

The system design demonstrated by Figs. 7 to 9 could easily be coded by one with ordinary skill in the art of computer programming into almost any computer language. The source code listings for one application program utilizing the disclosed invention is included as Appendix II. The software in Appendix II is written in Microsoft Basic, a common computer language available for virtually all microcomputers and operating systems. The program is a complete text editing demonstration, which shows the improvements that can be made upon traditional word processing systems.

Program lines 2600 to 4000 contain the character recognition subroutine which includes the software code necessary to get X and Y coordinates. This section of the program corresponds to Fig. 8.

Program lines 2600 to 2699 make up a subroutine designed to obtain the X and Y coordinates of a given Point. This code corresponds to boxes 152, 154, 160, 162, 164, 166 and 168 of Fig. 8.

Program lines 3000 to 3339 constitute a Point and Stroke analysis and characterization routine embodying boxes 156, 158, 170, 172 and 173 of Fig. 8.

Program lines 3700 to 3790 make up a subroutine designed to compare the analyzed Strokes to a Stroke database. These program lines embody boxes 171 to 184 of Fig. 8.

Program lines 3810 to 3980 make up a subroutine which is designed to learn a new character. This code embodies boxes 186, 188, 190, 192 and 194 of Fig. 8.

Program lines 3060 to 3273 make up a subroutine designed for Stroke characterization purposes. This section of the code corresponds to Fig. 9.

Program lines 3060 to 3095 are used to calculate Point-to-Point slopes and embody box 220.

Program lines 3058, 3241 and 3262 are used to calculate a height above baseline (HABL) and correspond to box 222 of Fig. 9.

Programs lines 3253, 3270-3273 are used to normalize the Point height and slope and correspond to box 224 of Fig. 9.

Program line 3253 is used to store the height above baseline and embodies box 226 of Fig. 9.

The foregoing program can be stored in the memory of a microcomputer of microprocessor with a requirement of approximately 25K of machine memory, so that it can be seen that the use of the program does not use up a lot of expensive memory and is relatively fast in executing the program's operation. If the program is written in a language other than Basic, requiring less memory, such as assembly language, the size of the

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program can be made smaller.

Boxes 195 to 200 of Fig. 8 appear in logical places throughout the code.

A dictionary of the variables of the relevant code section is included as Appendix III.

With reference now to Fig. 13, a flowchart for the editing software ("Editor") demonstrated by Figs. 11A to 11I and described above is depicted. Once the Editor is loaded into the system (box 229), control of the screen is returned to the system. The system then proceeds in the normal manner described above to acquire Points and display them (box 230), convert the Points into Strokes (box 231), characterize each Stroke (box 232), and attempt to match the Stroke or Strokes with the database (box 233). In processing box 234, the system sends each Handwritten Symbol to the Editor to interpret and execute a command if necessary. At decision diamond 235, the Editor determines whether the Handwritten Symbol is an Editing Symbol or a Font Symbol. If the character is determined to be an Editing Symbol, the Editor proceeds to processing box 236 where it determines which Editing Symbol has been entered and executes the Editing Function. If the character is determined not to be an Editing Symbol, then the alphanumeric character corresponding to the handwritten entry is displayed at processing box 237. In an alternate configuration of the Editor, Font Symbols will only be accepted when the Editor is in the "Insert Mode". This structure insures that each Font Symbol is verified before being added to a document.

The Editor uses a variety of symbols designed to make editing on the system similar to, but much more efficient than, traditional editing with pencil and paper. These primary editing functions include, but are not limited to:

DELETE symbol - "_____" A horizontal line drawn through a character or characters. The Editor will remove the underlying characters and reformat the text.

ADJUST MARGINS symbol - "|" A vertical line longer then the height of one line on the display. The Editor will adjust the margin to the indicated position and reformat the text.

INSERT symbol - "Λ" A caret drawn at the Point where text is to be added. The Editor displays an input writing line (Fig. 11B) and when input is recognized inserts it into the text.

MARK TEXT symbols - "<" and ">" A less than and greater than symbol drawn at the beginning and end of a block of text. The marked text is displayed in reverse video and then special block functions can be performed.

DELETE MARKED TEXT - A delete symbol drawn within marked text will erase the marked text and reformat.

MOVE MARKED TEXT - An insert symbol drawn anywhere within the text moves the marked text to the indicated position, deletes it from its origional position and reformats the text.

REPLACE MARKED TEXT - An insert symbol drawn within the marked text displays an input line and replaces the marked text with the inputted text.

The Editing Symbols described above can be changed to the particular Editing Symbols preferred by each user, thereby customizing the Editor and preventing new users from having to learn unfamiliar Editing Symbols.

Further modifications and enhancements to the present system will be apparent to those skilled in the art. For example, the common characteristics of each Font Symbol could be extracted and organized into a synthetic symbol. The synthetic symbol's characteristics could then be exaggerated to maximize their variance from all other synthetic symbols. This would create a very compact, optimal database. On the other hand, as an example, a database created by the described preferred embodiment of the invention usually results in two to three different characterizations for each symbol.

The system has numerous useful applications, almost without limitation. The most obvious applications are text editing and filling out and modifying forms. Some of the many other applications that may not come to mind as readily are writing in languages utilizing large numbers of symbols like Japanese or Chinese, writing in Arabic and similar languages made up of a limited number of complex symbols; writing chemical equations, including those involving organic compounds; writing music (a "window" with five parallel lines can be provided for musical applications); writing symbols and codes for graphic manipulation of data, including the transfer of graphic data to a spreadsheet; in education, as where predetermined questions are presented on the screens and the answers written in long-hand; as in teaching mathematics, as when numbers are manually inserted in equations and the equation analyzed to determine the result using those numbers; in CAD/CAM applications involving symbols, geometric shapes and the like.

We have described a particular preferred embodiment of a keyboardless computer on which usual computer functions are performed by writing in a normal manner with a pen-like stylus on an input screen placed directly over a flat display. The keyboardless computer illustrated is ideally configured for use by non-keyboard oriented individuals, by keyboard individuals for whom the utility of the computer is enhanced, and in various settings and applications in which keyboard entry is awkward or impossible. Computer based information and application software can be loaded into a portable device for later viewing, manipulation of text and data, and adding new text and data in a normal handwriting mode. Thereafter the user may transmit this computer text to another computer, a similar device, an external electronic storage device, a hard copy printer, or through a telecommunications system. The computer is capable of recognising Handwritten Symbols with a high degree of accuracy and of "learning" individual styles of handwriting. The data and commands can be input with the aid of a stylus.

Although the invention has been described in terms of a selected preferred embodiment encompassing the apparatus and methods aspects of a keyboardless computer system, the invention should not be deemed

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limited thereto, since other embodiments and modifications will readily occur to one skilled in the art.

APPENDIX I

```
'h' (1) ns = 1 x = (-17..0..19) y = (-6..18..60)
        1) np = 20 x = (-17..0..19) y = (-6..18..60)
              5,      42
            -57,      34
            -85,      26
            -71,      19
            -76,      10
            -64,       3
            -89,      -3
            -72,      -9
            -85,     -17
            -72,     -24
             47,     -17
             56,     -11
             43,      -3
             39,       3
             11,       7
             -9,       5
            -57,      -3
            -71,     -11
            -71,     -18

'H' (1) ns = 2 x = (-27..0..37) y = (-20..18..61)
        1) np = 14 x = (-27..-12..-2) y = (-20..22..61)
             -9,      37
              4,      38
            -39,      32
            -48,      25
            -58,      16
            -71,       8
            -72,       2
            -64,      -4
            -89,     -11
            -72,     -17
            -80,     -24
            -89,     -30
            -80,     -36
        2) np = 20 x = (-21..10..37) y = (-15..16..59)
             27,      43
            -80,      37
            -71,      29
            -98,      23
            -80,      16
            -78,       8
            -85,       1
            -89,      -6
            -80,     -12
            -80,     -18
            -64,     -25
            -64,     -31
             48,     -25
             56,     -18
             48,     -12
             64,      -6
             89,       1
           -124,       0
           -124,      -2
```

APPENDIX II

```
1 REM Z SERIES COPYRIGHT: LINUS TECHNOLOGIES INCORPORATED, RESTON, VA., 7/30/85
10 DEFINT A-Y  : REM all integers except z
20 DIM X(2000),Y(2000),D(9, 800),DN(300),DC(300),SX( 80),SY( 80),SL( 80),SC( 80)
,SA( 80),SXX( 80),SXN( 80),SYX( 80),SYN( 80),SNO(80),MTITL$(20),A$(1500),LL(24),
AS$(200),SLET(80),DBC(9,10),ASTRT(80),AEND(80)
25 PRINT FRE(0)
30 PRINT "Z SERIES COPYRIGHT: LINUS TECHNOLOGIES INCORPORATED, RESTON, VA., 7/30
/85"
40  IMARGN=5  : IMARGX=62 : JTOP=1 : JBTM=15 : JMENU=160  :CR$="^"
50  KYBD=0: LHT=16 :SXTT=4: JTX=0: ACPT=1000
60 LHT4=LHT\4 :LHT3=LHT\3 :LHT5=LHT\5 :LHT2=LHT\2
70 PRINT "PLEASE INPUT PEN SWITCH...-1 TO RERUN, 0 TO RUN, 1 TO RUN & STORE": IN
PUT SWTPN
75  IF SWTPN > -1 THEN GOSUB 10700 :REM TOUCH TECH SCREEN IN ASCII @ 9600
80 PRINT "PLEASE INPUT DEBUG ...-5 TO 5 ": INPUT DBUG
85 PRINT "PLEASE INPUT ACCEPTANCE CRITERIA...10 TO 1000 ": INPUT ACPT
90 PRINT "PLEASE INPUT EDIT/LEARN SWITCH...1 TO EDIT": INPUT EDLN
92 PRINT "PLEASE INPUT KEYBOARD SWITCH...0 FOR KEYS, 1 FOR MENU ": INPUT KYBD
95 PRINT "PLEASE INPUT RESTART SWITCH...1 TO RESTART WITH STORED DATA BASE": INP
UT RESTRT
97 IFAVE=0 :IF SWTPN=-1 THEN IFAVE=0 :REM PRINT "PLEASE INPUT AVERAGING SWITCH..
.1 TO READ & AVERAGE, 2 TO AVERAGE INPUT": INPUT IFAVE
100 KEY OFF :SCREEN 2 :CLS
120 IF RESTRT = 1 THEN GOSUB 12700
130 IF EDLN = 1 THEN GOSUB 12100 : REM READ IN TEXT
140 IF EDLN = 1 THEN GOSUB 600 : REM PRINT TEXT
150 IF SWTPN = 1 THEN GOSUB 7200
151 IF SWTPN = -1 THEN GOSUB 7000
170 IF EDLN <> 1 THEN GOSUB 6100
180 IF EDLN <> 1 THEN GOSUB 12500
200 REM EDIT
205 LINY=0
210 IF SWTPN = -1 THEN GOSUB 7100 ELSE GOSUB  2600 :REM TOUCH TECH SCREEN IN ASC
II  @ 9600
211 IF SWTPN =1 THEN GOSUB 7300
220 REM RECOGNIZE SYMBOLS
221 IF NP > 2000 THEN LOCATE 23,1: PRINT "TOO MANY POINTS" : STOP
222 IF NP < 4 THEN GOTO 200
230 GOSUB 3000 :GOSUB 3400 :REM -,<>^,|,^,\,/,P,E
240 ON NCHAR GOTO 1200,1300,1700,6200,6700,6500,6600,12500,6900,200 :REM DELETE,
MOVE,FORMAT,INSERT,WRITE OVER,REMOVE,PARAGRAPH,INSERT CHARACTER,END
250 GOTO 200
500 END
600 REM DISPLAY TEXT FROM SINGLE CHARACTER ARRAY
605 LOCATE 23,20: PRINT "      ",
610 I=II : J=JJ : REM INITIAL DISPLAY POINT FOR NC1
620 FOR K=NC1 TO NC
630 IF A$(K) <> CR$ THEN GOTO 660
640 LOCATE J,I : PRINT " " : I=I+1 : IF I < 81 GOTO 640
650 J=J+1 : I=IMARGN : LL(J)=K : GOTO 740
660 IF I< IMARGX THEN GOTO 670 ELSE IF A$(K)=" " GOTO 690
670 IF J> JBTM THEN LOCATE 21,20: PRINT "READY", :RETURN
680 LOCATE J,I : IF I=IN THEN GOTO 710 ELSE PRINT A$(K) : I=I+1 : GOTO 740
690 LOCATE J,I : PRINT " " : I=I+1: IF I< 81 GOTO 690
700 J=J+1 : I=IMARGN : LL(J)=K+1 : GOTO 740
710 IF A$(K) <> " " THEN GOTO 730
720 IF LL(J)=K GOTO 740
730 I=I+1 : PRINT A$(K)
740 IF I> IMARGX+10 THEN GOTO 690 ELSE NEXT K
750 IF J> JTX THEN GOTO 790
760 JS=J
765 LOCATE J,I : PRINT " ": I=I+1: IF I< 81 GOTO 765
770 J=J+1 : I=IMARGN: IF J > JTX THEN GOTO 780 ELSE GOTO 765
```

```
780 J=JS
790 JTX=J : LOCATE 23,20: PRINT "READY", :RETURN
1200 REM DELETE
1205 XX=SXX(1): XN=SXN(1): YX=SYX(1): YN=SYN(1)
1206 IF NSTRK=1 GOTO 1220
1210 FOR L=2 TO NSTRK
1212 IF XX < SXX(L) THEN XX=SXX(L)
1214 IF XN > SXN(L) THEN XN=SXN(L)
1216 IF YX < SYX(L) THEN YX=SYX(L)
1218 IF YN > SYN(L) THEN YN=SYN(L)
1219 NEXT L
1220 IN=IMARGN
1225 I=INT(XX/8)+1 : IF I < IN THEN I=IN
1230 J=INT(YX/8)+1 : ML=LL(J) :M2=ML+I-IN : IF A$(ML)=" " THEN M2=M2+1
1231 IF A$(ML)=CR$ THEN M2=M2+1
1232 I=INT(XN/8)+1 : IF I < IN THEN I=IN
1234 J=INT(YN/8)+1 : ML=LL(J) :M1=ML+I-IN : IF A$(ML)=" " THEN M1=M1+1
1240 IF A$(ML)=CR$ THEN M1=M1+1
1250 MD=M2-M1+1: IF MD < 0 THEN MD=M1-M2+1 : M1=M2
1260 FOR M=M1 TO NC : A$(M)=A$(M+MD) : IF M+MD=NC THEN GOTO 1270 ELSE NEXT M
1270 FOR M=NC-MD+1 TO NC :A$(M)= " " : NEXT M
1280 II=I: JJ=J: NC1=M1 : GOSUB 600
1290 NC=NC-MD : GOTO 200
1300 REM MOVE INDICATED BY OPENING BRACKET
1305 IN=IMARGN
1310 XX=SXX(1): XN=SXN(1): YX=SYX(1): YN=SYN(1)
1320 XP=(XN+XX)/2: YP=(YN+YX)/2 :REM AVE BRACKET POSITION
1330 I=INT(XP/8)+1: J=INT(YP/8)+1:REM CONVERT X,Y TO I,J
1340 ML=LL(J): M1=ML+I-IN :REM CALC A ARRAY INDEX OF LETTER AT I,J
1350 IF A$(ML)=" " THEN M1=M1+1
1360 IF A$(ML)=CR$ THEN M1=M1+1
1390 XX=SXX(2): XN=SXN(2): YX=SYX(2): YN=SYN(2)
1400 XP=(XN+XX)/2: YP=(YN+YX)/2 :REM AVE BRACKET POSITION
1410 I=INT(XP/8)+1: J=INT(YP/8)+1:REM CONVERT X,Y TO I,J
1420 ML=LL(J): M2=ML+I-IN :REM CALC A ARRAY INDEX OF LETTER AT I,J
1430 IF A$(ML)=" " THEN M2=M2+1
1440 IF A$(ML)=CR$ THEN M2=M2+1
1450 M3=0:REM INITIATE COUNTER
1460 FOR M=M1 TO M2 :REM LOOP OVER PORTION CUT
1470 M3=M3+1: REM INCREMENT COUNTER
1480 AS$(M3)=A$(M) :NEXT M :REM COPY CUT TEXT
1490 XX=SXX(3): XN=SXN(3): YX=SYX(3): YN=SYN(3)
1500 REM INSERT WITH M3 LETTERS STORED IN AS$ & xx,xn,yx,yn
1520 XP=(XN+XX)/2: YP=(YN+YX)/2 :REM AVE BRACKET POSITION
1530 I=INT(XP/8)+1: J=INT(YP/8)+1:REM CONVERT X,Y TO I,J
1540 ML=LL(J): M3=ML+I-IMARGN :REM CALC A ARRAY INDEX OF LETTER AT I,J
1550 IF A$(ML)=" " THEN M3=M3+1
1560 IF A$(ML)=CR$ THEN M3=M3+1
1570 MD=M2-M1+1 : IF MD > 0 THEN GOTO 1580 ELSE GOTO 200
1580 FOR M=M1 TO NC : REM LOOP OVER A$ ARRAY POSITIONS TO BE SHIFTED
1590 A$(M)=A$(M+MD) : REM SHIFT A$ ARRAY LETTERS
1600 IF M+MD = NC THEN GOTO 1610 ELSE NEXT M : REM STOP AT END OF ARRAY=NC
1610 IF M3 > M2 THEN M3=M3-MD :REM OFF SET INSERTION POINT TO ACCOUNT FOR DELETI
ON
1620 FOR M=NC-MD TO M3 STEP -1 : REM SPRED ARRAY TO MAKE ROOM FOR INSERTION
1630 A$(M+MD)=A$(M) :REM MOVE LETTERS
1640 NEXT M
1650 FOR M=1 TO MD :REM LOOP OVER CHARACTERS
1660 A$(M3+M-1)=AS$(M) :REM INSERT LETTERS
1670 NEXT M
1680 CLS: II=IMARGN: JJ=JTOP: NC1=1 : GOSUB 600
1690 GOTO 200
1700 REM REFORMAT MARGINS
```

```
1720 XP=(SXN(L)+SXX(L))\2 :REM AVE BRACKET POSITION
1730 I=XP\8+1 :REM CONVERT X TO I
1740 IF ABS(I-IMARGN) <ABS(I-IMARGX) THEN IMARGN=I ELSE IMARGX=I
1750 CLS: II=IMARGN: JJ=JTOP: NC1=1 : GOSUB 600
1760 GOTO 200
2600 REM TT ACQUIRE POINTS IN ASCII  @ 9600  WITH TIME OUT
2603 M=20
2605 IF LOC(2) > 0 THEN IPUT$=INPUT$(1,2) : GOTO 2605
2606 PRINT #2,"G" :N=0
2610 IF LOC(2) < 40 THEN GOTO 2610
2620 NU=0: INPUT #2,XP,YP :INPUT #2,XP,YP :INPUT #2,XPA,YPA :INPUT #2,XP0,YP0
2630 N=N+1: XPA=(XPA+XP0)\2: YPA=(YPA+YP0)\2: XP0=XPA: YP0=YPA: X(N)=XPA: Y(N)=Y
PA
2640 INPUT #2,XP,YP
2653 XPA=(XP+3*XPA)\4: YPA=(YP+3*YPA)\4
2657 IF ABS(XPA-XP0)+ABS(YPA-YP0) < 3 THEN GOTO 2672
2660 I=32*XPA\AX+BX:J=32*YPA\AY+BY:PSET(I,J)
2670 N=N+1 : X(N)=XPA :Y(N)=YPA: XP0=XPA: YP0=YPA
2672 IF LOC(2) > 9 THEN GOTO 2640
2675 MM=0
2680 MM=MM+1: IF LOC(2) > 9 THEN GOTO 2640 ELSE IF MM < M THEN GOTO 2680
2685 X(N)=-X(N): IF X(N) = 0 THEN X(N)=-1
2690 IF LOC(2) > 39 THEN GOTO 2620  ELSE NU=NU+1 :IF NU < 4000 THEN GOTO 2690
2695 PRINT #2,"S": NP=N
2696 IF DEBUG <> 0 THEN LOCATE 20,2 :PRINT "NP=",NP
2697 IF IFAVE=2 THEN GOSUB 4200
2698 IF DEBUG <> 0 THEN LOCATE 20,12 :PRINT NP
2699 RETURN
3000 REM CALCULATE CHARACTERIZATION OF STROKES
3005 REM GOSUB 4200 :REM 2 POINT AVERAGE POINTS
3010 A1=0: A2=0: DA1=0: DA2=0: SEND=0: ZX=0: ZY=0: ZA=0: ZDA=0: ZL=0: NSP=0
3015 NSTRK=0: XX=ABS(X(1)): XN=XX: YX=Y(1): YN=YX: M1=1: M2=1: M3=2: NLONG=0
3020 FOR M=2 TO NP
3025 IF X(M) < 0 THEN SEND=2  :X(M)=-X(M)
3030 IF M > M1 GOTO 3035 ELSE 3391
3035 IF X(M1) < 0 THEN M1=M: GOTO 3391
3040 DX=X(M)-X(M1): DY=Y(M)-Y(M1): ADX=ABS(DX): ADY=ABS(DY): DS=ADX+ADY
3043 IF AY > 0 THEN DY=-DY
3044 IF DS < 3 THEN GOTO 3391
3052 IF X(M) < XN THEN XN=X(M)
3053 IF X(M) > XX THEN XX=X(M)
3054 IF Y(M) < YN THEN YN=Y(M)
3056 IF Y(M) > YX THEN YX=Y(M)
3058 ZX=ZX+X(M)*DS: ZY=ZY+Y(M)*DS: ZL=ZL+DS: NSP=NSP+1
3060 IF ADX < ADY THEN GOTO 3080  :REM ENCODE ANGLE  0-255 +-n256
3070 IF DX > 0 THEN A1=64-(32*DY)\DX ELSE A1=192-(32*DY)\DX
3075 GOTO 3085
3080 IF DY > 0 THEN A1=     (32*DX)\DY ELSE A1=128+(32*DX)\DY
3085 IF NSP>M2 THEN GOTO 3090
3086 IF A1<0 THEN A1=A1+256
3087 ZA=ZA+A1*DS
3089 GOTO 3190
3090 IF A1-A2 < -127 THEN A1=A1+256 : GOTO 3090
3095 IF A1-A2 > 128 THEN A1=A1-256 : GOTO 3095
3100 ZA=ZA+A1*DS
3110 DA1=A1-A2
3115 ZDA=ZDA+DA1
3120 IF NSP > M3 THEN ADA=(DA2+ADA)/2 ELSE ADA=DA1 : ASTRT(NSTRK+1)=(A1+A2)\2
3130 IF NSP = M3+1 THEN ASTRT(NSTRK+1)=(A1+A2)\2
3140 IF ABS(DA1-ADA) > 80 THEN SEND=1
3150 IF ABS(DA1) > 64 THEN SEND=1
3190 IF SEND=0 THEN GOTO 3300
3200 REM END OF STROKE
```


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3205 IF SEND = 1 THEN GOTO 3220
3206 X(M)=-X(M)
3208 SEND=0: SZL=ZL: SZL=32*SZL\AY: IF SZL < 0 THEN SZL=-SZL
3209 IF NSP < 3 THEN GOTO 3210 ELSE IF SZL > 2 THEN M1=M+1: GOTO 3250
3210 IF NSTRK > 0 THEN IF X(SNO(NSTRK)) > 0 THEN X(SNO(NSTRK))=-X(SNO(NSTRK))
3212 M1=M+1
3215 GOTO 3280
3220 SEND=0: SZL=ZL-DS: SZL=32*SZL\AY: IF SZL < 0 THEN SZL=-SZL
3226 IF NSP < 4 THEN GOTO 3300 ELSE IF SZL < LHT5 THEN GOTO 3300
3230 M1=M
3240 ZX=ZX-X(M)*DS
3241 ZY=ZY-Y(M)*DS
3242 ZL=ZL-DS: ZA=ZA-A1*DS: ZDA=ZDA-DA1
3243 NSP=NSP-1
3250 NSTRK=NSTRK+1
3253 SL(NSTRK)=50*SZL\LHT: AEND(NSTRK)=(A3+A4)\2: SC(NSTRK)=ZDA : AZA=ZA/ZL
3254 IF AZA > 255 THEN AZA=AZA-256 : GOTO 3254 :REM USE 128 HERE FOR DIRECTION I
NDEPENDENCE
3256 IF AZA <   0 THEN AZA=AZA+256 : GOTO 3256
3260 SX(NSTRK)=ZX/ZL: SX(NSTRK)=32*SX(NSTRK)\AX+BX
3262 SY(NSTRK)=ZY/ZL: SY(NSTRK)=32*SY(NSTRK)\AY+BY
3264 SA(NSTRK)=AZA
3270 SXX(NSTRK)=32*XX\AX+BX: SXN(NSTRK)=32*XN\AX+BX: SNO(NSTRK)=M
3272 IF AY < 0 THEN SYN(NSTRK)=32*YX\AY+BY: SYX(NSTRK)=32*YN\AY+BY : GOTO 3280
3273 SYX(NSTRK)=32*YX\AY+BY: SYN(NSTRK)=32*YN\AY+BY
3280 IF DBUG > 3 THEN LPRINT USING "#######";M,NSP,X(M),Y(M),ZL,ZA,A1,DA1,ADA,ZDA
,(A1+A2+A3+A4)\4 ELSE IF DBUG < -3 THEN PRINT USING "#######";M,NSP,X(M),Y(M),ZL,
ZA,A1,DA1,ADA,ZDA,(A1+A2+A3+A4)\4
3281 IF DBUG > 2 THEN LPRINT "SL,SA,SC,AS,AE",SL(NSTRK) SA(NSTRK) SC(NSTRK) ASTR
T(NSTRK) AEND(NSTRK) ELSE IF DBUG < -2 THEN PRINT "SL,SA,SC,AS,AE",SL(NSTRK) SA(
NSTRK) SC(NSTRK) ASTRT(NSTRK) AEND(NSTRK)
3285 A1=0: A2=0: DA1=0: DA2=0:DS2=0:DS1=0:SEND=0: ZX=0: ZY=0: ZA=0: ZDA=0: ZL=0
3290 XX=ABS(X(M1)): XN=XX :YX=Y(M1): YN=YX: NLONG=0 :NSP=0
3295 GOTO 3391
3300 REM FINISH LOOP
3310 M1=M
3320 DA3=DA2: DA2=DA1: DS2=DS1: DS1=DS: A4=A3: A3=A2: A2=A1
3390 IF DBUG > 3 THEN LPRINT USING "#######";M,NSP,X(M),Y(M),ZL,ZA,A1,DA1,ADA,ZDA
,(A1+A2+A3+A4)\4 ELSE IF DBUG < -3 THEN PRINT USING "#######";M,NSP,X(M),Y(M),ZL,
ZA,A1,DA1,ADA,ZDA,(A1+A2+A3+A4)\4
3391 NEXT M
3392 IF DBUG >  1 THEN LPRINT "    I   NO    X    Y    L    A    C   XX   XN   Y
X   YN   ST   ND"
3393 IF DBUG < -1 THEN LOCATE  9,1 :PRINT "    I   NO    X    Y    L    A    C
 XX   XN   YX   YN   ST   ND"
3394 IF DBUG < -1 THEN LOCATE 10,1 :FOR I=1 TO NSTRK:PRINT USING "#####";I,SNO(I
),SX(I),SY(I),SL(I),SA(I),SC(I),SXX(I),SXN(I),SYX(I),SYN(I),ASTRT(I),AEND(I) :NE
XT I
3395 IF DBUG >  1 THEN FOR I=1 TO NSTRK: LPRINT USING "#####";I,SNO(I),SX(I),SY(
I),SL(I),SA(I),SC(I),SXX(I),SXN(I),SYX(I),SYN(I),ASTRT(I),AEND(I) :NEXT I
3396 IF NSTRK > 1 THEN GOSUB 4000 ELSE GOTO 3399
3397 IF DBUG < -1 THEN FOR I=1 TO NSTRK:PRINT USING "#####";I,SNO(I),SX(I),SY(I)
,SL(I),SA(I),SC(I),SXX(I),SXN(I),SYX(I),SYN(I),ASTRT(I),AEND(I) :NEXT I
3398 IF DBUG >  1 THEN FOR I=1 TO NSTRK: LPRINT USING "#####";I,SNO(I),SX(I),SY(
I),SL(I),SA(I),SC(I),SXX(I),SXN(I),SYX(I),SYN(I),ASTRT(I),AEND(I) :NEXT I
3399 RETURN
3400 REM EDITING SYMBOL RECOGNITION
3410 FOR L=1 TO NSTRK
3412 A1=(SA(L)+32)\64: IF A1 > 3 THEN A1=0
3416 IF A1 = 0 THEN IF SL(L) > 100 THEN NCHAR=3: RETURN: REM VERTICAL
3418 IF A1 = 1 THEN IF SL(L) >  60 THEN NCHAR=1: RETURN: REM HORIZONTAL
3420 IF A1 = 2 THEN IF SL(L) > 100 THEN NCHAR=3: RETURN: REM VERTICAL
3422 IF A1 = 3 THEN IF SL(L) >  60 THEN NCHAR=1: RETURN: REM HORIZONTAL
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3430 NEXT L
3500 REM CONVERT LETTER TO EDITTING CODE
3510 ED=1 :GOSUB 3600 :ED =0
3515 IF NLET > 0 THEN GOTO 3530
3520 NCHAR=10: LOCATE 20,1: PRINT "TRY AGAIN" :RETURN
3530 IF CS$ = "-" THEN NCHAR =1 :RETURN
3532 IF NLET = 3 THEN IF CS$ = "^" THEN NCHAR=2 :RETURN
3536 IF CS$ = "^" THEN NCHAR=4 :RETURN
3538 IF CS$ = "\" THEN NCHAR=9 :RETURN
3540 IF CS$ = "P" THEN NCHAR=7 :RETURN
3542 IF CS$ = "E" THEN NCHAR=8 :RETURN
3544 IF CS$ = "/" THEN NCHAR=6 :RETURN
3546 IF NLET= 1   THEN NCHAR=5 :RETURN
3550 GOTO 3520
3590 RETURN
3600 REM PARCEL STROKES INTO CHARACTERS
3602 IF DBUG > 4 THEN LPRINT USING "#######"; SXX(1),SXN(1),SYX(1),SYN(1),LHT4
3603 SLET(1)=1: NLET=1: IF NSTRK=1 THEN GOTO 3650
3605 FOR L=2 TO NSTRK
3606 IF DBUG > 4 THEN LPRINT USING "#######"; SXX(L),SXN(L),SYX(L),SYN(L)
3607 ICONT=0
3610 FOR L1=1 TO 2 : IF L > 2 THEN GOTO 3615 ELSE IF L1=2 GOTO 3635
3615 IF SXX(L-L1) > SXX(L) THEN GOTO 3630 ELSE IF (SXX(L-L1)+LHT4) < SXN(L) THEN
 GOTO 3635
3620 IF ABS((SYX(L)+SYN(L))-(SYX(L-L1)+SYN(L-L1))) > LHT THEN GOTO 3635
3629 ICONT=L1 :GOTO 3635
3630 IF SXN(L-L1) > SXX(L)+LHT4 THEN GOTO 3635 ELSE GOTO 3620
3635 NEXT L1
3640 IF ICONT=0 THEN NLET=NLET+1 :SLET(L)=NLET: GOTO 3649
3645 NLET=SLET(L-ICONT) : SLET(L)=NLET :SLET(L-1)=NLET
3646 IF DBUG > 3 THEN LPRINT "L,NLET,SLET",L,NLET,SLET(L-1),SLET(L-2)
3649 NEXT L
3650 REM LOOP OVER LETTERS
3652 IF ED=1 THEN ZLINY=0: FOR LMN=1 TO NSTRK : ZLINY=ZLINY+SYX(LMN)+SYN(LMN): N
EXT LMN : LINY=ZLINY/NSTRK :LINY=(1+LINY\16)*8+4 :IF DBUG > 0 THEN LPRINT "LINY=
",LINY ELSE IF DBUG < 0 THEN LOCATE 22,1 :PRINT "LINY=",LINY
3655 MCHR=1: NST=0: XX=-1: XN=1000: XX1=-100 :YX=-1 :YN=1000 :YX1=-100
3656 FOR LSTRK=1 TO NSTRK-1
3657 LST=LSTRK :IF LSTRK = NSTRK+1 THEN GOTO 3659
3658 IF SLET(LSTRK) = MCHR THEN NST=NST+1: GOTO 3690
3659 IF NST > 10 THEN LOCATE 23,1 : PRINT "TOO MANY STROKES", :STOP
3660 FOR M=1 TO NST :LMN=LST-NST+M-1
3661 DBC(1,M)=SL(LMN): DBC(2,M)=SA(LMN): DBC(5,M)=SC(LMN)
3662 DBC(6,M)=(100*(SX(LMN)-SX(LST-NST)))\LHT :DBC(3,M)=ASTRT(LMN) :DBC(4,M)=AEN
D(LMN)
3663 DBC(7,M)=(100*(SY(LMN)-LINY))\LHT : DBC(9,M)=( 50*(32*Y(SNO(LMN)-1)\AY+BY-L
INY))\LHT: IF LMN =1 THEN DBC(8,M)=( 50*(32*Y(2)\AY+BY-LINY))\LHT ELSE DBC(8,M)=
( 50*(32*Y(SNO(LMN-1)+2)\AY+BY-LINY))\LHT
3664 IF YX < SYX(LMN) THEN YX=SYX(LMN)
3665 IF YN > SYN(LMN) THEN YN=SYN(LMN)
3666 IF XX < SXX(LMN) THEN XX=SXX(LMN)
3667 IF XN > SXN(LMN) THEN XN=SXN(LMN)
3668 IF DBUG > 0 THEN LPRINT USING "######";MCHR,DBC(1,M),DBC(2,M),DBC(3,M),DBC(4
,M),DBC(5,M),DBC(6,M),DBC(7,M),DBC(8,M),DBC(9,M)
3669 IF DBUG < 0 THEN LOCATE 10+M,27: PRINT USING "######";MCHR,DBC(1,M),DBC(2,M)
;DBC(3,M),DBC(4,M),DBC(5,M),DBC(6,M),DBC(7,M),DBC(8,M),DBC(9,M)
3670 NEXT M :GOSUB 3700
3671 NPOS=(2+(XX+XN)\16-IMARGN)\2
3672 REM PRINT "MCHR,NPOS,CHAR,ED" ,MCHR,NPOS,CS$,ED :INPUT IJK
3673 IF ED = 1 THEN NPOS=0: AS$(MCHR)=CS$
3674 IF NPOS > 0 THEN IF NPOS < 40 THEN AS$(NPOS)=CS$
3675 REM
3676 IF ED <> 1 THEN LOCATE (LINY-LHT+1)\8,(XX+XN)\16+1 :PRINT CS$
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3677 REM
3680 SXX(MCHR)=XX : SXN(MCHR)=XN
3682 SYX(MCHR)=YX : SYN(MCHR)=YN
3688 MCHR=MCHR+1: NST=1: XX1=XX: XX=-1: XN=1000: YX1=YX: YX=-1: YN=1000
3690 NEXT LSTRK
3699 RETURN
3700 REM COMPARE TO DATABASE
3710 R1=16000 :M3=0 :IF NDBT=0 THEN GOTO 3900
3715 FOR M=1 TO NDBT
3720 IF  DN(M) <> NST THEN GOTO 3790 :REM CHECK NUMBER OF STROKES
3725 M2E=9 :IF LINY = 0 THEN M2E=6
3730 R=0 : FOR M1 =1 TO NST
3735 FOR M2=1 TO M2E
3738 DR=ABS(D(M2,M3+M1)-DBC(M2,M1))
3740 IF M2 < 2 THEN GOTO 3744 ELSE IF M2 > 4 THEN GOTO 3744
3741 IF DR > 128 THEN DR=ABS(DR-256): GOTO 3741 :REM USE 64 FOR DIRECTION INDEPE
NDENCE
3742 IF ABS(D(5,M3+M1)) > 20 THEN DR=20*DR\(ABS(D(5,M3+M1)))
3744 IF DR > 300 GOTO 3790
3748 R=R+DR
3749 IF R > R1 GOTO 3790
3750 NEXT M2 : NEXT M1
3780 MS1=M : R1=R
3790 M3=M3+ DN(M) :NEXT M
3800 REM IDENTIFY CHARACTER
3803 CS$=CHR$( DC(MS1))
3804 REM
3805 IF DBUG <> 0 THEN LOCATE 19,1 :PRINT R1,MS1,CS$
3806 REM
3810 IF R1\NST > ACPT GOTO  3900 :REM CHARACTER NOT FOUND
3830 RETURN
3900 REM LEARN NEW CHARACTER
3902 IF LERN = 0 THEN CS$=CHR$(2): RETURN
3904 IF KYBD=0 THEN LOCATE 23,1 :INPUT "CHARACTER NOT UNDERSTOOD, PLEASE TYPE IT
 IN: ",CS$
3906 IF KYBD = 0 THEN LOCATE 23,1 :PRINT "
                "
3910 IF KYBD=1 THEN GOSUB 11400
3912 IF KYBD =1 THEN GOSUB 9600
3914 IF KYBD =1 THEN GOSUB 11600 : CS$=CHR$(MSEL)
3915 IF CS$="~" THEN GOTO 3960
3917 IF ED=1 THEN RETURN
3920 IF NDBT =  300 THEN PRINT "Too Many Symbols": STOP
3926 NDBT=NDBT+1 :  DN(NDBT)=NST :  DC(NDBT)=ASC(CS$)
3930 IF M3+NST > 800 THEN PRINT "Too Many Strokes" :STOP
3936 FOR M1=1 TO NST : FOR M2=1 TO 9
3940 D(M2,M1+M3)=DBC(M2,M1) : NEXT M2 : NEXT M1
3950 RETURN
3960 CS$=" "
3980 RETURN
4000 REM CONCATENATE STROKES
4010 FOR L=2 TO NSTRK
4014 IF X(SNO(L-1)) < 0 THEN GOTO 4090
4016 IF SL(L-1) < 4 THEN GOTO 4100
4020 ALNO=(ABS(ABS(X(SNO(L)))-ABS(X(SNO(L-1))))+ABS(Y(SNO(L))-Y(SNO(L-1))))
4021 REM LOCATE 1,1: PRINT "L,ALNO",L,ALNO
4022 IF ALNO > 100 THEN GOTO 4090 : REM TOO FAR AWAY
4024 ALNO= 8*ALNO\(SNO(L)-SNO(L-1))
4026 DD =ABS(ABS(X(SNO(L-1)))-ABS(X(SNO(L-1)+2)))+ABS(Y(SNO(L-1))-Y(SNO(L-1)+2))
4027 REM PRINT "L,DD,ALNO",L,DD,ALNO
4028 IF DD > ALNO THEN GOTO 4090 : REM TOO FAR AWAY
4030 IR1=80*SC(L)\SL(L) : IR2=80*SC(L-1)\SL(L-1)
4031 REM PRINT "L,IR1,IR2",L,IR1,IR2
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4032 IF ABS(IR1) > 350 THEN GOTO 4040 :REM SMALL WIGGLE
4034 IF ABS(IR1) <  80 THEN GOTO 4038 :REM STRAIGHT LINE
4036 IF ABS(IR1-IR2) > ABS(IR1+IR2)\3 THEN GOTO 4090 ELSE GOTO 4050 : REM TOO DI
FFERENT CURVATURE
4038 IF ABS(IR2) > 80 THEN GOTO 4036 ELSE IF IR1*IR2 < -2000 THEN GOTO 4090 :REM
 TOO DIFFERENT CURVATURE
4039 GOTO 4050
4040 IF ABS(IR2) < 350 THEN GOTO 4036 ELSE IF IR1*IR2 < 0 THEN GOTO 4090
4050 ASTND=ABS(ASTRT(L)-AEND(L-1))
4051 REM PRINT "ASTND",ASTND
4052 IF ASTND > 128 THEN ASTND=ABS(ASTND-256): GOTO 4052
4054 IF ASTND > 64 THEN GOTO 4090 ELSE IF ASTND > DD*(ABS(IR1)+ABS(IR2))\40 THEN
 GOTO 4090
4056 GOTO 4100
4090 NEXT L
4099 RETURN
4100 REM COMBINE STROKES
4101 REM PRINT "COMBINING",L,L-1
4110 L1=L-1 :SLL=SL(L1)+SL(L)
4115 IF SLL = 0 THEN LOCATE 23,1 :PRINT "TWO STROKES WITH NO LENGTH" :STOP
4120 IF SXX(L) > SXX(L1) THEN SXX(L1)=SXX(L)
4122 IF SXN(L) < SXN(L1) THEN SXN(L1)=SXN(L)
4124 IF SYX(L) > SYX(L1) THEN SYX(L1)=SYX(L)
4126 IF SYN(L) < SYN(L1) THEN SYN(L1)=SYN(L)
4130 SX(L1)=(SL(L1)*SX(L1)+SL(L)*SX(L))/SLL
4133 SY(L1)=(SL(L1)*SY(L1)+SL(L)*SY(L))/SLL
4137 SA(L1)=(SL(L1)*SA(L1)+SL(L)*SA(L))/SLL
4140 SL(L1)=SLL +DD
4150 SC(L1)=SC(L1)+SC(L)+((SC(L1)+SC(L))*DD)\SLL
4160 SNO(L1)=SNO(L)   :AEND(L1)=AEND(L)
4170 NSTRK=NSTRK-1 : IF NSTRK < L THEN RETURN
4180 FOR LL=L TO NSTRK
4185 L1=LL+1 :SXX(LL)=SXX(L1) :SXN(LL)=SXN(L1) :SYX(LL)=SYX(L1) :SYN(LL)=SYN(L1)
4187 SX(LL)=SX(L1) :SY(LL)=SY(L1) :SA(LL)=SA(L1) :SC(LL)=SC(L1) :SNO(LL)=SNO(L1)
4189 SL(LL)=SL(L1): ASTRT(LL)=ASTRT(L1): AEND(LL)=AEND(L1)
4190 NEXT LL
4195 GOTO 4010
4200 REM 2 POINT AVERAGE POINTS
4210 M2=0
4220 FOR M=2 TO NP STEP 2  :M1=M-1
4230 IF X(M1) > 0 GOTO 4240
4235 M2=M2+1 :X(M2)=X(M1) :Y(M2)=Y(M1) :GOTO 4280
4240 IF X(M) > 0 GOTO 4250
4245 M2=M2+1 :X(M2)=X(M) :Y(M2)=Y(M) :GOTO 4280
4250 IF ABS(X(M)-X(M1)) > 30 THEN GOTO 4280
4260 IF ABS(Y(M)-Y(M1)) > 30 THEN GOTO 4280
4270 M2=M2+1 :X(M2)=(X(M)+X(M1))\2 :Y(M2)=(Y(M)+Y(M1))\2
4280 NEXT M
4283 X(M2)=X(NP)
4285 NP=M2
4290 RETURN
4340 REM ORDER STROKES BY SXN
4342 XCH=0 :IF NSTRK < 2 THEN RETURN
4345 FOR L=2 TO NSTRK
4350 IF SXN(L) > SXN(L-1) THEN GOTO 4380
4355 XCH=1 :L1=L-1
4360 ST=SXX(L1) :SXX(L1)=SXX(L) :SXX(L)=ST
4361 ST=SXN(L1) :SXN(L1)=SXN(L) :SXN(L)=ST
4362 ST=SYN(L1) :SYN(L1)=SYN(L) :SYN(L)=ST
4363 ST=SYX(L1) :SYX(L1)=SYX(L) :SYX(L)=ST
4364 ST=SX(L1) :SX(L1)=SX(L) :SX(L)=ST
4365 ST=SY(L1) :SY(L1)=SY(L) :SY(L)=ST
4366 ST=SA(L1) :SA(L1)=SA(L) :SA(L)=ST
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4367 ST=SC(L1) :SC(L1)=SC(L) :SC(L)=ST
4368 ST=SL(L1) :SL(L1)=SL(L) :SL(L)=ST
4369 ST=SNO(L1) :SNO(L1)=SNO(L) :SNO(L)=ST
4380 NEXT L
4390 IF XCH = 0 THEN RETURN ELSE XCH=0 :GOTO 4345
6100 REM LEARN
6105 LERN=1 :J=3: JJ=J : FOR I=1 TO 40 :AS$(I)=" " :NEXT I
6110 LINY=8*(JJ+3)-1
6120 LINE (0,LINY-LHT-8)-(639,LINY+LHT\2),0,BF
6130 LINE (8*IMARGN-1,LINY)-(639,LINY-LHT),1,B
6140 LINE (607,LINY)-(639,LINY-LHT),1,BF
6150 IF SWTPN = -1 THEN GOSUB 7100 ELSE GOSUB  8600 :REM TOUCH TECH SCREEN IN AS
CII  @ 9600
6151 IF SWTPN = 1 THEN GOSUB 7300
6155 IF NP < 8 THEN GOTO 6190
6160 GOSUB 3000
6170 GOSUB 3600
6180 LOCATE 18,IMARGN: FOR I=1 TO 40: PRINT AS$(I);: NEXT I
6186 GOTO 6150
6190 FOR I=1 TO 4
6192 IF AS$(I) = "@" THEN RETURN
6194 NEXT I
6195 GOTO 6105
6200 REM INSERT
6201 XX=SXX(1): XN=SXN(1): YX=SYX(1): YN=SYN(1)
6202 XP=(XN+XX)/2: YP=(YN+YX)/2 :REM AVE CHARACTER POSITION
6203 I=INT(XP/8)+1: J=INT(YP/8)+1 :ISAV=I: JSAV=J: REM CONVERT X,Y TO I,J
6204 ML=LL(J): M1=ML+I-IMARGN :REM CALC A ARRAY INDEX OF LETTER AT I,J
6205 IF A$(ML)=" " THEN M1=M1+1
6206 IF A$(ML)=CR$ THEN M1=M1+1
6207 MSAV=M1
6210 JJ=JSAV : FOR I=1 TO 40 :AS$(I)=" " :NEXT I
6215 LINY=8*(JJ+3)-1
6220 LINE (0,LINY-LHT-8)-(639,LINY+LHT\2),0,BF
6230 LINE (8*IMARGN-1,LINY)-(639,LINY-LHT),1,B
6240 LINE (607,LINY)-(639,LINY-LHT),1,BF
6250 IF SWTPN = -1 THEN GOSUB 7100 ELSE GOSUB  8600 :REM TOUCH TECH SCREEN IN AS
CII  @ 9600
6251 IF SWTPN = 1 THEN GOSUB 7300
6255 IF NP < 8 THEN GOTO 6270
6256 GOSUB 3000
6257 GOSUB 3600
6258 IF DBUG <> 0 THEN LOCATE 22,IMARGN: FOR I=1 TO 40: PRINT AS$(I);: NEXT I
6259 GOTO 6250
6270 JB=0:  J=1
6271 REM LOCATE 16,1: FOR I=1 TO 40: PRINT AS$(I);: NEXT I
6272 IE=2 :FOR I=40 TO 2 STEP -1 : IF AS$(I) <> " " THEN IE=I+1 : GOTO 6274
6273 NEXT I
6274 FOR I=2 TO IE
6275 IF AS$(I) <> " " THEN GOTO 6280
6276 JB=JB+1
6278 IF JB < 3 THEN GOTO 6288
6280 J=J+1: JB=0
6282 AS$(J)=AS$(I)
6288 NEXT I
6289 REM LOCATE 17,1: FOR I=1 TO 40: PRINT AS$(I);: NEXT I
6290 AS$(J+1)=" "
6295 IF J < 2 THEN IF AS$(1) =" " THEN LOCATE 18,1 : PRINT "NO LETTERS, TRY AGAI
N" :GOTO 6210
6300 MD=J+1 : M3=MSAV : I=ISAV : J=JSAV
6310 REM LOCATE 20,1: FOR I=1 TO 40: PRINT AS$(I);: NEXT I
6315 REM INPUT IJK
6320 GOTO 1620
```

```
6500 REM REMOVE
6510 XX=SXX(1): XN=SXN(1): YX=SYX(1): YN=SYN(1)
6520 XP=(XN+XX)/2: YP=(YN+YX)/2 :REM AVE CHARACTER POSITION
6530 I=INT(XP/8)+1: J=INT(YP/8)+1:REM CONVERT X,Y TO I,J
6540 ML=LL(J): M1=ML+I-IMARGN :REM CALC A ARRAY INDEX OF LETTER AT I,J
6550 IF A$(ML)=" " THEN M1=M1+1
6560 IF A$(ML)=CR$ THEN M1=M1+1
6570 M2=M1
6590 GOTO 1250
6600 REM PARAGRAPH
6690 GOTO 200
6700 REM REPLACE A CHARACTER WHEN WRITTEN OVER
6710 XX=SXX(1): XN=SXN(1): YX=SYX(1): YN=SYN(1)
6720 XP=(XN+XX)/2: YP=(YN+YX)/2 :REM AVE CHARACTER POSITION
6730 I=INT(XP/8)+1: J=INT(YP/8)+1:REM CONVERT X,Y TO I,J
6740 ML=LL(J): M1=ML+I-IMARGN :REM CALC A ARRAY INDEX OF LETTER AT I,J
6750 IF A$(ML)=" " THEN M1=M1+1
6760 IF A$(ML)=CR$ THEN M1=M1+1
6770 A$(M1)=AS$(1) :LOCATE J,I :PRINT AS$(1)
6790 GOTO 200
6900 REM INSERT A LETTER
6910 XX=SXX(1): XN=SXN(1): YX=SYX(1): YN=SYN(1)
6920 XP=(XN+XX)/2: YP=(YN+YX)/2 :REM AVE CHARACTER POSITION
6930 I=INT(XP/8)+1: J=INT(YP/8)+1:REM CONVERT X,Y TO I,J
6940 ML=LL(J): M1=ML+I-IMARGN :REM CALC A ARRAY INDEX OF LETTER AT I,J
6950 IF A$(ML)=" " THEN M1=M1+1
6960 IF A$(ML)=CR$ THEN M1=M1+1
6970 AS$(2)=AS$(1)
6980 M3=M1 :MD=1
6990 GOTO 1570
7000 REM SET UP RERUN
7010 OPEN "I",#1,"POINTS.DAT"
7020 INPUT #1,AX,BX,AY,BY
7030 RETURN
7100 REM READ POINTS
7110 INPUT #1,NP
7120 FOR N=1 TO NP
7130 INPUT #1,X(N),Y(N)
7132 NEXT N
7133 IF IFAVE = 1 THEN GOSUB 4200
7134 FOR N=1 TO NP
7135 IF X(N) > 0 THEN I=32*X(N)/AX+BX ELSE I=-32*X(N)/AX+BX
7136 J=32*Y(N)/AY+BY
7137 PSET(I,J)
7140 NEXT N
7148 IF DBUG > 5 THEN FOR N=1 TO NP: LPRINT N,X(N),Y(N):NEXT N
7149 IF DBUG <> 0 THEN LOCATE 20,2 :PRINT "NP=",NP
7150 RETURN
7200 REM SET UP STORE POINTS
7210 OPEN "O",#1,"POINTS.DAT"
7220 PRINT #1,AX,BX,AY,BY
7230 RETURN
7300 REM STORE POINTS
7310 PRINT #1,NP
7320 FOR N=1 TO NP
7330 PRINT #1, USING "######"; X(N),Y(N)
7340 NEXT N
7350 RETURN
8600 REM TT ACQUIRE POINTS IN ASCII  @ 9600  WITH INSERT
8603 M=20
8605 IF LOC(2) > 0 THEN IPUT$=INPUT$(1,2) : GOTO 8605
8606 PRINT #2,"G" :N=0
8610 IF LOC(2) < 40 THEN GOTO 8610
```


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```
8620 NU=0: INPUT #2,XP,YP :INPUT #2,XP,YP :INPUT #2,XPA,YPA :INPUT #2,XP0,YP0
8630 N=N+1: XPA=(XPA+XP0)\2: YPA=(YPA+YP0)\2: XP0=XPA: YP0=YPA: X(N)=XPA: Y(N)=Y
PA
8635 IF 32*XPA\AX+BX > 607 THEN GOTO 8695
8640 INPUT #2,XP,YP
8653 XPA=(XP+3*XPA)\4: YPA=(YP+3*YPA)\4
8657 IF ABS(XPA-XP0)+ABS(YPA-YP0) < 3 THEN GOTO 8672
8660 I=32*XPA\AX+BX:J=32*YPA\AY+BY:PSET(I,J)
8665 IF I > 607 THEN GOTO 8695
8670 N=N+1 : X(N)=XPA :Y(N)=YPA: XP0=XPA: YP0=YPA
8672 IF LOC(2) > 9 THEN GOTO 8640
8675 MM=0
8680 MM=MM+1: IF LOC(2) > 9 THEN GOTO 8640 ELSE IF MM < M THEN GOTO 8680
8685 X(N)=-X(N): IF X(N) = 0 THEN X(N)=-1
8690 IF LOC(2) > 39 THEN GOTO 8620  ELSE NU=NU+1 :IF NU < 25000 THEN GOTO 8690
8695 PRINT #2,"S": NP=N
8696 IF DEBUG <> 0 THEN LOCATE 20,2 :PRINT "NP=",NP
8697 IF IFAVE = 2 THEN GOSUB 4200
8698 IF DEBUG <> 0 THEN LOCATE 20,12 :PRINT NP
8699 RETURN
9600 REM TT ACQUIRE POINTS IN ASCII  @ 9600  WITH MENU
9603 M=20
9605 IF LOC(2) > 0 THEN IPUT$=INPUT$(1,2) : GOTO 9605
9606 PRINT #2,"G"
9610 II=0 :JJ=0 :N=0
9640 INPUT #2,XP,YP
9660 II=32*XP\AX+BX+II: JJ=32*YP\AY+BY+JJ: N=N+1
9670 IF N < 10 THEN GOTO 9674
9672 I=II\10: J=JJ\10: N=0 :II=0: JJ=0
9673 LINE (I+1,J+1)-(I-1,J-1),1,B
9674 IF LOC(2) > 9 GOTO 9640
9675 MM=0
9680 MM=MM+1: IF LOC(2) > 9 THEN GOTO 9640 ELSE IF MM < M THEN GOTO 9680
9690 IF LOC(2) > 9 THEN GOTO 9610  ELSE NU=NU+1 :IF NU < 1500 THEN GOTO 9690
9695 PRINT #2,"S"
9699 RETURN
10700 REM SET UP TOUCH SCREEN FOR ASCII  @ 9600
10710 OPEN "I",#2,"CAL.DAT"
10720 INPUT #2,AX,BX,AY,BY
10730 CLOSE #2
10740 OPEN "COM1:9600,N,8,1,CS0,DS0" AS #2
10750 PRINT #2,"S"
10760 RETURN
11000 REM UTILITIES
11100 REM input selection menus
11101 REM mnum= no. of items
11102 REM mtitl$=titles
11103 REM mi0,mie,mj0,mje=start & end points for boxes
11105 IF KYBD=1 GOTO 11400
11110 LINE(MI0,MJ0)-(MIE,MJE),0,BF :LINE(MI0,MJ0)-(MIE,MJE),1,B
11115 XX=MI0 : MRATO=(MIE-MI0)\MNUM
11120 FOR K=1 TO MNUM : LINE (XX,MJ0)-(XX,MJE)
11130 MJA=(MJ0+MJE+8)\16+1 : LOCATE MJA,(XX+20)\8 : PRINT MTITL$(K)
11140 XX=XX+MRATO :NEXT K
11160 RETURN
11300 REM DETERMINE MENU ITEM SELECTED
11310 IF KYBD=1 GOTO 11600
11320 XX=0 : FOR K=1 TO MNUM : XX=XX+MRATO : IF I < XX THEN GOTO 11340
11330 NEXT K
11340 MSEL=K
11350 RETURN
11400 REM DISPLAY KEYBOARD
11405 JMENU=163
```

```
11410 LINE(1,160)-(639,199),0,BF
11440 FOR I=  1 TO  26 :LOCATE 22,2*I : PRINT CHR$(I+64), : NEXT I
11450 FOR I=  1 TO  26 :LOCATE 24,2*I : PRINT CHR$(I+96), : NEXT I
11460 FOR I= 1 TO  10 :LOCATE 22,2*I+52 : PRINT CHR$(I+47), : NEXT I
11470 LOCATE 22,74 : PRINT ". ^ ? ",
11480 LOCATE 24,54 : PRINT "\ / * + - ( ) , ; : ";CHR$(34);" $ &";
11482 FOR J=163 TO 195 STEP 16 : LINE(3,J)-(629,J) :NEXT J
11484 FOR I=  3 TO 635 STEP 16 : LINE(I,163)-(I,195) :NEXT I
11490 LOCATE 1 ,1  :RETURN
11600 REM keyboard select from menu
11620 MSEL=(I\8+1)\2
11640 IF J > 179 THEN GOTO 11700
11650 IF MSEL < 27 THEN MSEL=MSEL+64 : RETURN
11660 IF MSEL < 37 THEN MSEL=MSEL+21 : RETURN
11670 IF MSEL=37 THEN MSEL=46 : RETURN
11680 IF MSEL=38 THEN MSEL=94 : RETURN
11690 MSEL=63 : RETURN
11700 IF MSEL < 27 THEN MSEL=MSEL+96 : RETURN
11710 IF MSEL=27 THEN MSEL=92 : RETURN
11720 IF MSEL=28 THEN MSEL=47 : RETURN
11730 IF MSEL=29 THEN MSEL=42 : RETURN
11740 IF MSEL=30 THEN MSEL=43 : RETURN
11750 IF MSEL=31 THEN MSEL=45 : RETURN.
11760 IF MSEL=32 THEN MSEL=40 : RETURN
11770 IF MSEL=33 THEN MSEL=41 : RETURN
11780 IF MSEL=34 THEN MSEL=44 : RETURN
11790 IF MSEL=35 THEN MSEL=59 : RETURN
11800 IF MSEL=36 THEN MSEL=58 : RETURN
11810 IF MSEL=37 THEN MSEL=34 : RETURN
11820 IF MSEL=38 THEN MSEL=36 : RETURN
11830 MSEL=38 : RETURN
11850 RETURN
12000 REM input output
12100 REM read in text
12110 OPEN "I", #1,"TEXT" :NC=0
12120 IF EOF(1) THEN CLOSE #1 : GOTO 12160
12130 INPUT #1, A1$ :KK=0
12140 FOR K=1 TO LEN(A1$) : KK=KK+1 :A$(NC+KK)=MID$(A1$,K,1)
12143 IF LEN(A$(NC+KK))=0 THEN KK=KK-1
12145 NEXT K
12150 NC=NC+KK:IF NC < 1500 THEN  GOTO 12120
12155 PRINT "TOO MUCH TEXT" : STOP
12160 REM TEXT EDITOR INITIALIZATION
12170 II=IMARGN : JJ=JTOP  : NC1=1  : REM DISPLAY ALL TEXT
12175 CLOSE #1
12180 RETURN
12500 REM SAVE SYMBOL DATA BASE
12505 IF SWTPN <> 0 THEN CLOSE #1
12510 OPEN "O",#1,"SYM.DAT"
12520 PRINT #1,NDBT
12530 M2=0 :FOR M=1 TO NDBT
12540 PRINT #1, DN(M) DC(M)
12550 FOR M1=M2+1 TO M2+DN(M)
12560 PRINT #1, D(1,M1) D(2,M1) D(3,M1) D(4,M1) D(5,M1) D(6,M1) D(7,M1)
12570 NEXT M1 :M2=M2+DN(M) : NEXT M
12580 CLOSE #1
12590 END
12700 REM RESTART READ IN DATA BASE
12710 OPEN "I",#1,"SYM.DAT"
12720 INPUT #1,NDBT
12730 M2=0 :FOR M=1 TO NDBT
12740 INPUT #1,DN(M),DC(M)
12750 FOR M1=M2+1 TO M2+ DN(M)
```

```
12760 INPUT #1,D(1,M1),D(2,M1),D(3,M1),D(4,M1),D(5,M1),D(6,M1),D(7,M1)
12770 NEXT M1 :M2=M2+DN(M) : NEXT M
12780 CLOSE #1
12790 RETURN
30000 FOR I=1 TO NSTRK:PRINT I,SNO(I),SX(I),SY(I),SL(I),SA(I),SC(I):NEXT I
30010 FOR I=1 TO NP:PRINT I,X(I),Y(I):NEXT I
30020 FOR I=1 TO NSTRK:PRINT USING "######";I,SNO(I),SX(I),SY(I),SL(I),SA(I),SC(I
):NEXT I
30030 FOR M1=1 TO NST :FOR M2=1 TO 5 :PRINT M1,M2,D(M2,M1),DBC(M2,M1):NEXT M2 :N
EXT M1
```

APPENDIX III

A1 - angle of slope between Point M and M1
A2 - previous angle
DA1 - change in angle (A1-A2)
SEND - flag for end of Stroke
ZX - double precision X position summation by arc length weighting
ZY - double precision Y position summation by arc length weighting
ZA - double precision angle summation by arc length weighting
ZDA - double precision change in angle summation
ZL - double precision length
NSP - number of Points in Stroke, counter
NSTRK - number of Strokes
XX - maximum X
XN - minimum X
YX - maximum Y
YN - minimum Y
M1 - Pointer to previous Point
M2 - (1) minimum number of Points for which to adjust for 2π angle
M3 - (2) minimum number of Points for which to calculate change in change in angle
NLONG - counter (not used)
M - Pointer to Point being considered
NP - number of Points
X - array of X coordinate
Y - array of Y coordinate
DX - change in X
DY - change in Y
ADX - absolute value of DX
ADY - absolute value of DY
DS - pseudo arc length ADX + ADY
AY - calibration multiplier for vertical (Y) direction, e.g. AY ' 0 mean coordinate system true downward
ADA - running average change in angle
DA2 - previous change in angle
ASTRT - array for starting angle of Stroke
SZL - single precision Stroke length
SNO - array of number of the 1st Point for each Stroke
LHT5 - height between lines divided by 5 in display coordinates used as a measure
SL - array of Stroke lengths sealed to height between lines
AEND - array of angles at end of Strokes
SC - array of angle changes for eachs troke
AZA - average angle through Stroke
SX - array of averages centroid X coordinate for each Stroke
SY - array of averages centroid Y coordinate for each Stroke
SA - array of averages angle (slope) coordinate for each Stroke
SXX - array of maximum X coordinate for each Stroke
SXN - array of minimum X coordinate for each Stroke
SYN - array of minimum Y coordinate for each Stroke
SYX - array of maximum Y coordinate for each Stroke
DBUG - debugging flag for printing
INPUT - string of input bytes to be rejected
XP, YP - input coordinates
XPA - average 2 Points in X direction
YPA - average 2 Points in Y direction
XPO - initial X average on pan down
YPO - initial Y average on pan down
I - display pixel corresponding to X coordinate input

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J - display pixel corresponding to Y coordinate input
N - counter of input Points
MM - counter for timing pan up
NU - counter for timing pan up
```

Claims

1. An input/output or I/O device for providing input signals to a utilization device that are representative of a graphical character produced by a user and for receiving output signals from the utilization device and providing a visual representation of the output signals, said I/O device comprising:
(a) a display means for providing a visual display of a graphical character in response to output signals provided by the utilization device;
(b) an input screen means for producing a train of input signals as a graphical character or symbol is sketched by a user, said input screen means comprising a translucent input screen having top and bottom surfaces, said bottom surface being disposed with respect to said display surface such that the visual display produced by said display means is visible from said top surface of said input screen; and
(c) means for determining the identity of said graphical character and providing output signals representative thereof to said display means.

2. An I/O device as claimed in claim 1 wherein said display means comprises a display surface on which the graphical character is produced; and
said input screen means bottom surface is disposed in close proximity above said display surface such that the visual display produced by said display means is visible from the top side of said input screen.

3. An I/O device as claimed in claim 1 wherein said input screen means includes a substantially flat plate, and wherein said input screen top surface is the top surface of said plate.

4. An I/O device as claimed in claim 3 and further including an indicating means operated by a user for cooperating with said input screen top surface such that said input screen means generates said train of input signals when said indicating means is in a predetermined position with respect to said plate top surface.

5. An I/O device as claimed in claim 4 wherein said input screen means generates an input signal when said indicating means is in contact with said input screen top surface.

6. An I/O device as claimed in claim 5 wherein:
(a) said plate has electrical characteristics such that the voltage at any Point thereon varies in a known manner with the distance from the location at which a voltage is applied thereto;
(b) said input screen means further includes means for selectively sequentially applying a voltage along one Cartesian axis of said plate and then along the other Cartesian axis of said plate; and
(c) said indicating means is elongate and has a tip at one end thereof and includes a voltage detecting means that provides a signal representative of the voltage present where said tip contacts said input screen plate.

7. An I/O device as claimed in claim 5 wherein:
(a) said plate has electrical characteristics such that the voltage at any Point thereon varies in a known manner with the distance from the location at which a voltage is applied thereto;
(b) said input screen means further includes means for selectively sequentially sampling at an origin thereon the voltage along one Cartesian axis of said plate and then along the other Cartesian axis of said plate; and
(c) said indicating means is elongate with a tip at one end thereof and includes a means for applying a known voltage to said tip; said sampling means detecting the voltages at said origin when said tip contacts said input screen plate and provides a signal representative of the detected voltages.

8. An I/O device as claimed in claim 2 wherein said display screen has a display area on which graphic symbols can be generated and a key input area by which command signals for the utilization device can be generated when contact is made with the corresponding area thereabove on said input screen.

9. A handwriting character recognition apparatus comprising:
(a) a display means having a display surface for providing a visual display of graphical characters in response to a plurality of display signals;
(b) a writing surface means for receiving graphical characters handwritten by a user, said writing surface means being disposed in close proximity with respect to said display means and comprised of a substantially translucent surface which has positional coordinates associated therewith;
(c) an indicating means operated by a user in connection with said writing surface means for producing writing signals in cooperation with said writing surface means;

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(d) position detecting means for converting said writing signals into locating signals representative of the positional coordinates of said indicating means with respect to said writing surface;

(e) a processing means for receiving and storing said locating signals as they are produced and for generating said display signals such that said display means can graphically display the graphical character after it has been produced by said indicating means; said processing means being comprised of a character recognition means for comparing said produced locating signals representative of a graphical character with a plurality of stored database signals for identifying said graphical character.

10. A handwriting character recognition apparatus as claimed in claim 9 wherein said writing surface means includes a substantially flat plate which produces a signal when said indicating means is in contact therewith.

11. A handwriting character recognition apparatus as claimed in claim 9 and further including means for converting said positional coordinates into relational coordinates.

12. A handwriting character recognition apparatus as claimed in claim 11 and further including means for dividing up a stream of locating signals into sections representative of a Stroke; and means for calculating Stroke characteristics which can be compared with Stroke characteristics of the database signals.

13. A handwriting character recognition apparatus as claimed in claim 9 wherein said processing means further includes means for updating said stored database signals with said produced locating signals when no correct graphical character is identified.

14. A method of recognizing a Handwritten Symbol comprising the steps of:

(a) generating a stream of locating signals for Points by moving a stylus about locations proximate to a writing surface means that generates a signal representative of said location of said stylus;

(b) dividing up a stream of locating signals into sections representative of a Stroke;

(c) calculating Stroke characteristics;

(d) comparing said calculated Stroke characteristics with Stroke characteristics previously stored in a database; and

(e) determining the best comparison and indicating if said best comparison is good enough to be a match.

15. Apparatus for recognizing Handwritten Symbols and displaying Handwritten and Font Symbols on a screen comprising:

(a) A visual display screen having the graphic capability to display Font Symbols and execute predetermined commands;

(b) Hand-held means to write or draw Handwritten Symbols on or over said screen;

(c) Means to display a true representation of the Handwritten Symbols on said screen as they are created;

(d) Digitizing means to sense the position of said hand-held means and to convert the same into a series of electrical signals defining the position, size and shape of each Handwritten Symbol;

(e) Means to compare predetermined characteristics of each digitized Handwritten Symbol with a database of predetermined characteristics of Font Symbols to assess the identity of each Font Symbol;

(f) Means to convert the Handwritten Symbol to a predetermined Font Symbol or a command and to display the Font Symbol on the screen in close proximity to the screen area in which the Handwritten Symbol was originally entered or to execute the command, as the case may be.

16. Apparatus as set forth in Claim 15, including means to display predetermined fonts of symbols in the form of text or forms on said screen, whereby the Handwritten Symbols can be used to input information to complete a form or to edit a predetermined text.

17. Apparatus as set forth in Claim 15, wherein said apparatus comprises a portable unit having dimensions up to about 400mm by 40mm by 100mm, a weight of up to about 7 kilograms and is adapted to include a self-contained power supply.

18. Apparatus as set forth in Claim 15, including means to display predetermined symbols in a font and command-representing symbols on said screen, to permit handwritten symbols representing each predetermined symbol to be manually defined on the screen and means to identify the manually defined symbol with the corresponding predetermined symbol in said database.

19. Apparatus as set forth in Claim 18, including means to modify said database when a Handwritten Symbol causes an erroneous Font Symbol to be displayed on the screen or command to be performed, as the case may be.

20. Apparatus as set forth in Claim 16, including means to create a window of empty space on said screen upon a predetermined command for entering Handwritten Symbols in said window.

21. Apparatus as set forth in Claim 15, including areas on said screen sensitive to touch to cause predetermined functions to be performed.

22. Apparatus as set forth in Claim 15, wherein said screen is substantially flat and adapted to be used in a substantially horizontal position.

23. Apparatus as set forth in Claim 15, including Softkeys on said screen and means to execute operational commands in response to touching any of said Softkeys.

24. A microprocessor-based process for recognition, translation and display of Handwritten Symbols

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and execution of commands comprising the steps of:

(a) Creating a personalized database for each individual user of the process by having the user initially input a Handwritten Symbol for each character corresponding with a font to be displayed or command to be executed;

(b) Determining a unique set of characteristics to characterize each such symbol and storing it in the database;

(c) Writing or drawing Handwritten Symbols on a computer screen with a stylus;

(d) Digitizing each Handwritten Symbol to identify the x,y coordinates of a multiplicity of Points defining the Symbol;

(e) Processing the digitized characteristics of each Handwritten Symbol to determine the predetermined characteristics of the Symbol;

(f) Search the database to find a "hit", a perfect or the closest correspondence to the characteristics;

(g) Displaying the Font Symbol or performing the command most closely associated with the "hit" characteristics.

25. A process as set forth in Claim 24, including the additional steps of:

(a) Determining if the Font Symbol displayed or command performed is an error; and

(b) If there is an error, re-inputting a Handwritten Symbol for the desired Font Symbol or command to modify the database.

26. A process as set forth in Claim 24, including the additional step of:

(a) Substantially contemporaneously displaying the Handwritten Symbol on the screen as it is being written or drawn.

27. A process as set forth in Claim 24, wherein steps (b) and (c) involve a determination of the (i) length, (ii) average slope, (iii) centroid height above base line, (iv) curvature (rate of change in slope) and (v) comparison of the location of the centroid of each Stroke with the centroid of the Handwritten Symbol.

28. A process as set forth in Claim 27, wherein step (f) comprises:

(a) Determining the value of each of the five characteristics;

(b) Subtracting the database value of the characteristic from the newly-measured value;

(c) Scaling the absolute values of each measurement to make each of the five measurements reasonably equivalent to the others;

(d) Adding all five values;

(e) If a predetermined threshold is exceeded, discarding the comparison and creating an error message; and

(f) Searching the database to find a numerical "hit", or, if not feasible, the closest numerical match between the database value and the newly inputted value.

29. A process as set forth in Claim 24, wherein the error rate is 5% or less.

30. A process as set forth in Claim 28, wherein the program for step (f) requires less than 6K of machine memory.

31. A process as set forth in Claim 24, wherein said Handwritten Symbols include Editing Symbols and said process includes recognition of the Editing Symbols drawn on the screen and executing the Editing Functions represented.

32. A process as set forth in Claim 24, in which text in Font Symbol format is displayed on the screen, and including the steps of:

(a) Creating a window on the screen proximate to, but not overlying, an area of said text to be edited;

(b) Inputting and displaying said Handwritten Symbols in said window;

(c) Displaying the Font Symbols corresponding to said Handwritten Symbols in close proximity to said Handwritten Symbols;

33. A process as set forth in claim 24, including the steps of:

(a) Creating one or more Softkeys on said screen to cause the computer to perform operational functions; and

(b) Touching one or more of said Softkeys to execute the corresponding functions.

34. A process as set forth in Claim 24, including the steps of determining the x,y coordinates of from about 4 to 8 Points per mm and from about 100 to 200 points per second in characterizing said Handwritten Symbols.

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Neu eingereicht / Newly filed
Nouvellement déposé

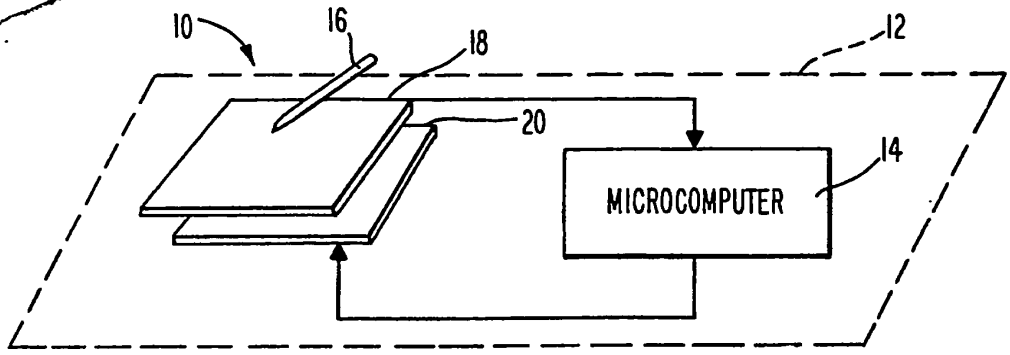


Fig. 1

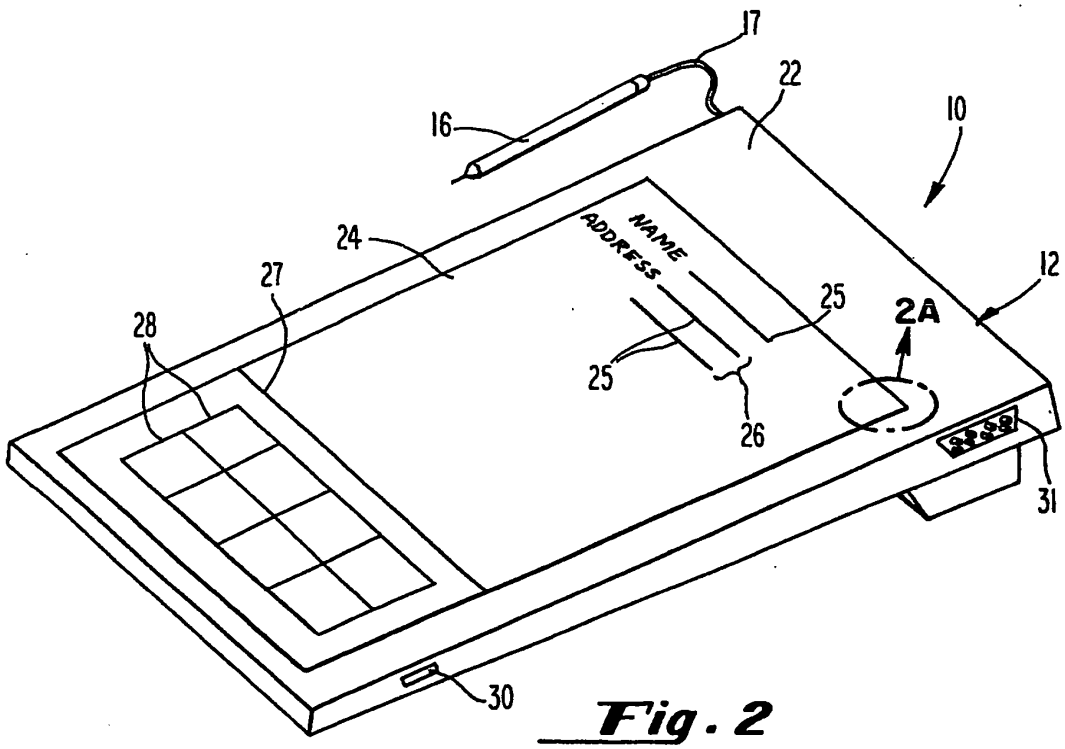


Fig. 2

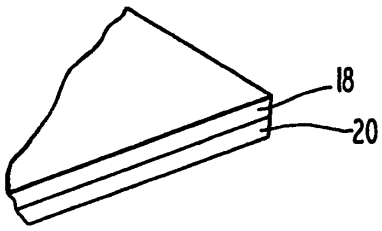


Fig. 2A

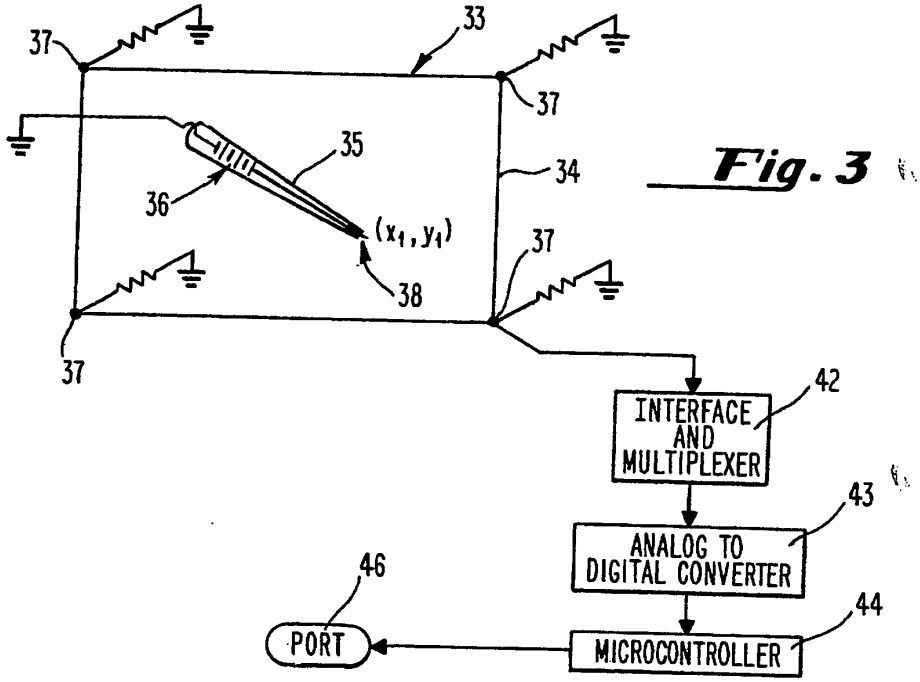

37
33
37
35
34
36
(x_1, y_1)
37
38
37
INTERFACE AND MULTIPLEXER
42
ANALOG TO DIGITAL CONVERTER
43
46
PORT
MICROCONTROLLER
44

Fig. 3

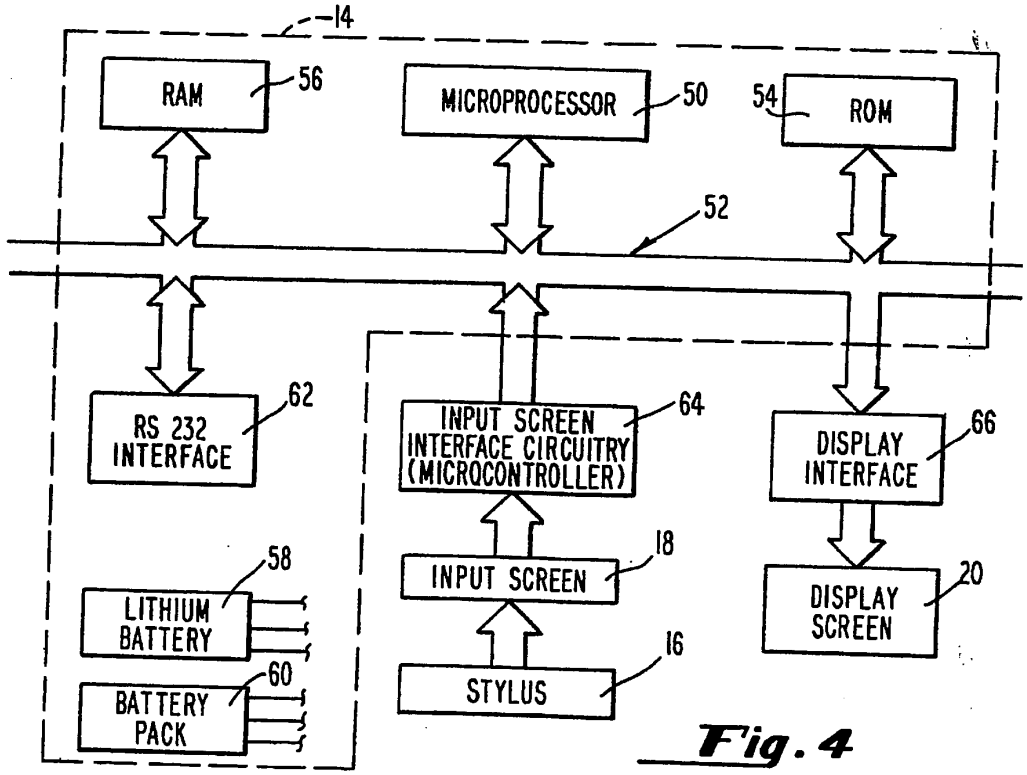

14
RAM
56
MICROPROCESSOR
50
54
ROM
52
RS 232 INTERFACE
62
INPUT SCREEN INTERFACE CIRCUITRY (MICROCONTROLLER)
64
DISPLAY INTERFACE
66
58
LITHIUM BATTERY
INPUT SCREEN
18
DISPLAY SCREEN
20
60
BATTERY PACK
STYLUS
16

Fig. 4

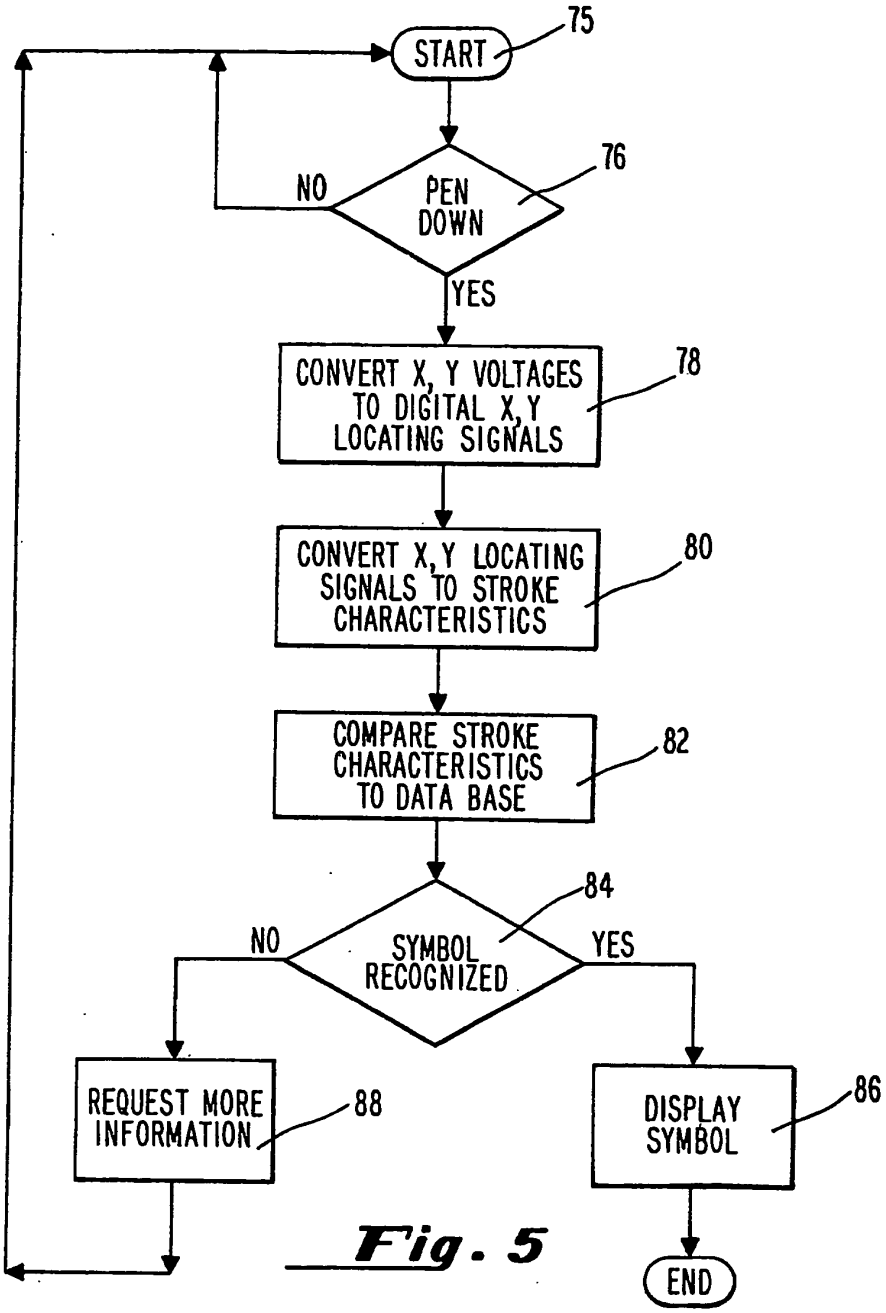

START
75
PEN DOWN
76
NO
YES
CONVERT X, Y VOLTAGES TO DIGITAL X, Y LOCATING SIGNALS
78
CONVERT X, Y LOCATING SIGNALS TO STROKE CHARACTERISTICS
80
COMPARE STROKE CHARACTERISTICS TO DATA BASE
82
SYMBOL RECOGNIZED
84
NO
YES
REQUEST MORE INFORMATION
88
DISPLAY SYMBOL
86
END

Fig. 5

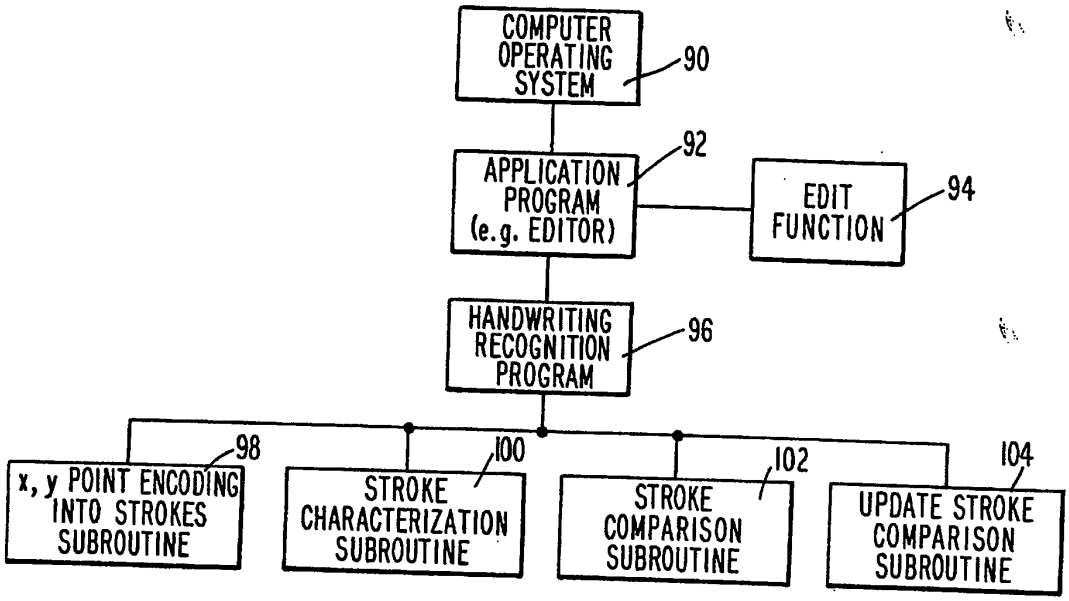

COMPUTER OPERATING SYSTEM
90
APPLICATION PROGRAM (e.g. EDITOR)
92
EDIT FUNCTION
94
HANDWRITING RECOGNITION PROGRAM
96
x, y POINT ENCODING INTO STROKES SUBROUTINE
98
STROKE CHARACTERIZATION SUBROUTINE
100
STROKE COMPARISON SUBROUTINE
102
UPDATE STROKE COMPARISON SUBROUTINE
104

Fig. 6

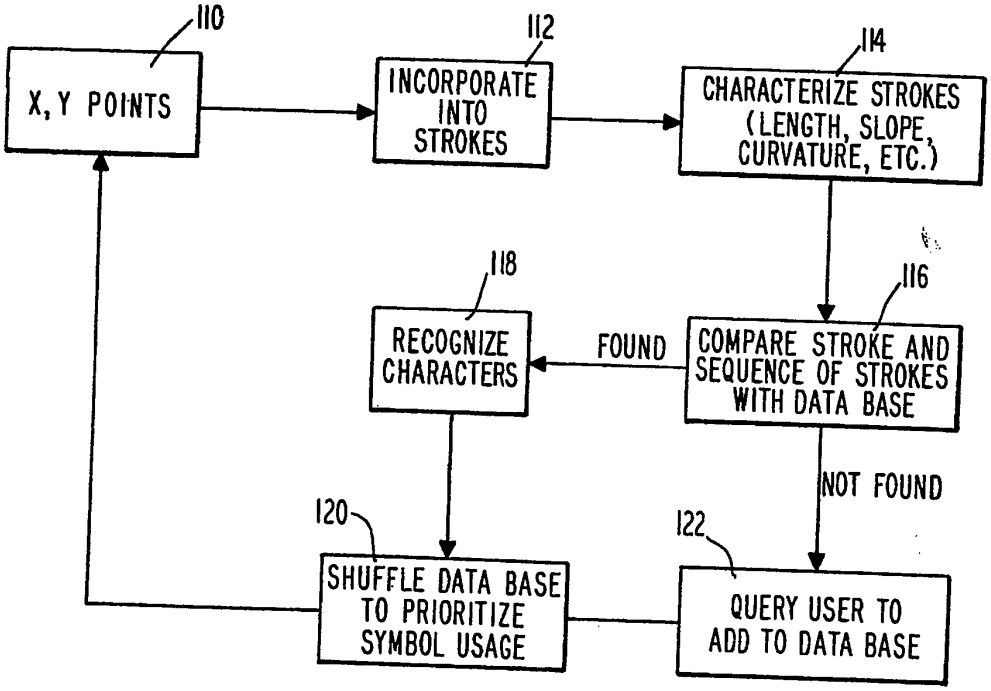

X, Y POINTS
110
INCORPORATE INTO STROKES
112
CHARACTERIZE STROKES (LENGTH, SLOPE, CURVATURE, ETC.)
114
COMPARE STROKE AND SEQUENCE OF STROKES WITH DATA BASE
116
FOUND
RECOGNIZE CHARACTERS
118
NOT FOUND
SHUFFLE DATA BASE TO PRIORITIZE SYMBOL USAGE
120
QUERY USER TO ADD TO DATA BASE
122

Fig. 7

Fig. 8A

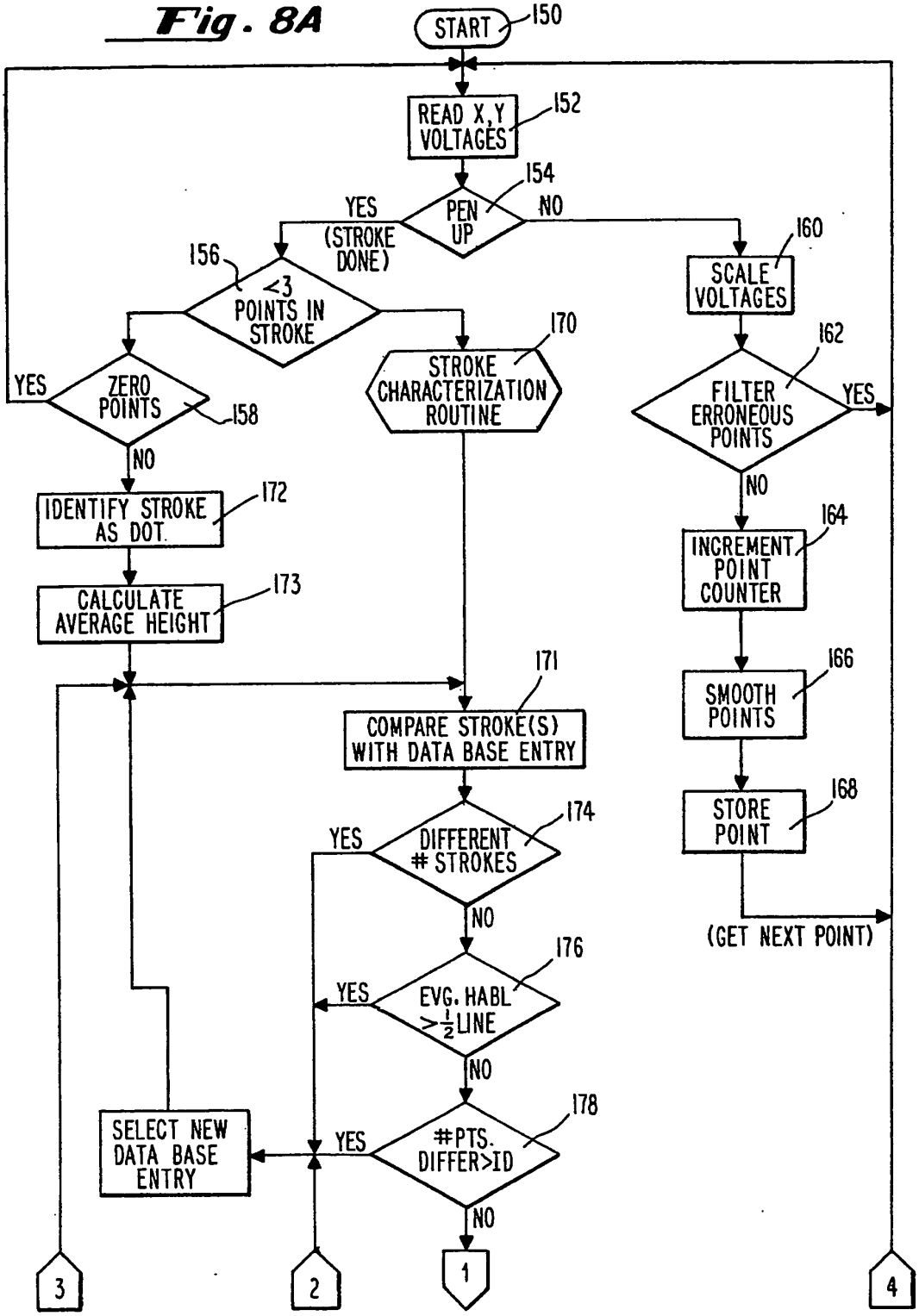
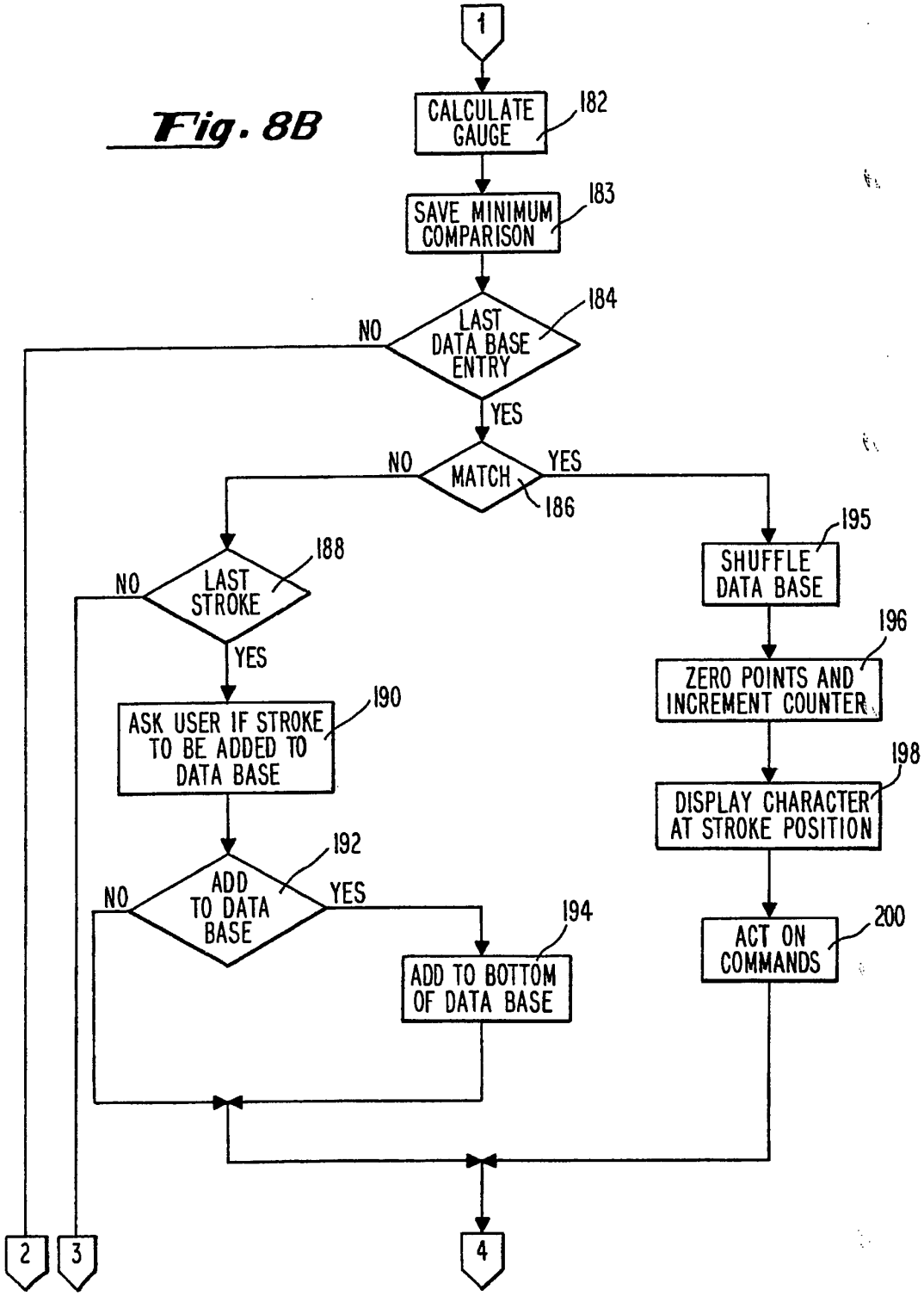

START
150
READ X,Y VOLTAGES
152
PEN UP
154
YES (STROKE DONE)
NO
<3 POINTS IN STROKE
156
ZERO POINTS
158
YES
NO
IDENTIFY STROKE AS DOT.
172
CALCULATE AVERAGE HEIGHT
173
STROKE CHARACTERIZATION ROUTINE
170
SCALE VOLTAGES
160
FILTER ERRONEOUS POINTS
162
YES
NO
INCREMENT POINT COUNTER
164
SMOOTH POINTS
166
STORE POINT
168
(GET NEXT POINT)
COMPARE STROKE(S) WITH DATA BASE ENTRY
171
DIFFERENT # STROKES
174
YES
NO
EVG. HABL > 1/2 LINE
176
YES
NO
#PTS. DIFFER>ID
178
YES
NO
SELECT NEW DATA BASE ENTRY
3
2
1
4

Fig. 8B


1
CALCULATE GAUGE
182
SAVE MINIMUM COMPARISON
183
LAST DATA BASE ENTRY
184
NO
YES
MATCH
186
NO
YES
LAST STROKE
188
NO
YES
ASK USER IF STROKE TO BE ADDED TO DATA BASE
190
ADD TO DATA BASE
192
NO
YES
ADD TO BOTTOM OF DATA BASE
194
SHUFFLE DATA BASE
195
ZERO POINTS AND INCREMENT COUNTER
196
DISPLAY CHARACTER AT STROKE POSITION
198
ACT ON COMMANDS
200
2
3
4

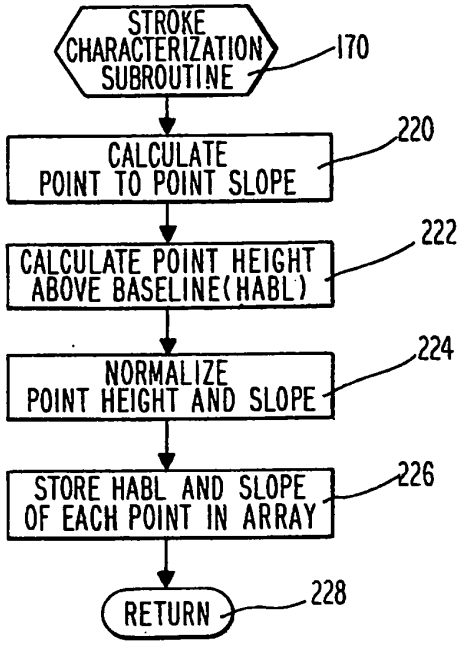

STROKE CHARACTERIZATION SUBROUTINE
170
CALCULATE POINT TO POINT SLOPE
220
CALCULATE POINT HEIGHT ABOVE BASELINE(HABL)
222
NORMALIZE POINT HEIGHT AND SLOPE
224
STORE HABL AND SLOPE OF EACH POINT IN ARRAY
226
RETURN
228

Fig. 9

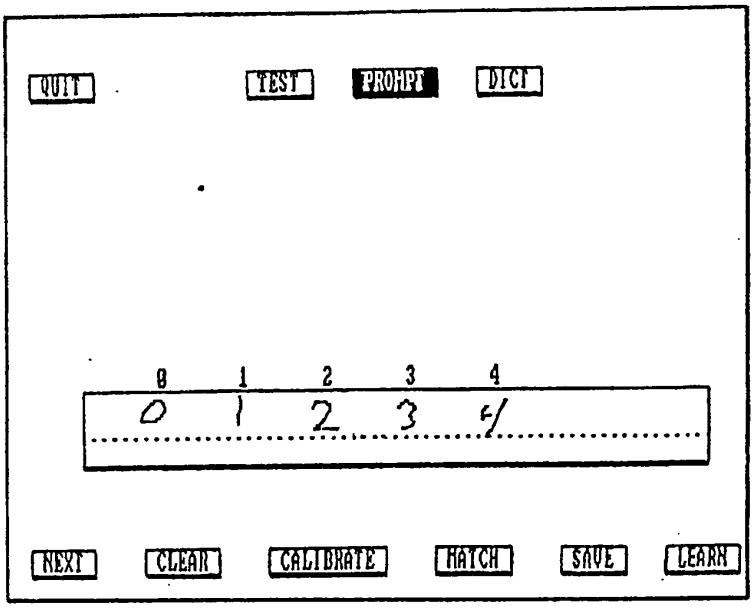

QUIT
TEST
PROMPT
DICT
0 1 2 3 4
0 1 2 3 4
NEXT
CLEAR
CALIBRATE
MATCH
SAVE
LEARN

Fig. 10

I - Printed Circuit Board

The Board's size, cost, power consumption, and reliability are critical to the sucess of our product.

The board must fit in our package, which limits its dimensions to something like 10" X 5", or about 50 square inches. Room must be available for dealer installable options such as additional memory and modem - possibily as piggy back boards.

Power consumption must be low enough so that the battries in the product can provide for about 8 hours of operation and about 2 weeks of data retention. These are exclusive, i.e. 8 hours of operation followed by 2 weeks of data retention is required. With this kind of power consumption heat should not be a problem.

Given our cost and power requirements we expect that we will be using CMOS technology through out. We also expect to use Surface Mounted Technology(SMT). SMT allows a denser packing, more shock resistence, and lower manufacturing costs, although initial costs may be slighlty higher. The final decision on SMT will depend upon the availability of

Fig. IIA

I - Printed Circuit Board

The board's size, cost, power consumption, and reliability are critical to the sucess of our product.

The board must fit in our package, which limits its dimensions to something like 10" X 5", or about 50 square inches. Room must be available for dealer installable options such as additional memory and modem - possibily as piggy back boards.

Power consumption must be low enough so that the battries in the product can provide for about 8 hours of operation and about 2 weeks of data retention. These are exclusive, i.e. 8 hours of operation followed by 2 weeks of data retention is required. With this kind of power consumption heat should not be a problem.

Given our cost and power requirements we expect that we

Fig. IIB

I - Printed Circuit Board

The board's size, cost, power consumption, and reliability are critical to the sucess of our product.

The board must fit in our package, which limits its dimensions to something like 10" X 5", or about 50 square inches. Room must be available for dealer installable options such as additional memory and modem - possibily as piggy back boards.

now is the time

Power consumption must be low enough so that the battries in the product can provide for about 8 hours of operation and about 2 weeks of data retention. These are exclusive, i.e. 8 hours of operation followed by 2 weeks of data retention is required. With this kind of power consumption heat should not be a problem.

Given our cost and power requirements we expect that we

Fig. IIC

0254561

I - Printed Circuit Board

The board's size, cost, power consumption, and reliability are critical to the sucess of our product.

The board must fit in our package, which limits its dimensions to something like 10^{n} X 5^{n}, or about 50 square inches. Room must be available for dealer installable options such as additional memory and modem - possibly as piggy back boards. ^

Now is the time

how is the time

Power consumption must be low enough so that the battries in the product can provide for about 8 hours of operation and about 2 weeks of data retention. These are exclusive, i.e. 8 hours of operation followed by 2 weeks of data retention is required. With this kind of power consumption heat should not be a problem.

Given our cost and power requirements we expect that we

Fig. IID

I - Printed Circuit Board

The board's size, cost, power consumption, and reliability are critical to the sucess of our product.

The board must fit in our package, which limits its dimensions to something like 10^{n} X 5^{n}, or about 50 square inches. Room must be available for dealer installable options such as additional memory and modem - possibly as piggy back board. Now is the time

Power consumption must be low enough so that the battries in the product can provide for about 8 hours of operation and about 2 weeks of data retention. These are exclusive, i.e. 8 hours of operation followed by 2 weeks of data retention is required. With this kind of power consumption heat should not be a problem.

Given our cost and power requirements we expect that we will be using CMOS technology through out. We also expect to use Surface Mounted Technology(SMT). SMT allows a denser packing, more shock resistence, and lower manufacturing costs, although initial costs may be slightly higher. The final decision on SMT will depend upon the availability of

Fig. IIE

I - Printed Circuit Board

The board's size, cost, power consumption, and reliability are critical to the sucess of our product.

The board must fit in our package, which limits its dimensions to something like 10^{n} X 5^{n}, or about 50 square inches. Room must be available for dealer installable options such as additional memory and modem - possibly as piggy back board. ~~Now is the time~~

Power consumption must be low enough so that the battries in the product can provide for about 8 hours of operation and about 2 weeks of data retention. These are exclusive, i.e. 8 hours of operation followed by 2 weeks of data retention is required. With this kind of power consumption heat should not be a problem.

Given our cost and power requirements we expect that we will be using CMOS technology through out. We also expect to use Surface Mounted Technology(SMT). SMT allows a denser packing, more shock resistence, and lower manufacturing costs, although initial costs may be slightly higher. The final decision on SMT will depend upon the availability of

Fig. IIF

I - Printed Circuit Board

The board's size, cost, power consumption, and reliability are critical to the sucess of our product.

The board must fit in our package, which limits its dimensions to something like 10" X 5", or about 50 square inches. Room must be available for dealer installable options such as additional memory and modem - possibily as piggy back board.

Power consumption must be low enough so that the battries in the product can provide for about 8 hours of operation and about 2 weeks of data retention. These are exclusive, i.e. 8 hours of operation followed by 2 weeks of data retention is required. With this kind of power consumption heat should not be a problem.

Given our cost and power requirements we expect that we will be using CMOS technology through out. We also expect to use Surface Mounted Technology(SMT). SMT allows a denser packing, more shock resistence, and lower manufacturing costs, although initial costs may be slightly higher. The final decision on SMT will depend upon the availability of

Fig. IIG

I - Printed Circuit Board

The board's size, cost, power consumption, and reliability are critical to the sucess of our product.

The board must fit in our package, which limits its dimensions to something like 10" X 5", or about 50 square inches. Room must be available for dealer installable options such as additional memory and modem - possibily as piggy back board.

Power consumption must be low enough so that the battries in the product can provide for about 8 hours of operation and about 2 weeks of data retention. These are exclusive, i.e. 8 hours of operation followed by 2 weeks of data retention is required. With this kind of power consumption heat should not be a problem.

Given our cost and power requirements we expect that we will be using CMOS technology through out. We also expect to use Surface Mounted Technology(SMT). SMT allows a denser packing, more shock resistence, and lower manufacturing costs, although initial costs may be slightly higher. The final decision on SMT will depend upon the availability of

Fig. IIH

I - Printed Circuit Board

The board's size, cost, power consumption, and reliability are critical to the sucess of our product.

The board must fit in our package, which limits its dimensions to something like 10" X 5", or about 50 square inches. Room must be available for dealer installable options such as additional memory and modem - possibily as piggy back board.

Power consumption must be low enough so that the battries in the product can provide for about 8 hours of operation and about 2 weeks of data retention. These are exclusive, i.e. 8 hours of operation followed by 2 weeks of data retention is required. With this kind of power consumption heat should not be a problem.

Fig. III

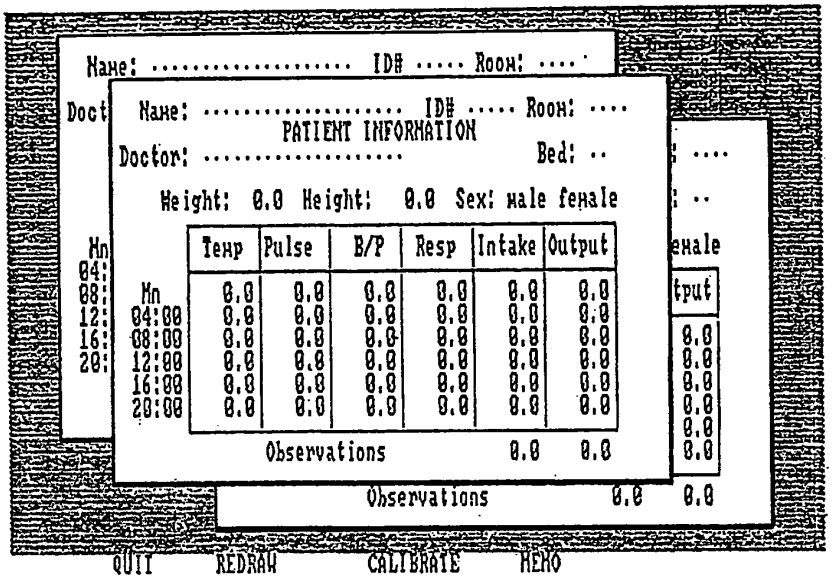


Fig. 12A

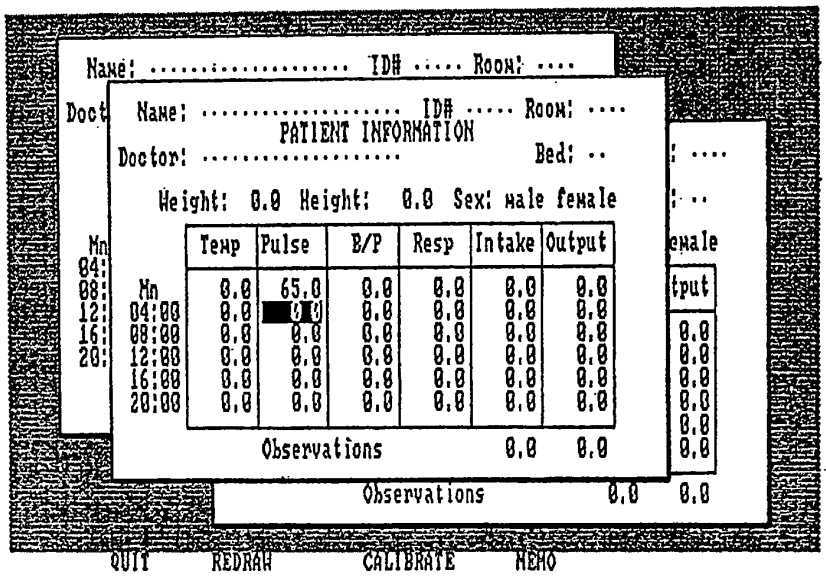


Fig. 12B

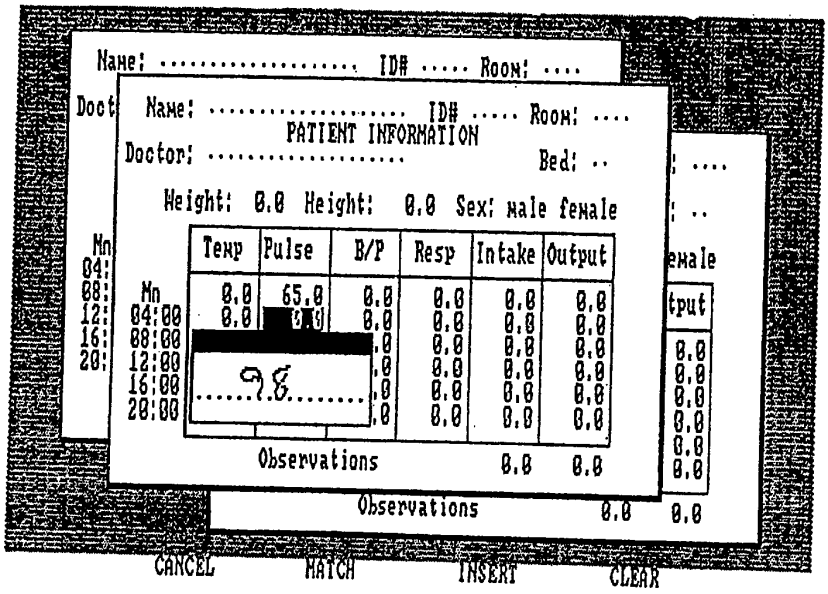


Fig. 12C

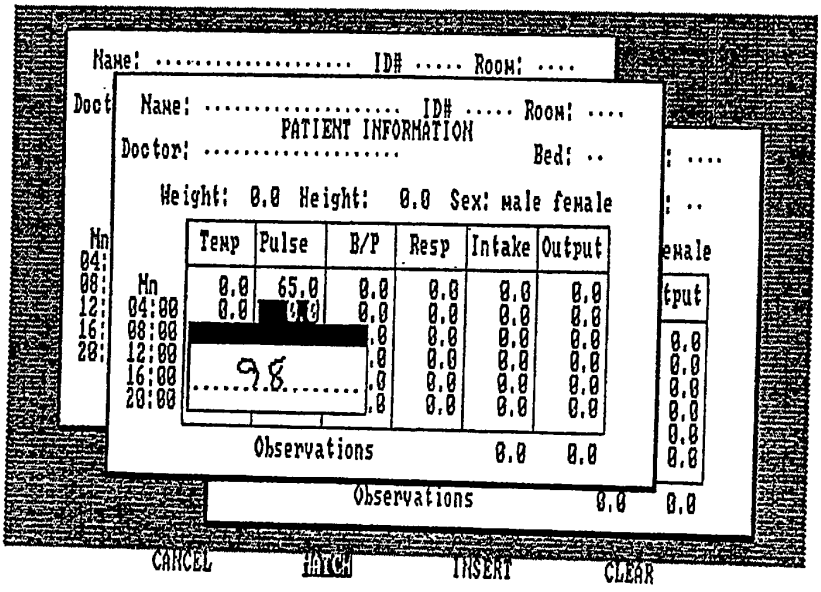


Fig. 12D

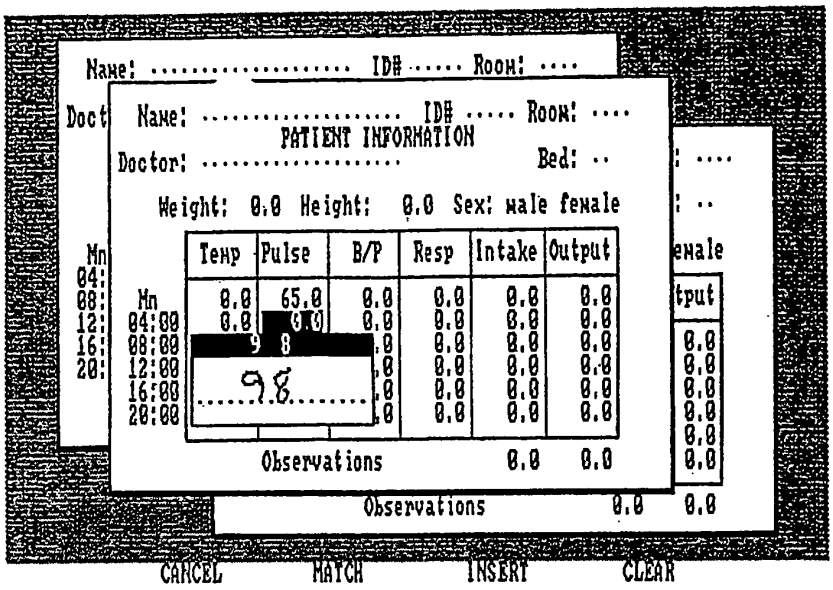


Fig. 12E

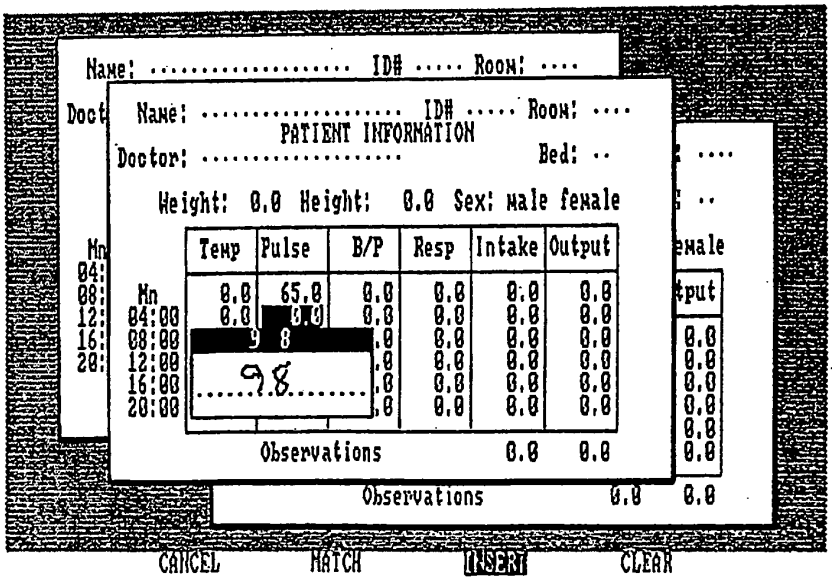


Fig. 12F

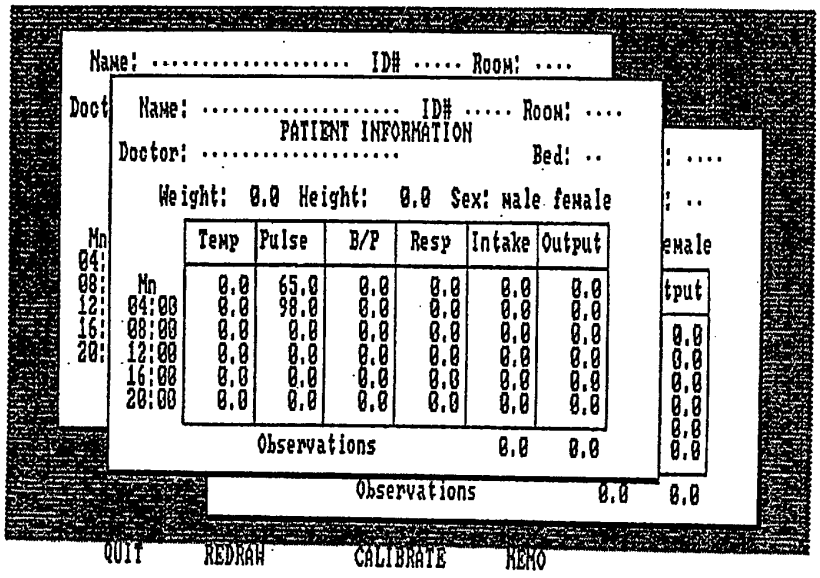

Name: ..... ID# ..... Room: ....
Name: ..... ID# ..... Room: ....
PATIENT INFORMATION
Doctor: ..... Bed: ..
Weight: 0.0 Height: 0.0 Sex: male female
Temp Pulse B/P Resp Intake Output
Mn 0.0 65.0 0.0 0.0 0.0 0.0
04:00 0.0 98.0 0.0 0.0 0.0 0.0
08:00 0.0 0.0 0.0 0.0 0.0 0.0
12:00 0.0 0.0 0.0 0.0 0.0 0.0
16:00 0.0 0.0 0.0 0.0 0.0 0.0
20:00 0.0 0.0 0.0 0.0 0.0 0.0
Observations 0.0 0.0
Observations 0.0 0.0
QUIT REDRAW CALIBRATE MEMO

Fig. 12G

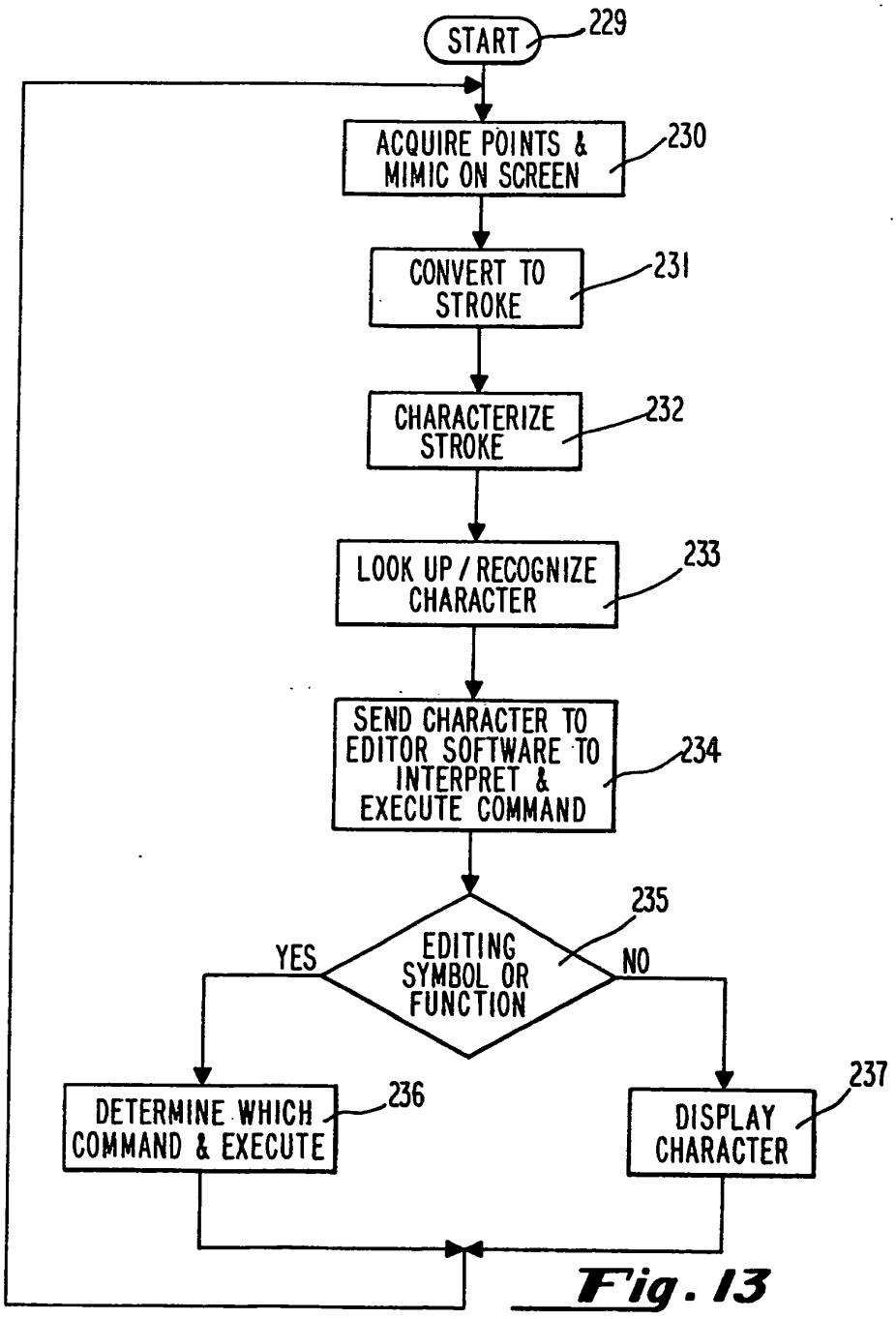

START
229
ACQUIRE POINTS & MIMIC ON SCREEN
230
CONVERT TO STROKE
231
CHARACTERIZE STROKE
232
LOOK UP / RECOGNIZE CHARACTER
233
SEND CHARACTER TO EDITOR SOFTWARE TO INTERPRET & EXECUTE COMMAND
234
EDITING SYMBOL OR FUNCTION
235
YES
NO
DETERMINE WHICH COMMAND & EXECUTE
236
DISPLAY CHARACTER
237

Fig. 13

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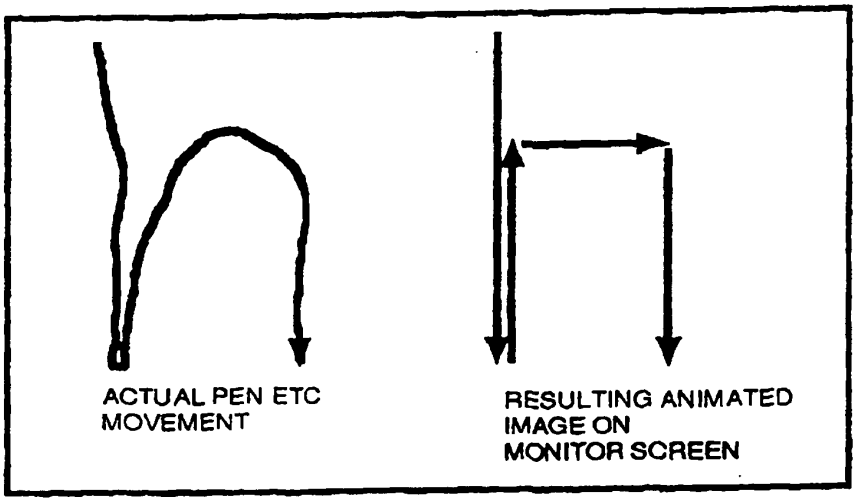
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(74) Agent: ROYSTONS; Tower Building, Water Street, Merseyside, Liverpool L3 1BA (GB).

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(54) Title: MEANS FOR INPUTTING CHARACTERS OR COMMANDS INTO A COMPUTER



(57) Abstract

Means for inputting a hand generated character into a computer comprises means (10) for drawing a character, means for abstracting a sequence of signals as the character is drawn corresponding to components of the character to produce a code representative of that character and means (12) for recognising that code, whereby the character is inputted to the computer (14).

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TITLE: Means for inputting characters or commands into a computer.

DESCRIPTION

This invention concerns means for inputting characters or commands into a computer or other information receiving device without a keyboard or the like using the automatic skills of handwriting.

The present day computer keyboard was initially designed to operate a typewriter. The keys were operated as levers to stamp a die onto paper to print each character. Each key carried two characters one above the other, the lower case character being reproduced by normal depression of a key onto paper with an ink ribbon therebetween and the upper case character being obtained by shifting the entire paper carriage or die set so that the impact occurs with the upper character die impression rather than the lower. Punctuation and special characters were obtained by shifting the numbers or with extra keys.

The printing method is fundamentally the same as in a printing press but the purpose of a typewriter is very different from the purpose of a press. Printing, of course, allows publication of a manuscript and the reproduction of many identical copies of the original manuscript without the effort of handwriting each copy.

The typewriter came into being with the growth of modern commerce and the need for legible business letters. At that time (and indeed presently), handwriting was

highly personal and showed great variation from one person to another. This made handwritten letters, agreements, contracts and other legal documents potentially ambiguous or unclear in meaning. It is this complexity of handwriting which mitigates against current approaches to computer analysis of handwriting.

Variations in handwriting represent simple information embedded in a mass of redundant detail. In modern information and communications, the approach to redundancy in a pattern is to throw large computing power into analysis and recognition. Computer equipment for analysing handwriting is available but does require considerable computing power and hence is relatively expensive and often cannot recognise the handwriting quickly enough, in real time, causing delays to the inputting process.

The analysis employed in such methods depends upon the extraction of salient features from the pattern of handwriting presented to the device and its software. It should be noted that the salient features chosen are often complex and any one may be specific to one character or letter. This implies that the set of such features is large and complex. In addition there exists a number of different ways in which a particular character can be drawn, each of which may contain different salient features. Add to this the difficulty that even with a single way of drawing a particular character, the actual pattern drawn will vary greatly from one person to another. The result is that such approaches to the computer recognition of handwriting have so far been limited in their success and often require a learning process in which the software adjusts to the handwriting of the user or the user learns a way of writing which allows the system to work. The overhead in terms of

programme size and computing power required is often expensive and impractical in the application to hand-held computers or personal digital assistants particularly at the smaller end of the scale of size, power and cost (the high volume market of pocket databanks, diaries, organisers and the like).

Another approach to data input to a computer from finger movements is embodied in systems that require the user to draw each character in a particular way, devoid of ambiguity. This results in a sort of short-hand code which has to be learned by the user. The short-hand forms are often not familiar or readily recognisable as the characters they represent. The result is a commercially successful system but some way removed from natural writing and which needs to be learned and practised.

Another difficulty associated with the current approaches to handwritten input to a computer is the complexity and expense of the hardware required for the sensing of the finger movements. In both the approaches described above, the moment-by-moment and point-by-point form of the motion of the fingers must be sensed, digitised and transmitted to the processor carrying out the analysis and recognition. In many devices currently available this function is performed by a pen or stylus moved by the fingers across a touch sensitive screen. The finger motions are detected by this device and transmitted to the processor, which causes an image of the movement to be displayed on the same screen. Such a complex input device is expensive and can represent a significant proportion of the cost of for example a hand-held computer.

Thus, it is not easy to input hand generated information into a computer in a

direct manner.

The printed word, on the other hand, is clear and unambiguous. Every character can be standard in form and scale and easy to read. The printing press sets up its text as a block of lead type which is impressed onto one or more paper pages at a time. This allows the rapid production of many copies of a page. The typewriter, however, needed to be flexible at the level of each character, not at the level of each page. Hence, one key (one print operation) per character. Therefore, the present day keyboard has 60 to 70 keys.

Keyboards which deliver the component parts of each character (one part to one key) have been proposed. Because the form of printed numbers and letters can be simplified (they can be displayed with 7 and 14 segment displays) such a keyboard would only need a relatively small number of keys compared to the standard keyboard. However, such keyboards have not been successful possibly due to the barrier of having to learn a new way of typing which overrides the advantages of such a simple keyboard. It is to be noted that during conventional touch-typing, although the fingers of both hands cover the keys, only one finger is working at a time. With character constructing keyboards as mentioned above, a number of fingers must be employed simultaneously to print a character and so co-ordination skills must be learned by the user. This means that the typing skill called for is less natural than the one-key one-character scheme used by conventional keyboards.

An object of this invention is to provide means for inputting hand generated information into a computer.

According to one aspect of the invention there is provided means for inputting

a hand generated character into a computer comprising means for drawing a character, means for abstracting a sequence of signals as the character is drawn corresponding to components of the character to produce a code representative of that character and means for recognising that code, whereby the character is inputted to the computer.

The signal abstracted preferably corresponds to a quantization of motion as the character is drawn. The signal abstracted may correspond to a change in direction as the character is drawn and/or may correspond to movement beyond one or more defined thresholds in a particular direction as the character is drawn and/or a signal abstracted may correspond to a change in position of the drawing means from one defined area to another defined are on a drawing surface.

According to a second aspect of the invention there is provided means for converting movement or force generated in reproducing a character into a coded signal corresponding to one or more elements of said movement or force that are indicative of the character, whereby the character is recognisable from said coded signal.

According to a third aspect of the invention there is provided a device for converting movement of or force applied to at least a part of said device, said movement or force being imparted by reproduction of a character, into a coded signal corresponding to one or more elements of said movement or force that are indicative of the character, whereby the character is recognisable from said coded signal.

According to a fourth aspect of the invention there is provided means for inputting a hand generated character into a computer having a monitor, comprising

means for drawing a character to produce a sequence of signals corresponding to that character, means for converting signals produced for one character into a code representative of that character, means for recognising that code and means for providing visual feedback corresponding to the character being inputted as the character is being drawn.

The means according to this aspect of the invention may be used with any handwriting recognition/input system whether involving quantisation recognition or any other system of handwriting analysis.

According to a fifth aspect of the invention there is provided a visual feedback to the writer on a display screen. Feedback may take the form of a sequential build-up or animation of a character form which itself is produced from the above mentioned coded signal. Feedback may be generated by the processor which is connected to the above mentioned input means or input device or any other suitable input means.

Thus the display screen can show the results of the handwriting recognition process as a feedback of information to guide the writer. It preferably operates step by step as the elements of movement are coded by the input device and includes the aspect of computer recognition in the visual feedback process unlike all prior art. It does not indicate the moment by moment movement of the fingers or the point by point form of the character as drawn, as is the case with current approaches to handwriting input to a computer. The user is guided by the interpretation of the finger movements by the system, so as to be able easily and naturally to produce just the correct finger movements that will code as the correct sequence of elements of

unambiguous recognition of the writing.

Preferably the visual feedback means comprises means for producing on a monitor a graphic simulation of a character component in response to an abstracted signal. The graphic simulation is preferably modifiable in response to a subsequent signal of a sequence for a character.

The graphic simulation preferably further includes an indicator as to position of the drawing means on a drawing surface. The indicator may comprise an icon displayed at or near an end of the latest graphic simulation component. Alternatively, the indicator may comprise an icon that moves around the graphic simulation of a character in response to movement of the drawing means.

The feedback can be a smoothly produced animation of a cursive character form that responds during its formation to the incoming flow of recognised elements or signal codes.

The computer or input device appears to the user to be cooperating in the process of writing and to be producing the characters on the screen from the prompting provided by the finger movements.

Of course, the characters shown on the screen are not representative of the actual locus or form of the movement of the fingers, but are synthetic representations of the intent of the user, and merely guide the user in the inputting process. From the user's point of view the characters seem to appear as if written by the user, with the cooperation of the computer.

Such characters can build up to display a completed word, for example, in a standard, clear, joined-up cursive writing, each character of which has been produced

from the sequence of simple elements produced by or abstracted from the operation of the input device.

When the user lifts the pen or signals the end of a word in an appropriate manner, then the processor can immediately replace the cursive characters with the same word displayed in a selected font appropriate to the application or application programme.

In contradistinction to prior art handwriting analysis systems which input information describing the character as drawn and carry out an extraction of salient features (necessarily scale and speed independent), followed by comparison with a stored library of possible shapes, strokes and their inter-relationships, both spatial and temporal, to give the best fit to one character of a complete character set, and thence to the recognised code for the character, the system of the present invention is a direct encoding system where the movements generating the character as drawn, are compared with a single template in such a way that complacent movements directly produce the elements of a code that identifies the character completely by the time the character is completed. At the instant the character is completed, the recognisable code has been completely built and no further analysis or processing is required for recognition.

Preferably recognition occurs character by character in real time. The one or more elements of movement or force are preferably unit vectors.

Preferably analysis of movements or forces into elements is by means of quantizing said movements or forces into one or a sequence of unit vectors. These elements are preferably speed independent, are preferably scale independent and are

preferably substantially independent of distortions or variations in the character as reproduced.

Preferably the elements form a set common to all the characters to be reproduced, which set does not contain elements specific to only one or a few characters.

The signal is preferably recognisable by a computer or any other information handling device to which the device is connected, whereby the character can be displayed on a visual display unit operated by the computer or can be processed in the same manner as a character input from a keyboard.

If an input device were activated by movements similar to those employed in writing, then this could provide a method of inputting characters and text into a computer without the need to learn a completely new skill.

What is here described is a device providing a method of analysis which is mechanical or automatic and does not require an indirect process of analysis and comparison to produce a unique code for a character, in contrast to prior art.

This automatic generation of a unique character code may be facilitated by means of a visual feedback from a display of the recognised elements of a character as synthesised from the signal from the input device.

The automatic switch-like method of extracting the coded signal from the finger movements gives rise to relatively simple and inexpensive input devices, recognition contemporaneous with the completion of a handwritten character, low computing power requirement, natural character forms and ease of learning and use, in contrast to prior art.

Thus the invention herein described allows data input to a computer or other system by means of the natural finger movements employed in writing utilising simple and low cost input devices with high speed recognition and visual feedback.

There is an advantage to detecting motion as it is happening as opposed to analysing the space pattern of completed handwriting. The motion of a pen when writing the circle of the letter "a" is different from the motion when writing the circle of the letter "p", although the resulting shapes are very similar. The "a" circle is normally produced by an anti-clockwise motion whilst the "p" circle is normally made with a clockwise motion. This distinction is lost if the resultant handwritten character is considered after it has been written. However, if the handwriting is analysed dynamically, as it is being written, then the information gained is far more useful. It will be appreciated that references to detection of movement include detection of applied forces in generating said movements.

In a preferred embodiment the drawing means will be a hand held pen or the like, whereby the pen or a part thereof can be moved to reproduce characters.

It is envisaged that the drawing means of the invention will have a part that may be moved relative to a real or notional template when a character is being reproduced and that the drawing means will include means for detecting said movement relative to the template. The template may be incorporated in the drawing means itself or may be separate therefrom. There are various ways in which the movement of said part of the drawing means may be detected.

For example it may be possible to have a template around which said part of the drawing means can be moved, whereby contact of that part of the drawing means

on a sensor in a particular part of the template will indicate a direction of movement and again one movement or a sequence of movements will generate a signal corresponding to the character being reproduced by those movements.

Put another way assuming a pen having a body, writing tip and a real template, the template may be separate from the pen, such as on a surface, may be fixed to the pen body or may be fixed to the tip. On the other hand, for a pen having a body and a writing tip, movement of either or both may be relative to a notional template associated with the body, the tip or a separate surface.

The means for detecting a movement of the drawing means or that part thereof may include contact switches, magnetic or capacitive sensors, optical encoders, light detectors, voltage changes, piezo-electric crystal activation or any other suitable means.

The system of the invention preferably includes means for signalling completion of a drawn character. Completion may be signalled by lifting the drawing means from a drawing surface. Alternatively, completion of a character may be indicated by a unique movement of the drawing means relative to that character. Another alternative may be to indicate completion of a character by movement of one of the drawing means and an icon indicative of the drawing means to a defined position, possibly on the drawing surface or an area defined on a monitor.

The mode of analysis envisaged by the invention is actually concerned with the time patterns of muscle action, in contrast to the space patterns of completed handwriting. It is relevant to note that all communication occurs through the medium of muscle action, whether speech, body language, touch, action, handwriting or

typing. The first outward expression of thought is always through muscular action. This invention is aimed at allowing the communication with a computer to take place at the level of the neuromuscular skill of writing.

It will be appreciated, however, that there is considerable redundancy present in handwriting. Although handwriting may be taught in a uniform fashion, variations and embellishments are added as a person develops his handwriting skill, so that whilst letters and words can be recognised, it is extremely difficult for, for example, a computer scanning device to extract the essential characters because of personal variations and embellishments.

Accordingly, a preferred aim of the device of the invention is to enable characters to be reproduced as unit vectors. In other words, each character as it is drawn using the device of the invention preferably produces a signal for that character as one or a sequence of steps. This may be achieved by limiting or restricting registration of the movement to one or a series of quantized steps or unit vectors.

It is important to realise that signals which solely describe the position, movement or locus of a pen or moving part of the device simply provide a copy of that movement etc. in electronic, electrical etc form. They do not of themselves facilitate logical recognition of the inputted letter form or character form.

What this invention allows is an automatic reduction of the movement etc into a quantized form. This means that the movement is divided into steps which indicate the time sequence of unit vectors which characterise the movement etc. The steps themselves do not describe the point by point and moment by moment movement which results from drawing the character form. They are rather the result of an

analysis of the movement etc which indicates a series of unit vectors. This series of unit vectors cannot be used to reconstruct the original finger movements, because all redundant space and time information is discarded in the process of detecting the unit vector sequence. All that remains is the sequence of the unit vectors and the character of the unit vectors.

The character of the unit vectors will be dependent on the design of the device. In the case of a physical square template the unit vectors could be characterised for example as being up, down, left or right.

The time delay between one unit vector and the next is not of importance and is discarded information. All that matters for recognition is the sequence, eg. left then down then right then up then down for the handwritten letter form "a".

Also the process of deriving the unit vectors disregards the scale or size of the movement or letter form. The same sequence of the same unit vectors results from a large "a" as from a small "a". In addition, provided the physical movements which activate the movement or position detectors are smaller than the smallest character to be drawn, the sequence of unit vectors will be the same for wide variations or distortions in the form of the original character, letter or resulting motion.

It should be noted that such a family of unit vectors (one simple case being: UP, DOWN, LEFT, RIGHT) can represent all the characters to be input to a computer etc through finger movements.

In other words, each and every number, letter etc can be analysed into a sequence of the same set or family of unit vectors. The uniqueness of character resides in the sequence of the unit vectors which represents a unique code for the

character. The different characters do not require analysis into unique individual features as in the prior art.

The analysis of original motion into unit vectors is according to a scheme which compares the movement to an arrangement of detectors placed in a fixed relation to a real or notional template. This allows the motion to be compared with the geometry of a template in such a way that a complacent movement will result in a single signal or part of a signal which indicates the characteristic direction or movement at that stage of the drawing of the letter or character etc.

For example, once the moving part has gone beyond the upper limit of detection, the unit vector will indicate simply "up" until the moving part has once again returned within the scope of detection in the direction, when it could be followed by "down". Similarly with horizontal movement. This approach leads naturally to a description of operation of the device in terms of a template.

The template is simply the geometry which determines the signalling of the unit vectors, and may be a physical form eg. a square aperture within which the pen tip etc. moves, or it may be notional, and is simply the space pattern of detector switching limits in two dimensions or it may be embodied in the movement analysing processor which is connected to the input device moved by the fingers.

Either scheme will result in practical devices which convert the finger and hand movement familiar to us as handwriting into a code signals which is logically recognisable as corresponding to the character drawn.

For accuracy of coding, and in order to remove the inaccuracies introduced by personal embellishments, the writer may be guided by visual feedback from an image

on a display screen, and can choose natural character shapes which can be learned quickly and easily.

Thus the device allows "typing" or inputting or textual information into a computer or other automatic text handler (eg. typewriter, portable databank or diary etc.) at handwriting speeds or faster, without the need to learn the far more complicated skills of touch typing using a conventional keyboard.

The principle of operation is based on the quantization of motion, and is not to be confused with handwriting analysis which causes automatic recognition of the form of normal personal handwriting (or even the recognition of a limited or defined or stylised set of character forms) by an analysis of its complex actual shape.

The aim of the template either real or notional is to register the movement of the device as unit vectors but not necessarily to restrict the movement of the device to unit vector form, whereby a recognisable signal corresponding to that character can be produced.

In preferred forms of the invention the relation between the template and the part or parts of the device will be flexible, thereby freeing the device from performing forced angular, rectangular or linear movements. In other words, by introducing a flexible linkage between relatively movable parts of the device or between a movable part of the device and the template, the device can follow both straight and curved lines whilst those movements will be detected as straight line movements or forces producing unit vectors.

Thus, the preferred device of the invention has the ability to detect movements of at least a part thereof in producing a character as one or a sequence of unit vectors

to produce a signal corresponding to the character, even when the character is not reproduced in a format constrained by the geometry of the template.

The flexible linkage may take any suitable form. For example, when the tip of a pen device is to be movable relative to the body of the device, the flexible linkage may be provided by one or more elastic members linking the tip to the body.

Various considerations may be taken into account in deciding the nature of the real or notional template.

In one preferred embodiment, the template may be in the form of an enclosure having at spaced positions around its periphery means for detecting movement of said device part from one point to another around the periphery of the enclosure. The enclosure may be of any suitable shape but will preferably be a square or a circle. Preferably four detection positions will be provided at equidistant spacings.

The movable part of the device may be a rod or the like and its movement from one detection point to another may be by any suitable sensor means, such as already suggested above.

In another preferred embodiment, the template may be in the form of a confined track around which the movable part of the device can travel, again with spaced detection points as in the first preferred embodiment.

In a yet further preferred embodiment, the template is notional rather than real and may be embodied in the processor running the requisite software and the movable part of the device may be detectable as being in accordance with a template. Thus, the device of this preferred embodiment of the invention will include means for registering the movement of said movable part as though it were following a

template. Thus, the device may be arranged to produce output signals when movement of at least a part thereof exceeds a notional boundary of the notional template.

It will be appreciated that these signals indicate major changes in direction as compared to a template or set of directions or axes. It is possible to derive the signals indicating the unit vectors as changes in velocity or other time derivatives as well as direction or position. Such a derivation is suited to the application of this invention to conventional computer pointing equipment.

For example the data stream from a computer pointing device such as a mouse, trackball, pen and tablet etc indicates the relative position of the fingers moment by moment. If this data stream is analysed by a computer or dedicated processor in such a manner that excursions of the finger position are compared with a notional template, encoded in an algorithm stored within the computer or processor or its associated memory as a pattern of excursion limits in two dimensions, movements beyond these limits or complacent with the template boundaries can trigger the generation of a sequence of signals, indicative of the unit vectors, which codes uniquely for the character drawn by the fingers which are moving the mouse, trackball, pen and tablet or other pointing device.

This invention will now be further described, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 shows schematically a system for writing into a computer;

Figures 2A and 2B show a possible arrangement for a pen device of the invention;

Figures 3A and 3B show possible movement of the pen body of Figure 2 and the resulting sequence of unit vectors around the template;

Figure 4 shows alternative forms of a letter, each of which can be represented by the same sequence of constrained movements;

Figure 5 shows another possible arrangement for a pen device of the invention;

Figure 6 shows a unit vector sequence resulting from forming a letter;

Figure 7 shows a variety of forms of the same letter that may all produce the unit vector sequence illustrated in Figure 6;

Figures 8A to D show schematically operation of a pen device utilising frictional forces between its tip and a surface;

Figures 9A and 9B show the correspondence of intended character, unit vector sequence and the animated cursive character form used in the visual feedback;

Figures 10, 11 and 12 show yet another form of pen device according to the invention;

Figures 13A and 14A are sectional views through a yet further form of pen device according to the invention; and

Figures 13B and 14B are sections on lines AA and BB respectively of Figures 13A and 14A.

Figure 15 illustrates the principle of using a virtual template in relation to a pen device according to the invention;

Figure 16 shows a pocket databank with conventional keyboard;

Figure 17 shows a pocket databank with a pen device of the invention;

Figure 18 shows a flow chart illustrating the procedure of synthesising an animated image to be displayed on a screen to provide visual feedback to the writer; and

Figure 19 shows the flow of information in such a system employing an input device of the invention and a method of visual feedback described herein;

Figure 20 shows a letter "a" reproduced with an additional movement to indicate completion and start of the next letter;

Figure 21 illustrates detection of double unit vectors;

Figure 22 shows detection of double unit vectors in drawing a letter "g";

Figure 23 illustrates provision of an actual pen position icon as a letter is drawn;

Figure 24 illustrates provision of a synthetic pen position icon as a letter is drawn;

Figure 25 illustrates how letters may be drawn starting from the same point;

Figure 26 shows use of guide lines to aid character input;

Figure 27 illustrates visual feedback compared to actual movement of a drawing device;

Figure 28 illustrates a display screen with special areas for signalling completion of a character; and

Figure 29 illustrates visual feedback with modification as new unit vectors are detected.

Referring to Figure 1 of the accompanying drawings, there is shown schematically an embodiment of the invention.

A pen device 10 contains a template which constrains the movements performed automatically by the fingers during handwriting and abstracts from these movements the elements that allow computer recognition. The result will be a "pen" which senses the sequence of movement elements in each character while allowing the user to feel as if he is writing in a near-normal way. The sequence of movements can be registered electronically via mechanical switches or optical, electric or magnetic sensors or other means and the sequences decoded by a microprocessor 12 and the characters transmitted to a computer as if from a keyboard and displayed on a visual display unit of computer 14 as they are recognised. Alternatively, the sequence can be transmitted directly for simple logical recognition therein.

Taking this concept a step nearer to a practical form, one of the simplest forms of template is a square and the template could be constrained to move around the pen tip with the pen tip held stationary. Such a pen would feel like being forced to write in a squared handwriting. Add to this a "soft" or flexible linkage, integral with the pen, to allow for writing the circle of, for example, an "a" or a "p".

Such an arrangement as shown in section in Figures 2A and B of the accompanying drawings allows the pen to describe a circle while the template moves around the pen tip in four segmented movements. As the pen body 18 is moved in a circle by the fingers, the flexible linkage 20 will stretch to drag the template 24 around the pen tip 22. The forces involved can be quite small - giving a slight tactile feedback to guide the user. As the template is within the pen body, and is smaller than the smallest circle drawn by the user, the template will be pulled against the pen tip sides by the slight force of the stretched flexible linkage. The relative movement

of the pen tip and template is, therefore, constrained to the four possible segments of the square template.

Figure 2B shows the pen at rest and Figure 2A shows the pen moved in the direction of arrow F.

These segments can be thought of as "unit vectors" which can be one of the following: up down left right or u d l or r. Thus the sequence of movements for the "a" circle would be detected as:

l, d, r, u

and the sequence for the "p" circle will be"

r, d, l, u

Figures 3A and B show respectively how a letter might be drawn with the pen of Figure 2 and the resultant sequence of unit vectors. This sequence of unit vectors will be the same with a wide variation of circle shapes such as shown in Figure 4 of the accompanying drawings.

In Figure 4, if all the circles were drawn clockwise starting with the pen tip in the top right of the template then they would all produce the same sequence of unit vectors:

d, l, u, r

and yet the user would feel that he was drawing a free form circle.

In a practical form of this pen the body would be moved by the fingers while the tip would be pressed onto a surface and held still. The template could then be integral with, and inside, the pen body (a typical template equivalent size is 0.5mm per side) and the tip would simply be the lower end of a spine rod that extended up

the central hollow of the pen, and connected to the pen body through the flexible linkage and thus be constrained to move around the sides of the square template. The user would feel that he was writing in a near normal way while the finger movements would be converted into a sequence of unit vectors.

It turns out that a square template, for example, can code uniquely for all the lower case letters of the English alphabet and for the numerals 0 - 9.

In order for this device to be useful in producing movement sequences recognisable by a computer as characters, it is necessary to explore the unit vector conversion of each character in the character set a-Z and 0 - 9. The character forms are desirably intuitive and simple. It is proposed to write in lower case and shift to upper case (for example with a simultaneous modifier key mounted on the pen body). A shift key could allow the input of capital letters and the special characters ! @ ú $ ~ & etc as with the standard keyboard. Thus, writing the character "a" while the shift key is down could give "A".

Further modifier keys, for example "option", could be employed to generate commands to the computer.

It will be noted that many redundant codes of unit vectors are available for the special characters, punctuation and commands.

For example a single "left" movement giving the L unit vector could delete the last character input, with the same result as pressing the "delete" key on a computer keyboard.

To determine the start and end of each character a signal could be generated by a switch inside the pen body activated by the pressure of the pen tip on the surface

or by a third key. This key would be pressed while "writing" a character and released at the end of the character sequence. The action becomes swift and automatic with a little practice. The end-signal would initiate the unit vector sequence analysis, a look-up algorithm lasting a few microseconds, and the character would then appear on the computer screen.

In another embodiment of this invention, the character end can be signalled by a slight pause (for example while the visual feedback device completes the animation of the intended cursive character form on the display screen) and the end of a word is signalled by the writer lifting the pen from the "writing" surface.

An arrangement for a template is shown in Figure 5 of the accompanying drawings. A square template 50 has sensor switches 52 (1, 2, 3 and 4) to detect the position of the pen tip 54 (more accurately the spine rod) within the square. These switches 52 are located at the centre of each template side and each switch operates whenever the spine rod is pressing against a particular side. It is the time sequence of these switch transitions that signals the motion of the pen relative to the spine rod and pen tip.

This leads to reduction in the redundancy of the information contained in the motion. Just as in the space domain the variation of form is removed by reducing the motion into notional unit vectors ("unit" implying the transparency of the absolute vector length - only the direction component is abstracted; this being effected by the design of the hardware switching), so in the time domain the variation in timing is removed by abstracting only the order of the switch transitions and disregarding the absolute time intervals involved; this being effected by the design of the software

sequencing.

(Note that the spine rod and the template dimensions can be many times larger than the effective template size. The effective size is equal to the possible movement of the spine rod or pen tip within the template. This can be typically 0.5mm x 0.5mm. Compare this with the movement producing a written "a" having a diameter of about 3mm).

The sequence of transitions generated by drawing an "a" with the arrangement of Figure 5 will be:

2- 4+ 1- 3+ 4- 2+ 3- 1+ 1- 3+

(where + signifies a switch turning on and - signifies it turning off, the number preceding the sign indicating the switch number). This is because the unit vector sequence for "a" is: l, d, r, u, d starting at the top right of the template (see Figure 6).

Thus the same sequence of transitions will be generated if the user draws the first curve of the "a" slowly and then speeds up or when he begins quickly and then slows down. All that matters is the relative order of the unit vectors.

Also, provided that the miniature square template inside the pen is smaller than the smallest "a" drawn, all the "a"'s shown in Figure 7 will also encode as:

2- 4+ 1- 3+ 4- 2+ 3- 1+ 1- 3+

irrespective of variations of form or scale.

Remember that the fingers move the pen body freely and the relative movement of the tip and the template is effected through a flexible linkage. This means that the character drawn can contain curves yet the template moves around the

pen tip in a series of linear steps.

Turning to the question of stylising character forms to facilitate recognition of movement sequences, it is to be remembered that the upper case forms can be generated automatically by the look-up algorithm in response to the lower case unit vector sequence plus a shift key or the like. It is important to realise that the locus of the pen body is invisible. The pen movements are felt not seen. The pen does not "write", it simply signals codes to the computer. The stylised characters which may be used are virtual characters. The mind's eye constructs its own fond image of the character it thinks it is drawing.

Instead of the rigid finger positioning over the conventional keyboard during touch typing, the pen allows a relaxed operation. As the pen does not need to move across the "page" and as the movements may be guided automatically by tactile and/or visual feedback there is absolutely no need to look down at the pen.

One further embodiment of the invention is a pen device shown schematically in Figures 8A to D, wherein its tip 200 is held in contact with a "writing" surface and is moved in relation to a real or virtual template 202 by means of the frictional force between the tip and the surface. This will signal the direction of movement of the pen body on it is moved by the fingers and hand. Figures 8A to D show respectively the pen moving downwards, upwards, to the left and to the right. As the tip moved under frictional forces, it touches contacts 211, 212, 213 and 214 respectively and thus signals a unit vector sequence. Such a pen is free to move over a surface in the same manner as a conventional pen.

Referring to Figures 9A and 9B, these tables show character stylisations which

form a character set which is only one example of many possible sets. The optimum set in any particular embodiment of the invention will depend on the template design and the arrangement and logic of the switching and the relationship to the animation sequences chosen to optimise the visual feedback as well as personal preferences.

This set relies on a flexible linkage to give a realistic feel to the drawing of the letters. Obviously the simple square template will not allow excursions (tails) up or down. However the fingers carry these out automatically, the pen body following the fingers, but the spine rod stays within the template square. Happily each character still generates a unique unit vector sequence and codes unambiguously into the target computer.

Obviously the writer will have to adapt the writing of each character to produce just the unit vectors required for error free recognition. However the abundance of codes derivable from sequences of unit vectors allows for multiple ways of drawing particular letters. (See the example of the letters "b" and "q" in the set of Figures 9A and 9B).

Most importantly the visual feedback will guide the writer effortlessly if the elements of the animation building the cursive character forms are designed to confirm the completed movements at any point in time and prompt for the required subsequent movements.

Because of the flexible linkage and the mind's own image of what it is telling its fingers to do, these letter forms seem quite natural.

After a little practice, far less than is needed to become skilled at using a conventional keyboard with all these characters, the component movements are not

created individually but in a fast automatic flow, as the mind goes through the act of writing each character. The speed can be typically 20 unit vectors per second.

In Figures 10, 11 and 12 is shown a form of pen according to the invention in which the pen has a body 60 which is movable relative to a template 62 in the pen tip 64 which is held stationary upon a surface. The pen tip 64 may include a suitably shaped rubber or the like pad which is relatively non-slip upon say a table.

The advantage of this embodiment is that the actual movement of the pen around the template and the imagined movement of the pen tip are equivalent. With the pen described earlier, these movements are opposite in sense and the mental link between the two has to be unlearned. The template may be of any desired shape with movement sensors also of any desired type as described hereinbefore or later.

Another refinement, which may be applicable to four-switch templates and more complex templates, is to generate the character start and end signals from the template switches. The start signal may be turned on whenever at least one of the template switches is on, and may be turned off whenever all four template switches are off. This defines a starting point for the pen tip at the centre of the template. If in addition, the pen tip is centre-sprung, ie. automatically returns to centre after each excursion, either by slightly lifting the pen or simply by relaxing pressure, then the process of sending a character becomes easier and automatic. The logic of the start signal may be handled electronically.

More complicated templates can be constructed, where the freedom of movement of the pen tip is greater. An analogy would be the increasing complexity of car gearshaft gates as the number of gears increases.

When a physical or real template is being used, the effective size of the square template may be reduced until the relative movement of the pen body and the spine rod or pen tip is arbitrarily small. The unit vectors may then be sensed using pressure transducers or strain gauges on each of the four template sides.

Character start/stop signals can be derived logically from the template signals.

A degree of flexible linkage is desirable to allow a very slight movement of the pen under the pressure of the writing fingers. This can be achieved by moulding the pen tip from say rubber or like material, and/or building in a slight compression movement into the pressure transducers or some other convenient position.

The movement of the pen in this arrangement is not constrained so obviously to a square template, however the signals from the transducers will conform to the same coding sequences for the same characters.

Writing control can be effected by means of an audible feedback generated from the vector recognition circuits. For example, as the fingers go through the movements of a particular stylisation, an audible signal can be generated as each vector is completed, the frequency of the sound being arranged to be unique to each vector. After a little practice this feedback could be muted or disabled. The occurrence of a mistake (unrecognised sequence) for a particular character could switch this feature back on for a predetermined number of characters following, thus reinforcing the learning process. Just as when, while dialling a familiar number on a touch-tone telephone, a mistake immediately "sounds" wrong and familiar groups of numbers sound right.

A further feedback to facilitate both learning and the normal operation of the

device could be a visual indication of the vectors themselves as they build up to describe a character. Most computer displays operating in word processing mode employ a cursor shape on screen to indicate the insertion point. This could be replaced with say a square representation of a virtual template showing the vectors as emboldened sides of the square (or whichever alternative template shape is used). At character end-signal this graphic would be replaced with the coded character and would itself move on to the next text position, ready to display the next pattern of vectors.

More sophisticated techniques of visual feedback and confirmation may be employed, in which the vector sequence information is used to synthesize a graphic image on screen which reflects the growing character as intended by the operator, using a stored programme to determine the available possibilities at each stage in order to guide the formation of the inputted character.

Such a system of visual feedback is illustrated in Figure 18 which is to be read as a flowchart. Here the way in which characters that all begin with an "UP" unit vector (chosen as an example) may be reproduced on a display screen as a progressively developing image of the intended character in synthesised, clear, standard, cursive form (represented in the square boxes) is illustrated.

In the flowchart of Figure 18, the sequence of unit vectors is indicated by the symbols in the circles. Thus 1U indicates that the first unit vector is "UP". Similarly, for example, 6L indicates that the sixth unit vector is "LEFT".

At the point of recognition, when the system decodes the finger movement into a unique unit vector sequence for a specific character, then at the corresponding

point in the flowchart of Figure 18 the recognised character is indicated by a square box containing the corresponding font character.

The progressive animation develops each character as the fingers move in drawing the character while holding the input device which converts these movements into a sequence of unit vectors. It is this stream of unit vectors which determines the animation process. Thus the feedback loop is closed allowing a completely novel method of inputting handwritten information into a computer or the like.

In other words the eye sees the character form on the screen as the fingers move in such a way as to produce the unit vector sequence. The computer etc appears to cooperate with the user in the process of writing the characters.

In the example illustrated in Figure 18 the letters "l" "h" "b" and "t" are reproduced and recognised. It can be seen from this example that all the basic forms of the characters "a" to "z" and "0" to "9" can be similarly analysed into unit vectors and animated on a display screen.

It is important to note that the definitions of the letter forms in terms of the unit vectors bears a functional relationship to the sequence of metamorphosis of the animation of the synthetic on-screen cursive character forms. As the unit vector sequence is generated automatically, the animation responds by developing the letter through the forms possible at each stage. Thus referring to Figure 18 the letter form for a cursive l transforms into the cursive form for the letter h with the further input of unit vectors U R D. Similarly the h transforms to the form b after an L unit vector. Thus, the design of the cursive font employed in the visual feedback animation contains the structure of the basic handwriting movements as defined by the

unit vector sequences (ie simple changes of average direction) as can be easily and automatically detected.

Thus the design of the visual feedback font and the process of its animation is very important. It is envisaged that different such fonts can be designed for different applications, languages, countries and scripts and users.

This gives rise to a device which allows the writing of natural character forms to be elegantly guided by visual feedback, thus placing the brain, fingers, input pen or input device, computer processor, display screen and eye, all in the same feedback loop.

Figure 19 shows this feedback loop. The flow of information is indicated by the arrows 406 (1 to 5). The fingers 400 of the writer perform the movements of writing a character and these movements are detected by the input device 401 which automatically produces signals indicative of the unit vectors characterising the character drawn. These signals are fed to a processor 402 which synthesises an animated image in response to the sequence of these unit vectors. The animated character is displayed on a display screen 403 and viewed by the eye 404 of the writer. Thus the brain 405 of the writer receives feedback according to the development of the unit vector sequence in terms of the development of the synthesised image indicative of the writer's intention, and is able instinctively to correct the movement of the fingers to cause correct computer recognition of the character drawn.

The process of computer recognition is thus included in the total feedback loop involving the user. This is in complete contradistinction to prior art, where the

feedback is merely from the reproduction of the actual finger movements on the display screen and does not include the recognition process itself.

The end of each character is signalled in this example by a slight pause in pen movement, shown in Figure 18 as a letter P in a circle. However, the on-screen animation can produce joined-up cursive handwriting by a simple process of stored instructions responding to the unit vector sequence, and animating the connecting links between letters.

It should be noted that the process of animation can present the user with a continuously moving cursive line on the display screen, in response to the signals from the input device, which may themselves be discontinuous in time. The eye sees what the mind intends, rather than what the fingers are doing. After a very short period of use, the process can become virtually automatic and natural.

At the end of each word the pen or input device may be lifted up (just as in normal writing onto paper) to activate a signal (produced automatically from a switch or other sensing means) to the system processor to initiate the transformation of the completed cursive image of the written word on the screen into the corresponding font characters of the application programme etc which is the object of the data input.

It should be noted that each character is recognised at the pause after the last unit vector has been input. In other words the user will pause momentarily after completing each character, while the processor completes the animation of the cursive character form on the display screen. This image of a cursive character form is already a product of the recognition process and has been derived from a unique code of unit vectors already input to the system, and should not be confused with the

cursive forms indicative of the actual unrecognised finger movements displayed in inventions of prior art.

In this example the cursive form is displayed on screen until the whole word is completed to facilitate useful feedback to the writer.

It should be understood that the cursive letter form so synthesised and displayed bears a functional relationship to the finger movements employed in writing the character. It would not be so useful to display the "printed" font characters at this point.

The structure of the synthesised character forms is based on the unit vectors that characterise the corresponding written characters. This relationship can be seen in the example of the flowchart of Figure 18.

The feedback thus guides the writer in a most natural way to input the correct sequence of unit vectors, without consciously having to pay attention to that level of analysis.

Once the whole word is completed the system has all the information required to display the recognised characters in the final form of "printed" font characters to make up the complete printed word.

It is easy to conceive computer learning programmes to take a new user through the structure of the character set stylisations, using graphics and feedbacks similar to those described above.

It is possible to use a virtual template as opposed to a physical template. The character recognition in the physical template systems is facilitated by the simplification of the movement by means of the physical boundary of the template

and by the resultant reduction of that movement to scale-independent and speed-independent unit vector sequences.

However, a further refinement is still possible, in which the restriction of the movement by a physical barrier is replaced by a notional limit to the registration of that movement. If movements are only recognised by sensors in directions parallel to the sides of a notional, non-physical template, and if these movements are quantized by the sensors and/or their associated electronics and algorithms up to a specific limit of excursion, and if this limit is smaller than the smallest character drawn, then the end result will be the same for the same character stylisations as with a physical template.

This would lead to the design of physically simpler, faster pens or touch screen sensing of stylus or finger movements and allow the invention to work utilising the input devices now available for computers such as the mouse, tracker ball, finger pad, touch sensitive screen, pressure sensitive screen, pen and digitising tablet and the like.

Further refinements of the invention are described below with reference to Figures 20 to 29 of the accompanying drawings.

Characters to be input are defined in terms of the movements required to produce the appropriate unit vector sequence. Therefore, predetermined styles of character are pre-supposed. These characters can be very close and in most cases identical to natural character forms. Characters may be defined in terms of unit vectors in such a way that each character is represented by a unit vector sequence that is not a truncation of any longer unit vector sequence for another character. That can

allow continuous input (eg within a word without necessarily signalling in some way completion of a character. Thus, completion of a character may be signalled by the last unit vector of the defined sequence for that character.

An example of such a unit vector set follows:

a = rldrud then r for start

b = uddurdl then r for start

c = rldr then r for start

d = rldruudd then r for start

e = ruldr then r for start or ruld then r for start

f = uddu then rr for start

g = rldruddl then r for start

h = uddurd then r for start

i = d then r for start

j = dl then r for start

k = uddrl then r for start

l = udd then r for start

m = dudud then r for start

n = dud then r for start

o = rldru then r for start

p = dduurdl then r for start

q = rldudd then r for start

r = duudr then r for start

s = rudl then r for start

t = udrld then r for start

u = drud then r for start or dru then r

v = du then r for start

w = dudu then r for start

x = rl then r for start

y = druddl then r for start

z = rlrdl then r for start

Figure 20 shows an animated screen image corresponding to movement of a drawing device in drawing a letter "a" according to the above unit vector set. The last RIGHT movement signals the completion of a unique unembedded code for "a" and therefore the end of the character. That can be used to cause the visual animation on the display screen of a line extending to a standard start position for the next character.

The signalling of the end of a word may be achieved by pen lift activating a switch or sensor or other eg button press, or a special unit vector sequence or special movement sequence.

Unit vectors may be derived in the following ways:

from switches detecting motion in a pen device as described above;

from exceeding a threshold of motion in a direction;

from exceeding a threshold of any combination of time derivatives of motion in a direction;

from movement from one defined area of writing surface to another;

from substantial complacency with a direction or axis or template side;

from combinations of the above.

Here substantial complacency means that the resolved vector components of the motion parallel to the direction, axis or template side are greater than those parallel to all other defined directions, axes or template sides in the system.

To facilitate drawing and recognition of some characters, it may be useful to be able to detect doubling of unit vectors. In other words in drawing some characters unit vectors may repeat one after the other. Detection of two vectors in the same direction may be detected by arranging two detectors with different thresholds of detection or two templates (real or virtual) one after the other so that the movement produces the detection of first one and then the second unit vector in the same direction. This is illustrated in Figures 21 and 22 of the drawings. In Figure 21 the arrow indicates the direction of movement of the drawing device or pointer. Figure 22 shows how this can be used, for example, for the letter "g".

Pen and pointer devices used in conjunction with computers and associated display screens or monitors often employ the reproduction on the screen of a line of pixels that represents the track or locus of the drawing device. This is some times termed "screen ink". Such a display can be used in conjunction with unit vector detection to guide the user in forming the correct letter shapes.

Referring to Figure 23 of the drawings, it is possible to cause an icon on a monitor screen to move in response to the actual movement of the drawing device. The icon 500 can be used to appear adjacent to the animated font providing visual feedback as described above. This allows the user to judge more accurately the movements required to cause correct unit vector recognition, as confirmed by the

display of the corresponding animated font elements 501, 502, 503, 504, for example, corresponding to the input of a drawn letter "o".

As the pointing device is moved to produce the display of animated font elements on the monitor screen, it is advantageous to indicate the direction of pen movement and to give a simulacrum of the pen position by causing the processor controlling the monitor to display an icon at the end of each consecutive animated font element. This icon is not to be confused with the icon which responds to and represents the actual drawing device movement. Figure 24 of the drawings illustrates the sequence of images that result from the input of the letter "o". Icon 520 appears at the end of each animated font element 521, 522, 523 and 524 as the letter "o" is input.

It is advantageous to arrange the drawing of characters so that they all start from the same point. This allows the writer to memorise one set of character forms which do not need mental re-adjustment of the pen position before the input of the next character. This leads to increased speed of writing. Figure 25 of the drawings shows examples of letters that can be drawn from a common start.

At the end of each character it is advantageous to arrange the visual feedback to move the position of the pen position icon (whether actual or synthetic) from the end position of the character to the standard start position. This immediately re-adjusts the writer's assumption of pen position to facilitate the speedy input of the following character.

The same result may be obtained by advancing the screen ink to the standard start position, or by causing the animation of a font element on the monitor to bridge

the gap between the end position and the following standard start position. That is shown, for example, in Figure 20 of the drawings, where the final right unit vector signals completion of the character "a" and the visual feedback automatically produces a line extending to the common start position.

Figure 26 illustrates provision of guide lines on a monitor display to aid correct input by providing indications of appropriate relative scale and necessary movement in conjunction with screen ink or actual pen position icon. This ensures a more regular drawing of characters and a scale which is consistent with the scale of the unit vector detection thresholds.

The use of extending vector images to provide visual feedback is an alternative way of guiding the user in the input of characters to produce correct unit vector sequences. The unit vector detected causes the image displayed of the pointing device movement to be locked to the corresponding direction and allows the input of a line reproduced on the screen that represents the extension of the movement. When the direction of movement changes sufficiently to trigger the recognition of a new unit vector, then the displayed line is locked in the new direction. This visual feedback allows simulacrum images of the intended character shape to be displayed as straight line segments corresponding to the degree of movement in each direction. Figure 27 illustrates the method.

It is advantageous to use special areas or special guidelines on the display screen used in conjunction with screen ink and/or pointer icon, in order to signal character end and therefore allow continuous input (eg within a word) without lifting the pen device or otherwise needing to signal character end and/or in order to signal

control or modifier characters or signals. In this method when the pen position icon and/or screen ink moves into an area of the monitor display surface corresponding to a defined area of the writing surface, or when the pen enters the defined area of the writing surface, or when the pen crosses a defined line on either surface, a signal is produced by the processor which indicates the end of a character or other control event or command.

This allows the rapid input of joined-up cursive characters without the need to lift the pen or otherwise signal the end of each character. This is shown in Figure 28 of the drawings in which movement of screen ink or pen icon into shaded areas 550, signals the end of a character.

Visual feedback may include the modification of displayed character elements as new unit vectors are detected. Figure 29 of the drawings illustrates this method. The seat of the "h" is modified into the circle of the "b" upon detection of the L (left) unit vector. Subsequently, the circle of the "b" is modified into the curl of the "k'" on detection of the final R (right) unit vector.

A practical drawing device for use in the invention, which has been built to prove the efficacy of quantisation of motion to produce unit vectors from the finger movements of handwriting, is now described with reference to Figure 13A and B and 14A and B of the accompanying drawings. It will be appreciated that many forms of pen can be produced in for use in this invention and that in addition existing computer input devices can be adapted to embody the invention herein described.

These drawings show a pen 100 having a tubular body 102. Extending through the lower end of the body is a rod 104 which is pivotally mounted in the

body at 106, so that when the tip of the rod is held stationary on a surface, the pen body can move relative to the tip in directions normal to each other. Within the pen body are four light sources 108 each being at the mid-point of a side of a notional square template. Opposite each light source is an optical fibre 110 for detecting an on or off situation for its own light source, whereby signals can be generated for microprocessor recognition. The rod 104 has a square shutter plate 112 on its upper end, which in a rest position, ie when the rod is centrally aligned with the axis of the pen, all of the light sources are detectable by their corresponding optical fibres 110 but when the pen body is moved relative to the rod, the shutter plate is moved to obscure two of the light sources corresponding to the direction in which the pen is moved. Figures 13B and 14B respectively show the shutter in the neutral position and in position where the pen has been pushed to the top right. The pen tip movement is constrained by a square template 114 in the form of an aperture at the end of the pen body through which the pen tip extends. Thus, the pen includes the means for detecting direction of movement of the pen in forming characters in order to generate a signal that can be recognised by a microprocessor or computer to produce the character on a computer screen.

If the pen tip has a built-in flexibility, the fingers can perform circular and curved movements while the signals are generated with reference to the square templates.

Figure 15 of the drawings shows schematically a pen device operating with a virtual template. The position of the pen tip 150 relative to the centre of the virtual template 152 is sensed in terms of its x, y coordinates as shown. As the pen body is

moved around the pen tip by the fingers, the notional template moves with the pen body and causes a relative movement between the pen tip and the template. The track or locus of the pen tip relative to the virtual template is indicated by line 154.

The movement is referred to template sides, ie is registered as a mapping of the pen tip position onto the template, resulting for example in the unit vector L D R, which could decode as the character "c".

Provided the pen tip travels around the outside of the template and the template is always smaller than the smallest character drawn, then the sequence of unit vectors will always decode for the stylised character shapes irrespective of the scale or speed they are drawn.

Another embodiment of the invention (see Figure 17) consists of a template built in to a portable databank 300 or portable computer or other product requiring the input of information such as a video recorder, pocket calculator, telephone, central heating controller, washing machine etc etc. The template sensors are activated by the movement of a small stylus 302 held by the fingers.

The stylus may be attached or hinged to the product or may be removable or separate. This application will allow the space taken up by data input to greatly reduce as the stylus template 304 will replace the much larger keyboard or keypad 310 of a conventional pocket databank 312 (see Figure 16) having a screen 314. The stylus may fold down as shown to conserve space when not in use. The advantages of this embodiment of the invention are that the product can be made considerably smaller, the stylus can be used with the eyes on the screen 314 and can be used more easily than the usually cramped keyboard keys, and data can be input more quickly.

The input device can be fabricated at considerably less expense than a keyboard or touch sensitive screen. Also a data link cable between the pocket databank etc could connect with a computer to allow text input from the built-in pen device to be input to the computer.

CLAIMS

1. Means for inputting a hand generated character into a computer comprising means for drawing a character, means for abstracting a sequence of signals as the character is drawn corresponding to components of the character to produce a code representative of that character and means for recognising that code, whereby the character is inputted to the computer.

2. Means as claimed in claim 1, wherein a signal abstracted corresponds to a quantization of motion as the character is drawn.

3. Means as claimed in claim 1 or 2, wherein a signal abstracted corresponds to a change in direction as the character is drawn.

4. Means as claimed in claim 1, 2 or 3, wherein a signal abstracted corresponds to movement beyond one or more defined thresholds in a particular direction as the character is drawn.

5. Means as claimed in any one of claims 1 to 4, wherein a signal abstracted corresponds to a change in position of the drawing means from one defined area to another defined are on a drawing surface.

6. Means as claimed in claim 3, wherein abstraction of a direction change is speed independent.

7. Means as claimed in claim 3 or 5, wherein abstraction of a direction change is scale independent.

8. Means as claimed in claim 3, 6 or 7, wherein abstraction of a direction change is substantially independent of distortions or variations in the character as drawn.

9. Means as claimed in any one of claims 1 to 8, wherein recognition occurs character by character in real time.

10. Means as claimed in any one of claims 1 to 9, further comprising means for displaying the recognised character.

11. Means as claimed in any one of claims 1 to 10, further comprising means for providing visual feedback corresponding to the character being inputted as the character is being drawn.

12. Means as claimed in claim 11, wherein the visual feedback means comprises means for producing on a monitor a graphic simulation of a character component in response to an abstracted signal.

13. Means as claimed in claim 12, wherein said graphic simulation is modifiable in response to a subsequent signal of a sequence for a character.

14. Means as claimed in claim 12 or 13, wherein said graphic simulation further comprises an indicator as to position of the drawing means on a drawing surface.

15. Means as claimed in claim 14, wherein said indicator comprises an icon displayed at or near an end of the latest graphic simulation component.

16. Means as claimed in claim 14, wherein said indicator comprises an icon that moves around the graphic simulation of a character in response to movement of the drawing means.

17. Means as claimed in any one of claims 12 to 16, further comprising means for displaying on the monitor the character as a reproduction thereof.

18. Means as claimed in any one of claims 1 to 17 including means for signalling completion of a character.

19. Means as claimed in claim 18, wherein the drawing means is arranged to signal completion of a character by lifting the drawing means from a drawing surface.

20. Means as claimed in claim 18, wherein completion of a character is indicated by a unique movement of the drawing means relative to that character.

21. Means as claimed in claim 18, wherein completion of a character is indicated by movement of one of the drawing means and an icon indicative of the drawing means to a defined position.

22. Means as claimed in claim 21, wherein said defined position is an area of a drawing surface.

23. Means as claimed in claim 21, wherein said defined position is an area defined on a monitor.

24. Means as claimed in any one of claims 1 to 23, wherein the drawing means comprises a hand-held pen-like device.

25. Means as claimed in claim 24, wherein the device has a part which is movable about a template during reproduction of a character.

26. Means as claimed in claim 25, wherein the part is movable relative to a notional template.

27. Means as claimed in claim 25 or 26, wherein the part is a body of the device.

28. Means as claimed in claim 27, wherein the body has a hollow part movable about a template within the hollow part.

29. Means as claimed in any one of claims 25 to 28, wherein the relation between the at least one movable part of the device and the remainder of the device and/or template includes flexibility.

30. Means as claimed in claim 29, wherein the device has a tip movable relative to a body of the device and one or more flexible linkages affecting movement of the tip relative to the body.

31. Means as claimed in any one of claims 25 to 30 including means for sensing direction of movement of said device or part thereof relative to a real or notional template in reproducing a character.

32. Means as claimed in claim 31, wherein sensing means are spaced about said real or notional template.

33. Means as claimed in claim 30 or 31, wherein the sensing means are selected from electrical, photoelectric and magnetic sensing means.

34. Means as claimed in any one of claims 25 to 33, wherein the template is a generally square enclosure.

35. Means as claimed in any one of claims 25 to 33, wherein the template is a generally circular enclosure.

36. Means as claimed in any one of claims 25 to 33, wherein the template defines a track.

37. Means as claimed in any one of claims 25 to 33, wherein the template has a plurality of zones and said part moves from zone to zone in reproducing a character.

38. Means as claimed in any one of claims 1 to 37, including means for converting a signal for a lower case character into a signal for an upper case character.

39. Means for inputting a hand generated character into a computer having a monitor, comprising means for drawing a character to produce a sequence of signals

corresponding to that character, means for converting signals produced for one character into a code representative of that character, means for recognising that code and means for providing visual feedback corresponding to the character being inputted as the character is being drawn.

40. Means as claimed in claim 39, wherein visual feedback means comprises means for producing on the monitor a graphic simulation of a character component in response to each signal of a sequence of signals.

41. Means as claimed in claim 39, wherein said graphic simulation is modifiable in response to a subsequent signal of a sequence.

42. Means as claimed in claim 39, 40 or 41, wherein said graphic simulation further comprises an indicator as to position of the drawing means on a drawing surface.

43. Means as claimed in claim 42, wherein said indicator comprises an icon displayed at or near an end of the latest graphic simulation component.

44. Means as claimed in claim 42, wherein said indicator comprises an icon that moves around the graphic simulation of a character in response to movement of the drawing means.

45. Means as claimed in any one of claims 34 to 44 further comprising means for displaying on the monitor the character as a reproduction thereof.

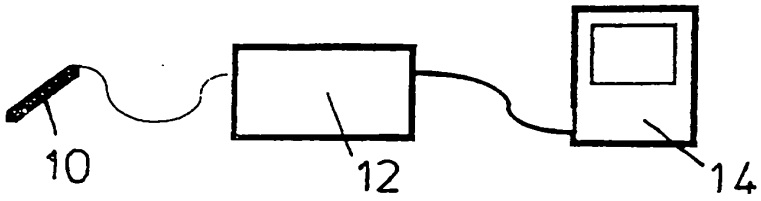


FIG. 1

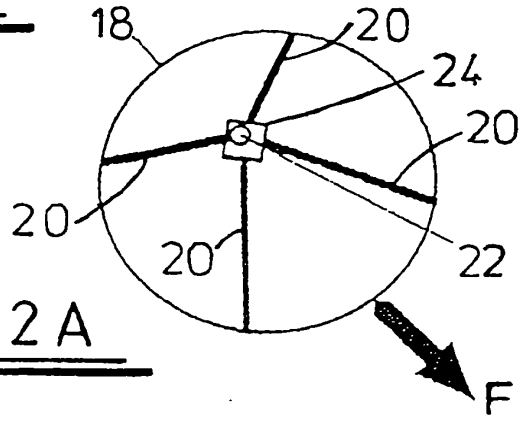


FIG. 2A

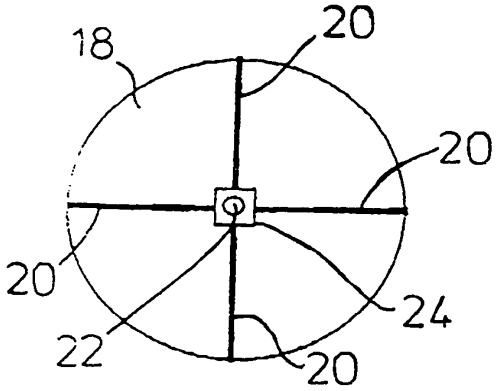


FIG 2B

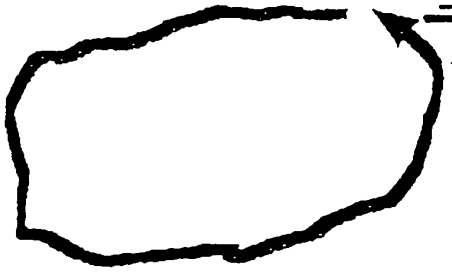


FIG. 3A

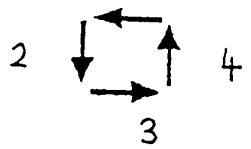


FIG. 3B

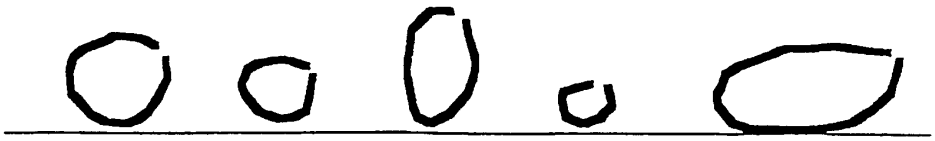


FIG. 4

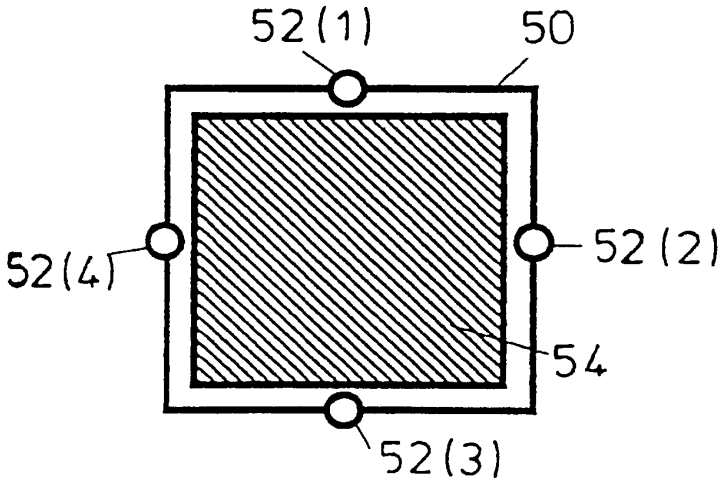


FIG. 5

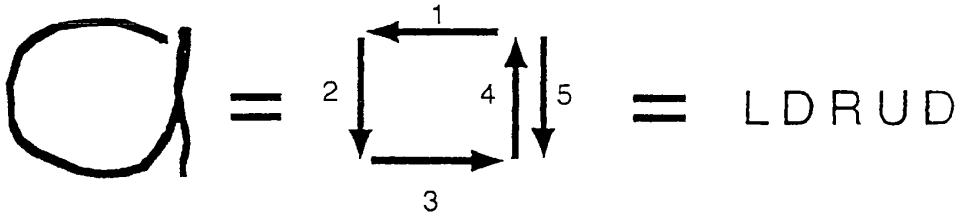


FIG. 6

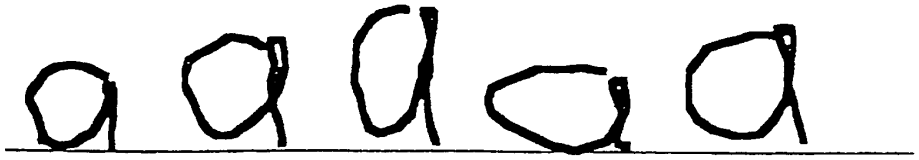


FIG. 7

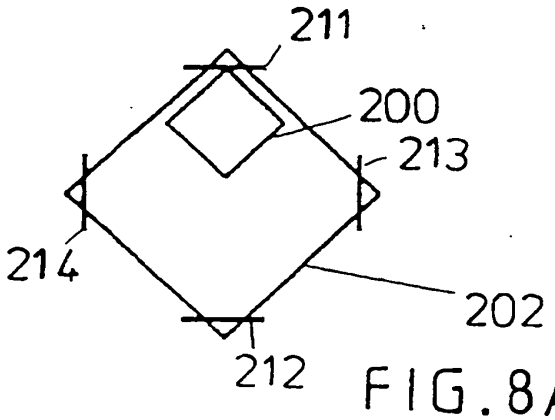


FIG.8A

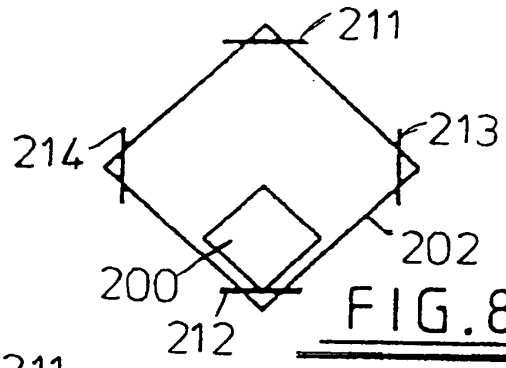


FIG.8B

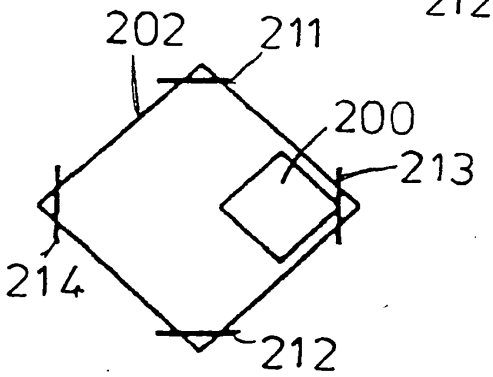


FIG.8C

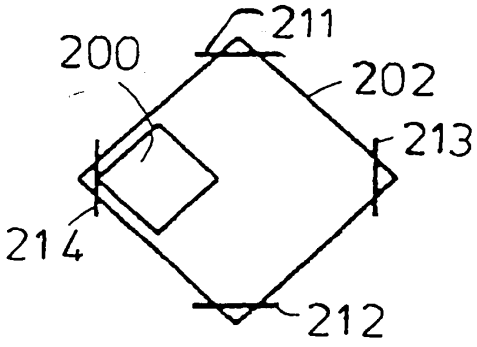


FIG.8D

CHARACTER	Number of Unit Vectors	Unit Vector Sequence	Animated Cursive Character Form
l	2	UD	
t	3	UDR	
k	4	UDRL	
b	5	UDRUL	
h	5	UDURD	
b	6	UDURDL	
i	1	D	
j	2	DL	
v	2	DU	
r	3	DUR	
w	4	DUDU	
n	4	DURD	
p	5	DURDL	
m	7	DURDURD	
u	3	DRU	
y	5	DRUDL	
4	4	DRUD	
1	3	DLR	
7	2	RD	
2	4	RDLR	
0	4	RDLU	
0	4	DLUR	
x	2	RL	

FIG. 9A

Exhibit 1004
Page 222 of 617

CHARACTER	Number of Unit Vectors	Unit Vector Sequence	Animated Cursive Character Form
z	3	RLR	z
3	5	RLRDL	3
e	5	RULDR	e
d	6	RLDRUD	d
q	7	RLDRUDR	q
q	7	RLDRUDL	q
f	2	LD	f
c	3	LDR	c
o	4	LDRU	o
6	5	LDRUL	6
a	5	LDRUD	a
g	6	LDRUDL	g
q	6	LDRUDR	q
q	6	LDRUDU	q
s	3	LRL	s
8	4	LRLR	8
9	3	LRD	9
5	4	LRDL	5

FIG. 9B

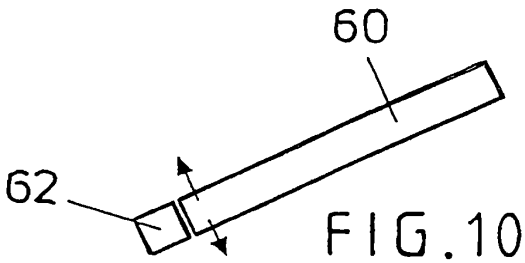


FIG.10

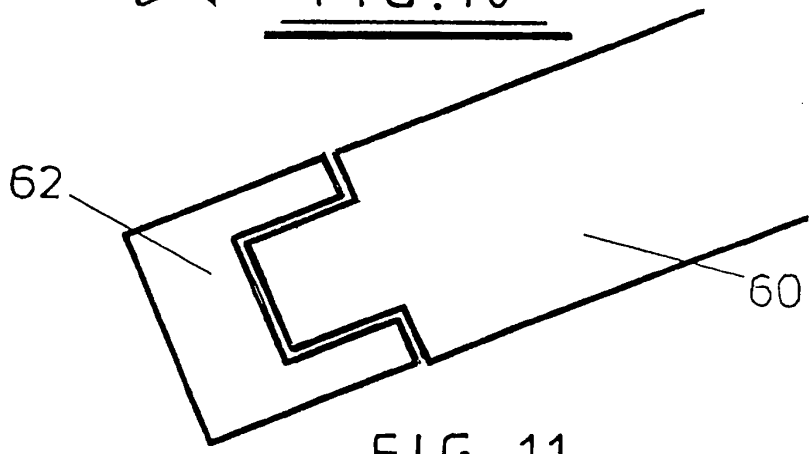


FIG.11

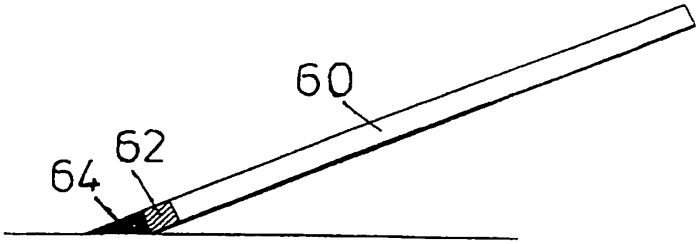


FIG.12

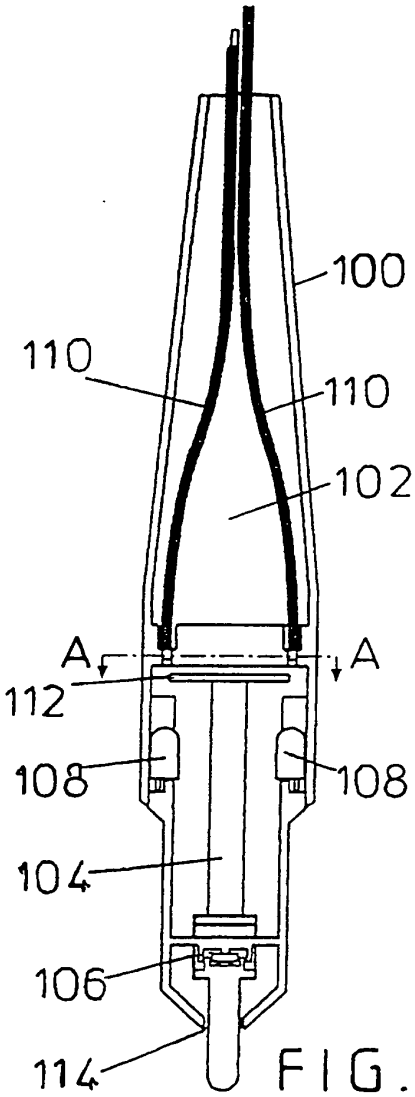


FIG.13A

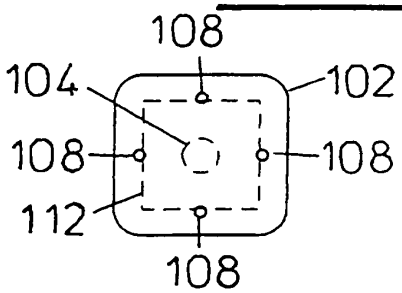


FIG.13B

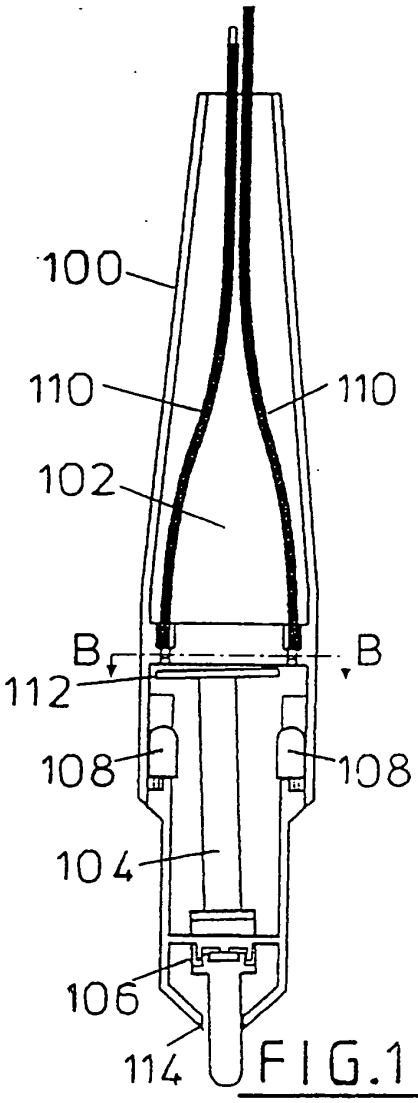


FIG.14A

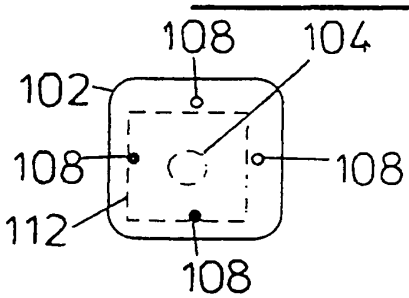


FIG.14B

Exhibit 1004
Page 225 of 617

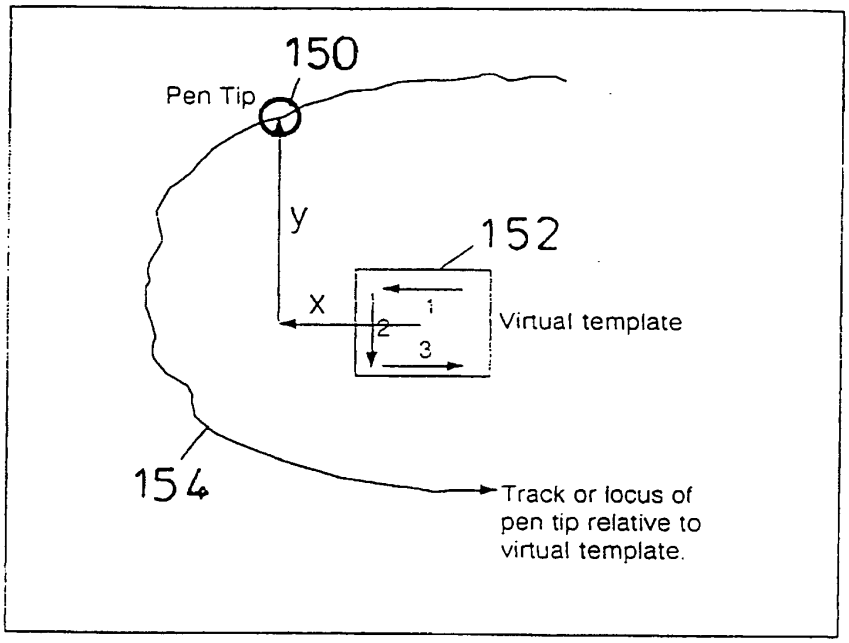

150
Pen Tip
y
152
x
1
2
3
Virtual template
154
Track or locus of
pen tip relative to
virtual template.

FIG.15

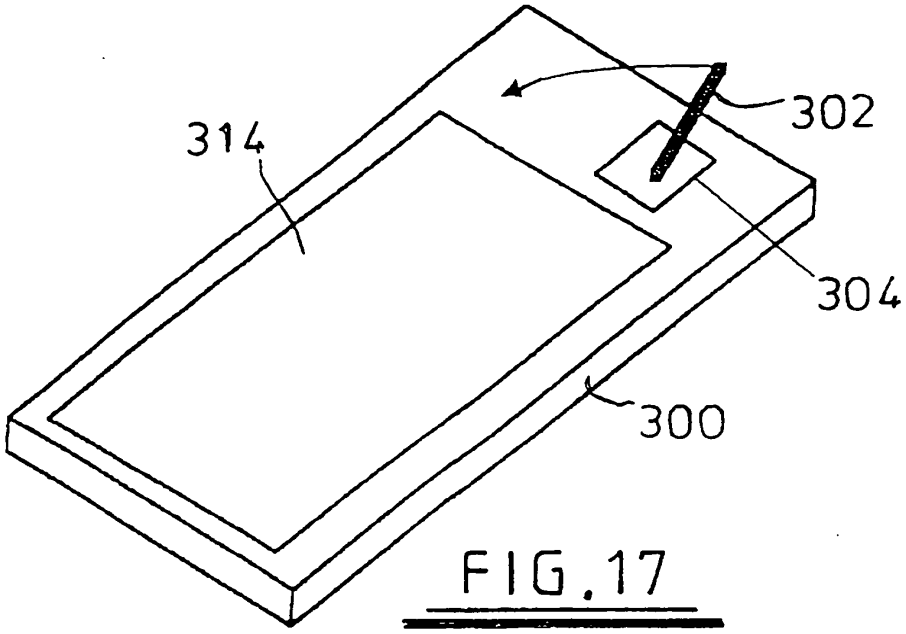


FIG. 17

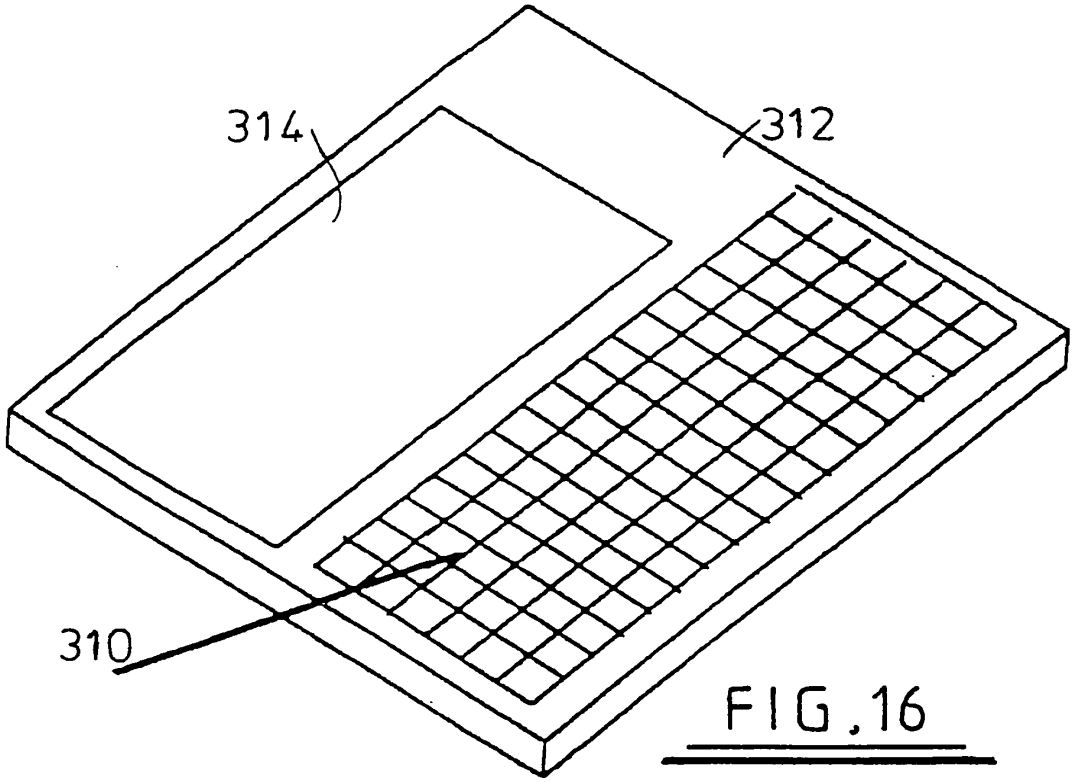


FIG. 16

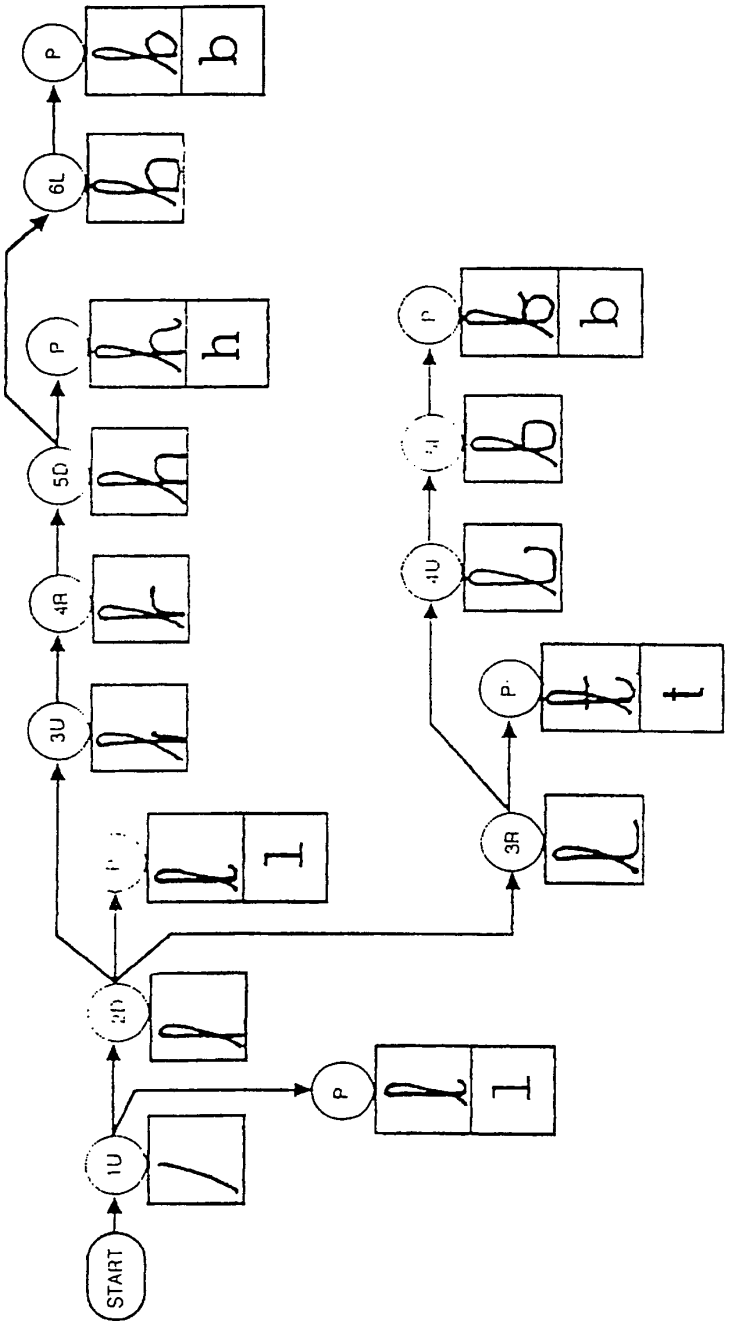


FIG.18

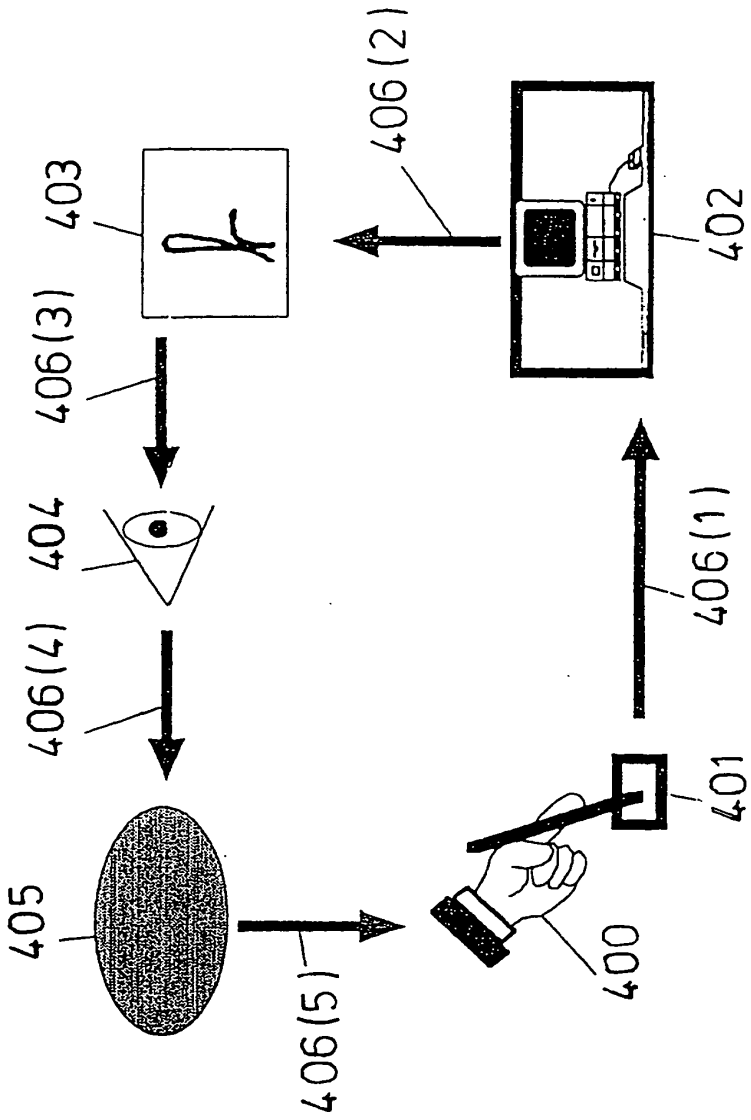


FIG.19

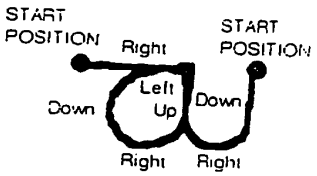


FIG. 20

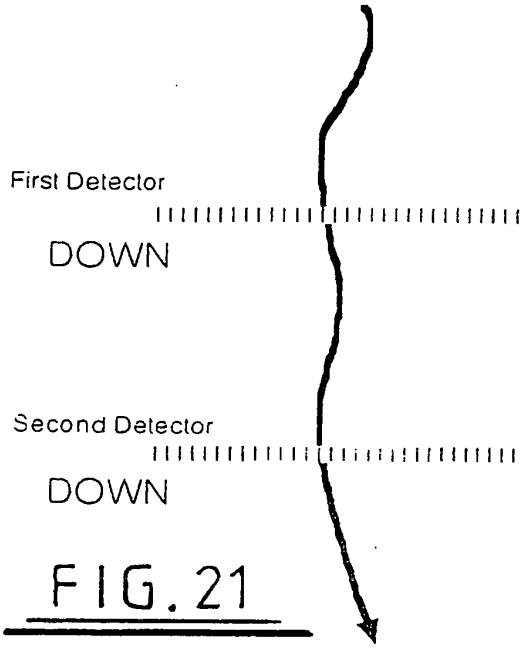


FIG. 21

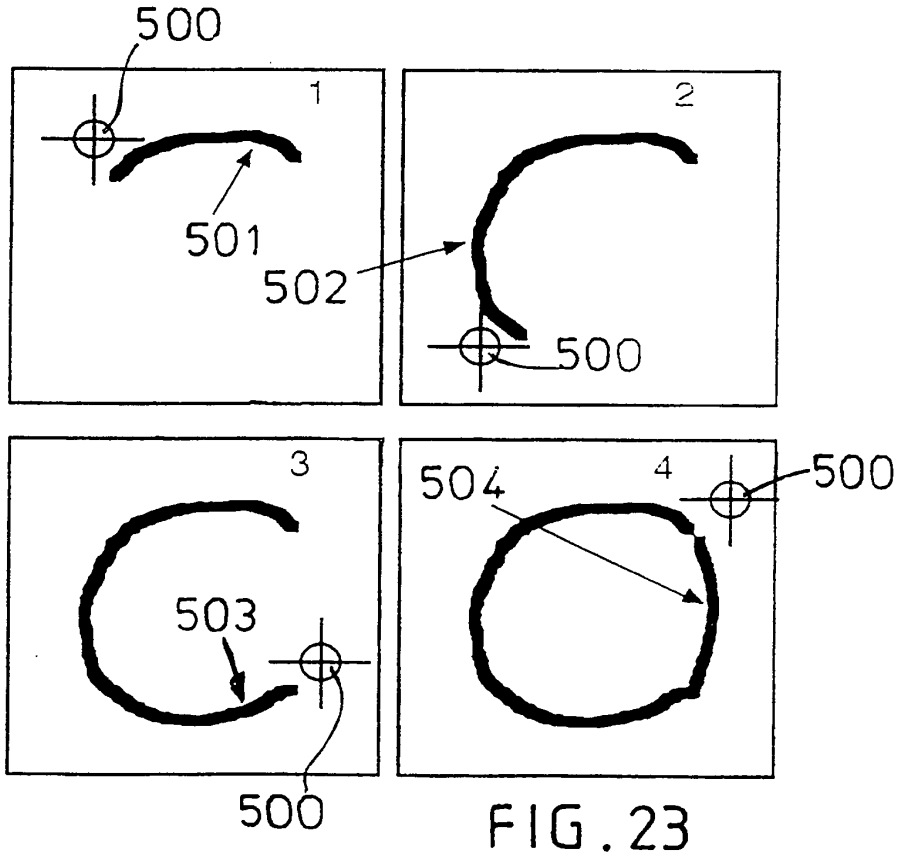


FIG. 23

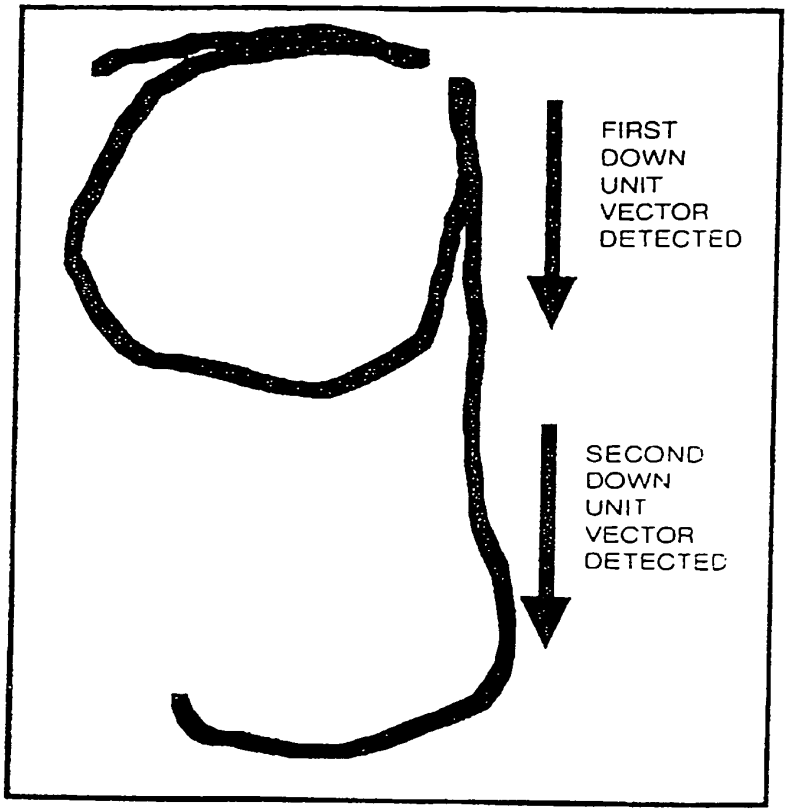


FIG. 22

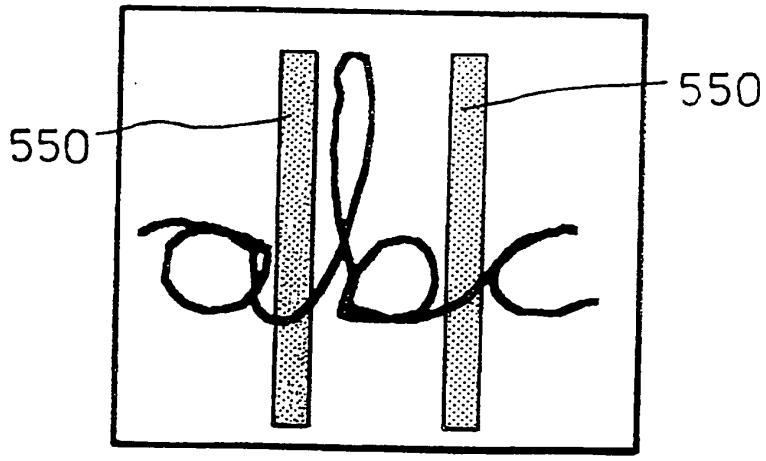


FIG. 28

Exhibit 1004
Page 231 of 617

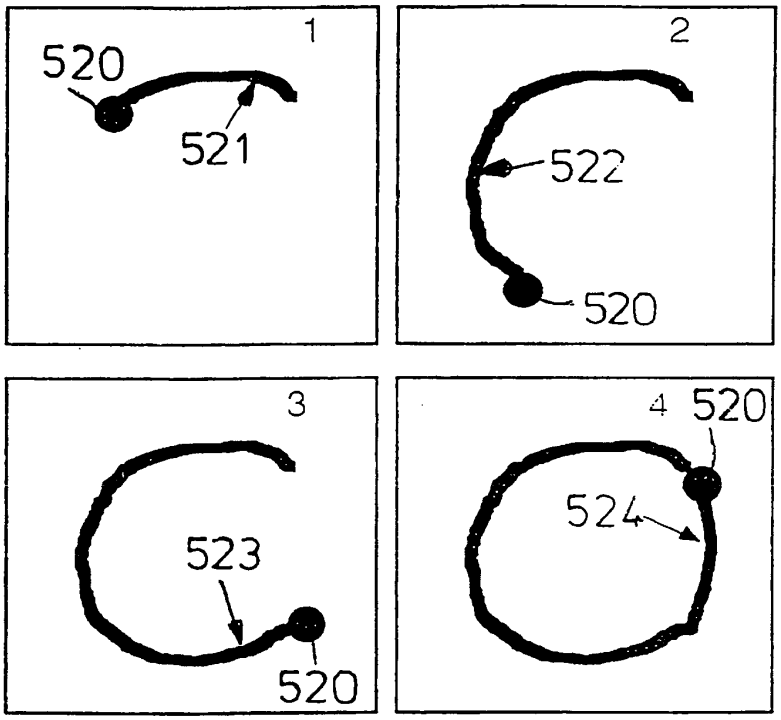


FIG. 24

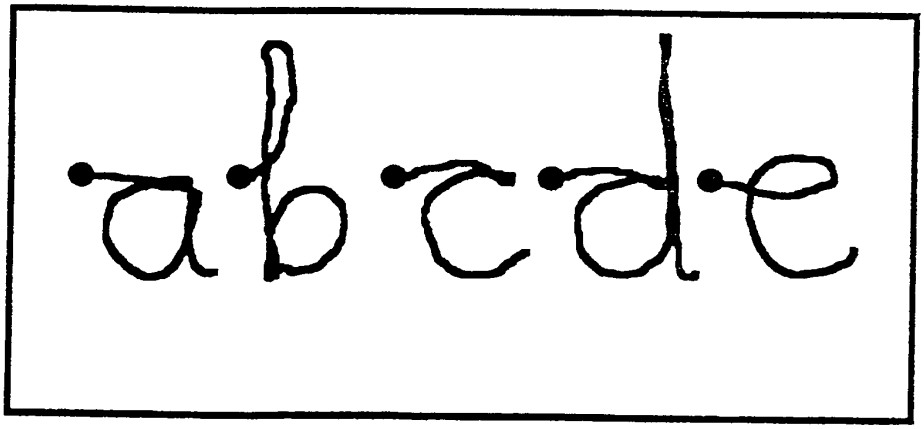


FIG. 25

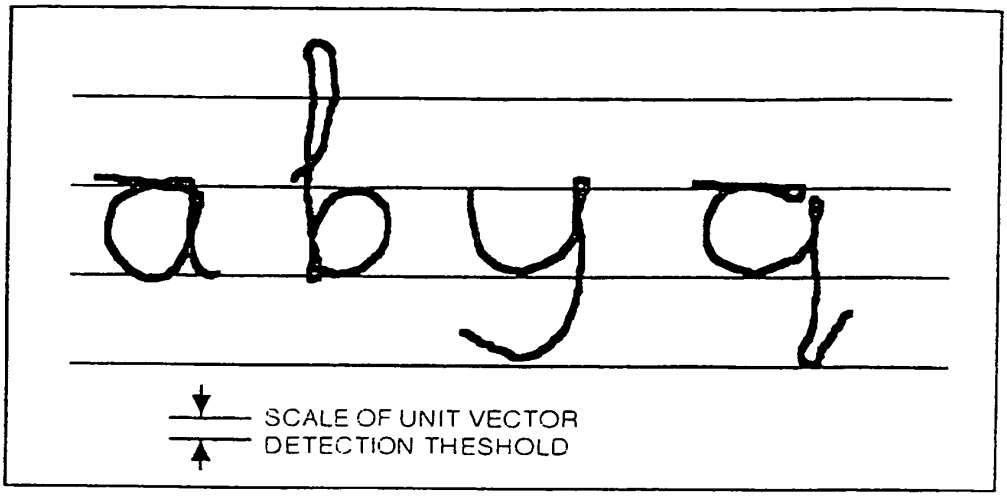

SCALE OF UNIT VECTOR
DETECTION THESHOLD

FIG. 26

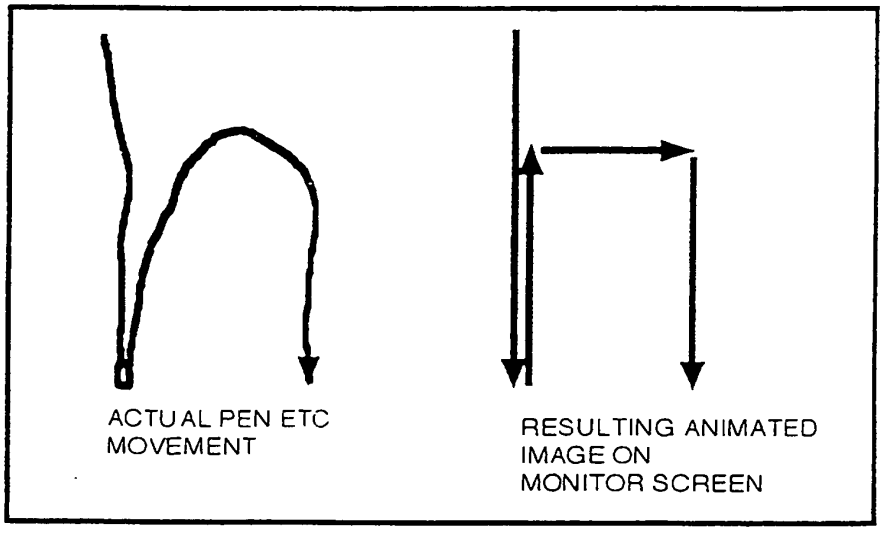

ACTUAL PEN ETC
MOVEMENT
RESULTING ANIMATED
IMAGE ON
MONITOR SCREEN

FIG. 27

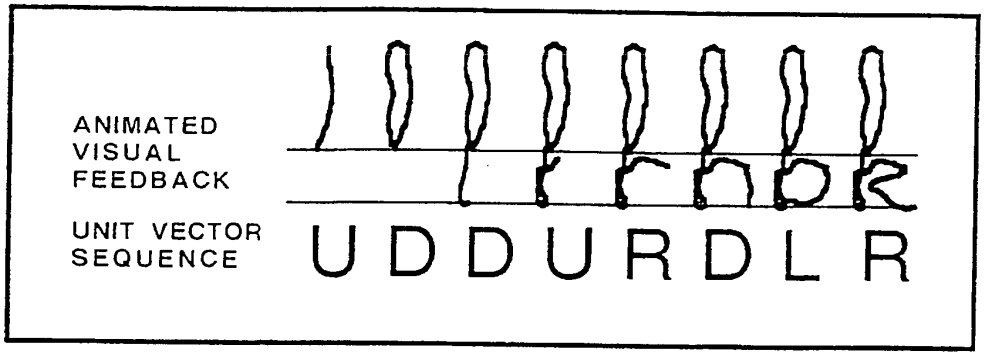


FIG. 29

INTERNATIONAL SEARCH REPORT

Int. .tional Application No
PCT/GB 98/00245

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G06K9/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 G06K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 90 15399 A (GAZALE MIDHAT) 13 December 1990 see abstract; figures 1,4 see page 7, line 4 - line 25	1-10,24, 25, 31-34, 37,39,45
X	EP 0 509 224 A (IBM) 21 October 1992 see abstract; figures 2,5	1,10-12, 39,40
X	US 4 905 007 A (ROHM SAMSON) 27 February 1990 see abstract; figures 1-39	1,24,25, 27-35

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

1

Date of the actual completion of the international search	Date of mailing of the international search report
18 May 1998	28/05/1998

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Sonius, M

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Int. ational Application No
PCT/GB 98/00245

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 254 561 A (LINUS TECHNOLOGIES INC) 27 January 1988 see figures 8A,10,13	1,2,10, 11,18, 19,24, 39,40,45

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. tional Application No
PCT/GB 98/00245

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9015399 A	13-12-90	FR 2648255 A	14-12-90
		AU 5838090 A	07-01-91
EP 0509224 A	21-10-92	CA 2061076 A	20-10-92
		JP 2669575 B	29-10-97
		JP 4326488 A	16-11-92
		US 5303312 A	12-04-94
US 4905007 A	27-02-90	WO 9111764 A	08-08-91
EP 0254561 A	27-01-88	SG 54994 G	17-03-95
		US 4972496 A	20-11-90
		CA 1302572 A	02-06-92
		CA 1325481 A	21-12-93
		EP 0645730 A	29-03-95
		EP 0645731 A	29-03-95
		FR 2602069 A	29-01-88
		GB 2193827 A,B	17-02-88
		GB 2234101 A,B	23-01-91
		GB 2234102 A,B	23-01-91
		JP 6259184 A	16-09-94
		JP 6005498 B	19-01-94
		JP 63184130 A	29-07-88
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		DE 3752121 T	16-04-98
		HK 1096 A	12-01-96
		HK 187495 A	22-12-95
		HK 187595 A	22-12-95

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10/524430 10/524430

PATENT APPLICATION FEE DETERMINATION RECORD
Effective December 8, 2004

Application or Docket Number: 08406.074

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)	SMALL ENTITY TYPE ☐ RATE	FEE	OR	OTHER THAN SMALL ENTITY RATE	FEE
U.S. NATIONAL STAGE FEES							
BASIC FEE	SMALL ENT. = $ 150	LARGE ENT. = $ 300	BASIC FEE		OR	BASIC FEE	300
EXAMINATION FEE	Satisfies PCT Article 33(1)-(4) = $ 50 / $ 100	All other situations = $ 100 / $ 200	EXAM. FEE			EXAM. FEE	200
SEARCH FEE	U.S. is ISA = $ 50 / $ 100 ALL other countries = $ 200 / $ 400	All other situations = $ 250 / $ 500	SEARCH FEE			SEARCH FEE	400
FEE FOR EXTRA SPEC. PGS.	29 minus 100 =	/ 50 =	X $ 125 =			X $ 250 =	
TOTAL CHARGEABLE CLAIMS	34 minus 20 =	* 14	X $ 25 =		OR	X $ 50 =	700
INDEPENDENT CLAIMS	4 minus 3 =	* 1	X $ 100 =		OR	X $ 200 =	200
MULTIPLE DEPENDENT CLAIM PRESENT ☐			+ $ 180 =		OR	+ $ 360 =	
* If the difference in column 1 is less than zero, enter "0" in column 2			TOTAL		OR	TOTAL	1800

CLAIMS AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE	ADDITIONAL FEE	OR	OTHER THAN SMALL ENTITY RATE	ADDITIONAL FEE
AMENDMENT A	Total	* 34	Minus	** 34	=	X $ 25 =		OR	X $ 50 =	
	Independent	* 4	Minus	*** 4	=	X $ 100 =		OR	X $ 200 =	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐					+ $ 180 =		OR	+ $ 360 =	
						TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	
AMENDMENT B	Total	*	Minus	**	=	X $ 25 =		OR	X $ 50 =	
	Independent	*	Minus	***	=	X $ 100 =		OR	X $ 200 =	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐					+ $ 180 =		OR	+ $ 360 =	
						TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than "20", enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than "3", enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

FORM PTO-875 (Rev. 02/2005) Patent and Trademark Office - U.S. DEPARTMENT OF COMMERCE

CLAIMS ONLY

Application Number 10524430

Filing Date

Applicant(s)

* May be used for additional claims or amendments

CLAIMS	AS FILED		AFTER FIRST AMENDMENT		AFTER SECOND AMENDMENT	
	Indep	Depend	Indep	Depend	Indep	Depend
1						
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Total Indep						
Total Depend						
Total Claims						

	*		*		*	
	Indep	Depend	Indep	Depend	Indep	Depend
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100						
Total Indep						
Total Depend						
Total Claims						

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U.S. APPLICATION NUMBER NO.	FIRST NAMED APPLICANT	ATTY. DOCKET NO.
10/524,430	Erika Okneilid	08806-0174

INTERNATIONAL APPLICATION NO.	
PCT/SE03/01226	
I.A. FILING DATE	PRIORITY DATE
07/18/2003	08/16/2002

22852
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

CONFIRMATION NO. 6160

371 FORMALITIES LETTER

OC000000016226749

Date Mailed: 06/10/2005

NOTIFICATION OF MISSING REQUIREMENTS UNDER 35 U.S.C. 371 IN THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US)

The following items have been submitted by the applicant or the IB to the United States Patent and Trademark Office as a Designated / Elected Office (37 CFR 1.495).

- Copy of the International Application filed on 02/15/2005
- Copy of the International Search Report filed on 02/15/2005
- Copy of IPE Report filed on 02/15/2005
- Preliminary Amendments filed on 02/15/2005
- Information Disclosure Statements filed on 02/15/2005
- U.S. Basic National Fees filed on 02/15/2005
- Assignment filed on 02/15/2005
- Priority Documents filed on 02/15/2005

The following items **MUST** be furnished within the period set forth below in order to complete the requirements for acceptance under 35 U.S.C. 371:

- Oath or declaration of the inventors, in compliance with 37 CFR 1.497(a) and (b), identifying the application by the International application number and international filing date.

- **$130** Surcharge for providing the oath or declaration later than 30 months from the priority date (37 CFR 1.492(e)) is required.

SUMMARY OF FEES DUE:

Total additional fees required for this application is **$130** for a Large Entity:

- **$130** Late oath or declaration Surcharge.

ALL OF THE ITEMS SET FORTH ABOVE MUST BE SUBMITTED WITHIN TWO (2) MONTHS FROM THE

DATE OF THIS NOTICE OR BY 32 MONTHS FROM THE PRIORITY DATE FOR THE APPLICATION, WHICHEVER IS LATER. FAILURE TO PROPERLY RESPOND WILL RESULT IN ABANDONMENT.

The time period set above may be extended by filing a petition and fee for extension of time under the provisions of 37 CFR 1.136(a).

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

*A copy of this notice **MUST** be returned with the response.*

PAULETTE R KIDWELL

Telephone: (703) 308-9140 EXT 216

PART 2 - OFFICE COPY

U.S. APPLICATION NUMBER NO.	INTERNATIONAL APPLICATION NO.	ATTY. DOCKET NO.
10/524,430	PCT/SE03/01226	08806-0174

FORM PCT/DO/EO/905 (371 Formalities Notice)

000FORM PTO-1390 U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE
REV. 2/01

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

CUSTOMER NO. 22,852
ATTORNEY'S DOCKET NUMBER
08806.0174
U.S. APPLICATION NO. (If known, see 37CFR1.5)
10/524,430

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/SE2003/001226	18 July 2003	16 August 2002

TITLE OF INVENTION
PRESENTING RECOGNISED HANDWRITTEN SYMBOLS

APPLICANT(S) FOR DO/EO/US
Erika OKNELID and Magnus PERSSON

Applicant(s) herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☐ This is a **FIRST** submission of items concerning a filing under 35 U.S.C 371.
2. ☒ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☐ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☐ A copy of the International Application as filed (35 U.S.C. 371 (c)(2)).
   - a. ☐ is attached hereto (required only if not communicated by the International Bureau.
   - b. ☐ has been communicated by the International Bureau.
   - c. ☐ is not required, as the application was filed with the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U.S.C. 371 (c)(2)).
   - a. ☐ is attached hereto.
   - b. ☐ has been previously submitted under 35 U.S.C. 154 (d)(4).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3)).
   - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   - b. ☐ have been communicated by the International Bureau.
   - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   - d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. ☐ Information Disclosure Statement under 37 CFR 1.97 and 1.98
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☐ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A Substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821-1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154 (d)(4).
19. ☐ A second copy of the English language translation of the international application 35 U.S.C. 154 (d)(4).
20. ☒ Other items or information:
    - a. ☐ Copy of cover page of International Publication No.
    - b. ☒ Copy of Notification of Missing Requirements.
    - c. ☐

U.S. APPLICATION NO. (If known, see 37CFR 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
10/524,430	PCT/SE2003/001226	08806.0174

21. ☒ The following fees are submitted:	Applicant Use	Office Use Only
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)): $300.00	$.00	
National Stage Search Fee.....**$500.00**	$.00	
National Stage Examination Fee.....**$200.00**	$.00	
ENTER APPROPRIATE BASIC FEE AMOUNT =	$.00	
☐ Additional fee for specification and drawings filed in paper over 100 sheets (excluding sequence listing or computer program listing filed in an electronic medium). The fee is **$250** for each additional 50 sheets of paper or fraction thereof.		

Total Sheets	Extra Sheets	Number of additional 50 or fraction thereof (rounded **up** to a whole number	Rate		
30 - 100 =	/50=	0	x 250.00	$	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).				$	

CLAIMS	NUMBER FILED		NUMBER EXTRA	RATE		
Total Claims		- 20 =		x $50.00	$.00	
Independent Claims		-3 =		x $200.00	$.00	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)				+$360.00	$	
TOTAL OF THE ABOVE CALCULATIONS =					$.00	
☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by ½.					$	
SUBTOTAL =					$.00	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☒ 30 months from the earliest priority date (37 CFR 1.492(f)).					$130.00	
TOTAL NATIONAL FEE =					$ 130.00	
Fee for recording the enclosed assignment (37 CFR 1.21 (h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property. +					$	
TOTAL FEES ENCLOSED =					$ 130.00	
					Amount to be refunded:	$
					charged:	$

08/12/2005 MKAYPAGH 00000121 10524430

01 FC:1617 130.00 OP

a. ☒ A check in the amount of $ 130.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 06-0916. A duplicate copy of this sheet is enclosed.

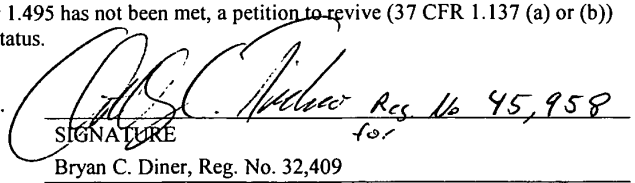
d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P.
1300 I Street, N.W.
Washington, D.C. 20005-3315

DATED: August 9, 2005



SIGNATURE

Bryan C. Diner, Reg. No. 32,409

NAME/REGISTRATION NO.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

U.S. APPLICATION NUMBER NO.	FIRST NAMED APPLICANT	ATTY. DOCKET NO.
10/524,430	Erika Okneilid	08806-0174

INTERNATIONAL APPLICATION NO.	
PCT/SE03/01226	
I.A. FILING DATE	PRIORITY DATE
07/18/2003	08/16/2002

22852
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

CONFIRMATION NO. 6160

371 FORMALITIES LETTER

OC000000016226749

Date Mailed: 06/10/2005

NOTIFICATION OF MISSING REQUIREMENTS UNDER 35 U.S.C. 371 IN THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US)

The following items have been submitted by the applicant or the IB to the United States Patent and Trademark Office as a Designated / Elected Office (37 CFR 1.495).

- Copy of the International Application filed on 02/15/2005
- Copy of the International Search Report filed on 02/15/2005
- Copy of IPE Report filed on 02/15/2005
- Preliminary Amendments filed on 02/15/2005
- Information Disclosure Statements filed on 02/15/2005
- U.S. Basic National Fees filed on 02/15/2005
- Assignment filed on 02/15/2005
- Priority Documents filed on 02/15/2005

RECEIVED
JUN 13 2005
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, LLP

The following items **MUST** be furnished within the period set forth below in order to complete the requirements for acceptance under 35 U.S.C. 371:

- Oath or declaration of the inventors, in compliance with 37 CFR 1.497(a) and (b), identifying the application by the International application number and international filing date.
- **$130** Surcharge for providing the oath or declaration later than 30 months from the priority date (37 CFR 1.492(e)) is required.

SUMMARY OF FEES DUE:

Total additional fees required for this application is **$130** for a Large Entity:

- **$130** Late oath or declaration Surcharge.

ALL OF THE ITEMS SET FORTH ABOVE MUST BE SUBMITTED WITHIN TWO (2) MONTHS FROM THE

DATE OF THIS NOTICE OR BY 32 MONTHS FROM THE PRIORITY DATE FOR THE APPLICATION, WHICHEVER IS LATER. FAILURE TO PROPERLY RESPOND WILL RESULT IN ABANDONMENT.

The time period set above may be extended by filing a petition and fee for extension of time under the provisions of 37 CFR 1.136(a).

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

*A copy of this notice **MUST** be returned with the response.*

PAULETTE R KIDWELL

Telephone: (703) 308-9140 EXT 216

PART 1 - ATTORNEY/APPLICANT COPY

U.S. APPLICATION NUMBER NO.	INTERNATIONAL APPLICATION NO.	ATTY. DOCKET NO.
10/524,430	PCT/SE03/01226	08806-0174

FORM PCT/DO/EO/905 (371 Formalities Notice)

PTO 03 AUG 2005

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

PRESENTING RECOGNISED HANDWRITTEN SYMBOLS

the specification of which
☐ is attached and/or
☒ was filed on February 15, 2005, as United States Patent Application No. 10/524,430 (Confirmation No. 6160), as a U.S. National Stage Application of PCT/SE2003/001226, filed July 18, 2003, or
☐ PCT International Application No. [Text] and was amended on [Text] (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate or § 365(a) of any PCT international application(s) designating at least one country other than the United States, listed below and have also identified below, any foreign application(s) for patent or inventor's certificate, or any PCT International application(s) having a filing date before that of the application(s) of which priority is claimed:

Country	Application Number	Date of Filing	Priority Claimed Under 35 U.S.C. 119
Sweden	0202446-1	16 August 2002	☒ YES ☐ NO
			☐ YES ☐ NO

I hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below:

Application Number	Date of Filing

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s) or § 365(c) of any PCT International application(s) designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application(s) in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56 which became available between the filing date of the prior application(s) and the national or PCT International filing date of this application:

Application Number	Date of Filing	Status (Patented, Pending, Abandoned)

I hereby appoint the following attorney and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. **FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, L.L.P., CUSTOMER NUMBER 22,852.**

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further 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, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Full Name of First Inventor	Inventor's Signature	Date
Erika ~~OKNELID~~ Prymus		2005-07-24
Residence		**Citizenship**
Bara, Sweden SEX		Sweden
Post Office Address		
Aspgatan 1, SE-230 40 Bara, Sweden		
Full Name of Second Inventor	**Inventor's Signature**	**Date**
Magnus PERSSON		2005-07-05
Residence		**Citizenship**
Malmö, Sweden SEX		Sweden
Post Office Address		
~~Oetindiofararegatan 18, SE-211 33 Malmö, Sweden~~ Sankt Knuts Torg nr 8, SE-211 57 Malmö, Sweden		

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26 JAN 2006

Legal Staff
International Division

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

Bib Data Sheet

CONFIRMATION NO. 6160

SERIAL NUMBER	FILING OR 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/524,430	08/09/2005 RULE	380	2131	08806-0174

APPLICANTS

Erika Prymus, Bara, SWEDEN;
Magnus Persson, Malmo, SWEDEN;

**** CONTINUING DATA ***************************

This application is a 371 of PCT/SE03/01226 07/18/2003

**** FOREIGN APPLICATIONS *********************

SWEDEN 0202446-1 08/16/2002

Foreign Priority claimed	STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ yes ☐ no	SWEDEN	6	34	4
35 USC 119 (a-d) conditions met ☐ yes ☐ no ☐ Met after Allowance				
Verified and Acknowledged Examiner's Signature Initials				

ADDRESS
22852

TITLE

Presenting recognised handwritten symbols

FILING FEE RECEIVED	FEES: Authority has been given in Paper	
1930	No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

#5

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

07 FEB 2006

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

In re Application of	:	
OKNELID, Erika et al.	:	
Application No.: 10/524,430	:	
PCT No.: PCT/SE03/01226	:	
Int. Filing Date: 18 July 2003	:	DECISION
Priority Date: 16 August 2002	:	
Attorney's Docket No.: 08806.0174-00	:	
For: PRESENTING RECOGNISED HANDWRITTEN SYMBOLS	:	

This is a decision regarding applicants' response to Notification of Missing Requirements, filed 09 August 2005.

BACKGROUND

On 18 July 2003, applicants filed international application PCT/SE03/01226. On 26 February 2004, a copy of the international application was transmitted to the Office by the International Bureau. The deadline for entry into the national stage in the United States was midnight 16 February 2005.

On 15 February 2005, applicants filed a submission for entry into the national stage in the United States which was accompanied by the basic national fee.

On 10 June 2005, the Office mailed a Notification of Missing Requirements (Form PCT/DO/EO/905) indicating, *inter alia*, that an oath or declaration in compliance with 37 CFR 1.497(a)-(b) and the surcharge for late filing of the oath or declaration were required.

On 09 August 2005, applicants filed a declaration in response to the Notification of Missing Requirements. The declaration was executed by Erika Prymus and Magnus Persson.

DISCUSSION

Under 37 CFR 1.41(a)(4), the inventorship of the international application entering the national stage under 35 U.S.C. 371 is that inventorship set forth in the international application, which includes any change effected under PCT Rule 92bis. The record does not reflect any such requests under Rule 92*bis* during the international stage.

The inventors in the international application are Erika Oknelid and Magnus Persson. The inventors on the declaration are Erika Prymus and Magnus Persson. Thus, the declaration fails to comply with 37 CFR 1.497(a)(3).

Applicant is required to submit an oath or declaration in compliance with 37 CFR 1.497(a)-(b). Attention is directed to MPEP §605.04(c) and the requirement for a petition under 37 CFR 1.182 contained therein, if there has been a change of name.

CONCLUSION

A proper response as indicated above must be filed within TWO (2) MONTHS from the mail date of this decision. Failure to timely file the proper response will result in abandonment of this application. Extensions of time are available under 37 CFR 1.136(a).

Any further correspondence with respect to this matter should be addressed to the Mail Stop PCT, Commissioner for Patents, Office of PCT Legal Administration, P.O. Box 1450, Alexandria, Virginia 22313-1450, with the contents of the letter marked to the attention of the Office of PCT Legal Administration.

Erin P. Thomson

Erin P. Thomson
Attorney Advisor
PCT Legal Administration

Telephone: 571-272-3292
Facsimile: 571-273-0459

IAP6 Rec'd PCT/PTO 07 JUL 2006

000FORM PTO-1390 U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE
REV. 2/01T

CUSTOMER NO. 22,852

ATTORNEY'S DOCKET NUMBER
08806.0174

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

U.S. APPLICATION NO. (If known, see 37CFR1.5)

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/SE2003/001226	18 July 2003	16 August 2002

TITLE OF INVENTION
PRESENTING RECOGNISED HANDWRITTEN SYMBOLS

APPLICANT(S) FOR DO/EO/US
Erika OKNELID and Magnus PERSSON

Applicant(s) herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☐ This is a **FIRST** submission of items concerning a filing under 35 U.S.C 371.
2. ☒ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☐ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☐ A copy of the International Application as filed (35 U.S.C. 371 (c)(2)).
   - a. ☐ is attached hereto (required only if not communicated by the International Bureau.
   - b. ☐ has been communicated by the International Bureau.
   - c. ☐ is not required, as the application was filed with the United States Receiving Office (RO/US).
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   - b. ☐ have been communicated by the International Bureau.
   - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
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10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

RECEIVED
4 AUG 2006
Legal Staff
International Division

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11. ☐ Information Disclosure Statement under 37 CFR 1.97 and 1.98
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☐ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A Substitute specification.
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18. ☐ A second copy of the published international application under 35 U.S.C. 154 (d)(4).
19. ☐ A second copy of the English language translation of the international application 35 U.S.C. 154 (d)(4).
20. ☒ Other items or information:
    - a. ☒ Petition for Name Change of Inventor Under 37 C.F.R. § 1.182
    - b. ☒ Petition for Extension of Time
    - c. ☒ Affidavit under MPEP § 605.04(c)
    - d. ☒ Original Extract from Population Registration
    - e. ☒ Checks in the amount of $1,020.00 (three month extension of time) and $130.00 (petition fee)

U.S. APPLICATION NO. (If known, see 37C[illegible]5)	INTERNATIONAL APPLICATION NO. PCT/SE2003/001226	ATTORNEY'S DOCKET NUMBER 08806.0174

21. ☐ The following fees are submitted:	Applicant Use	Office Use Only
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)): $300.00		
National Stage Search Fee.....**$500.00**		
National Stage Examination Fee.....**$200.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$	
☐ Additional fee for specification and drawings filed in paper over 100 sheets (excluding sequence listing or computer program listing filed in an electronic medium). The fee is **$250** for each additional 50 sheets of paper or fraction thereof.		

Total Sheets	Extra Sheets	Number of additional 50 or fraction thereof (rounded **up** to a whole number	Rate		
30 - 100 =	/50=	0	x 250.00	$	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).				$	

CLAIMS	NUMBER FILED		NUMBER EXTRA	RATE		
Total Claims	34	- 20 =	14	x $50.00	$	
Independent Claims	4	-3 =	1	x $200.00	$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)				+$360.00	$	
TOTAL OF THE ABOVE CALCULATIONS =					$	
☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by ½.					$	
SUBTOTAL =					$	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest priority date (37 CFR 1.492(f)).					$	
TOTAL NATIONAL FEE =					$	
Fee for recording the enclosed assignment (37 CFR 1.21 (h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property. +					$	
TOTAL FEES ENCLOSED =					$	
				Amount to be refunded:	$	
				charged:	$	

07/12/2006 MKAYPAGH 00000112 10524430
01 FC:1617 130.00 OP

a. ☒ Checks in the amount of $1,020.00 and $130.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 06-0916. A duplicate copy of this sheet is enclosed.

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

Adjustment date: 10/23/2006 MKHIPAGH 00000112 10524430
01 FC:1617 -130.00 OP

SEND ALL CORRESPONDENCE TO:

Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P.
1300 I Street, N.W.
Washington, D.C. 20005-3315

DATED: July 7, 2006

SIGNATURE

Milan S. Kapadia, Reg. No. 55,982

NAME/REGISTRATION NO.

PATENT
Customer No. 22,852
Attorney Docket No. 08806.0174-00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
Erika Oknelid et al.	)	
	)	Group Art Unit: Unassigned
Application No.: 10/524,430	)	
	)	Examiner: Unassigned
Filing Date: February 15, 2005	)	
	)	
For: PRESENTING RECOGNISED HANDWRITTEN SYMBOLS	)	

MAILSTOP PCT
Commissioner for Patents
Office of PCT Legal Administration
P.O. Box 1450
Alexandria, VA 22313-1450
Sir:

PETITION FOR NAME CHANGE OF INVENTOR UNDER 37 C.F.R. 1.182

In response to the Decision mailed on February 7, 2006 regarding Applicants' response to Notification of Missing Requirements and in accordance with MPEP § 605.04(c), Applicants hereby petition under 37 C.F.R. § 1.182 to change the name of inventor Erika Oknelid to Erika Prymus.

Applicants include in this Petition an affidavit signed by the inventor under both names setting forth the procedure whereby the change of name was effected. The affidavit attaches a document in support of the description of the procedure used to effect the change of name. The document is an original extract from a population registry. Also enclosed is the Petition fee of $130.00 due in accordance with 37 C.F.R. § 1.17(h).

In light of the above, Applicants respectfully request that the PCT Legal Office accept this Petition to effect the name change of the inventor.

If there is any fee due in connection with the filing of this Petition, please charge the fee to our Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

By: _____
Milan S. Kapadia
Reg. No. 55,982

Date: July 7, 2006

PATENT
Customer No. 22,852
Attorney Docket No. 08806.0174

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
Erika Oknelid et al.	)	
	)	Group Art Unit: Unassigned
Application No.: 10/524,430	)	
	)	Examiner: Unassigned
Filing Date: February 15, 2005	)	
	)	
For: PRESENTING RECOGNISED HANDWRITTEN SYMBOLS	)	
	)	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

AFFIDAVIT UNDER MPEP § 605.04(c)

1. I, Erika Prymus, state that I am a co-inventor of the subject matter claimed in the patent application referenced above.

2. Before acquiring my current name, my previous name was Erika Oknelid.

3. My last name changed from Oknelid to Prymus as a result of marriage.

4. I effected this name change by completing a document, supplied by the local Swedish tax office, indicating my wish to change my name after marriage. The tax office recorded the change in my name in the population registration. I attach to this Affidavit an original extract of the population registration, which evidences my change of name.

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5. I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that the 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, and that such willful false statements may jeopardize the validity of the application or any patents issuing thereon.

Dated: May 30, 2006 By: _____
Erika Prymus

Dated: May 30 2006 By: _____
Erika Oknelid

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Swedish Tax Agency

Telefon: 0771-567567

EXTRACT OF THE POPULATION REGISTER

Date
2006-06-26

Erika Prymus
Aspgatan 1
230 40 BARA

Personal identity no.	1978-06-22-4080
Name	Prymus, Erika Emy Neta
Residential address	Aspgatan 1 230 40 BARA
Population registration	Registered 2002-07-29
County	Skåne
Municipality	Svedala
Parish	Värby
Citizen of	Sweden
Civil status	Married 2003-08-16
Name as single	Oknelid
Place of birth (residence)	Räng
County	Malmöhus
Sex	Female

Husband ----------

Personal identity no.	1975-02-20-0657
Name	Prymus, Michael
Residential address	Aspgatan 1 230 40 BARA
Population registration	Registered 2002-07-29
County	Skåne
Municipality	Svedala
Parish	Värby
Citizen of	Sweden

SKV 7795 L utgåva 7 05-10

* Indicates middlename

www.skatteverket.se

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Swedish Tax Agency

Telefon: 0771-567567

EXTRACT OF THE POPULATION REGISTER

Date
2006-06-26

Erika Prymus
Aspgatan 1
230 40 BARA

Name as single	Prymus
Place of birth	Lodz
Country	Poland
Sex	Male

END OF EXTRACT

SKV 7795 L utgåva 7 05-10

* Indicates middlename

www.skatteverket.se

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PATENT
Customer No. 22,852
Attorney Docket No. 08806.0174-00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	
Erika Oknelid et al.	
	Group Art Unit: Unassigned
Application No.: 10/524,430	
	Examiner: Unassigned
Filing Date: February 15, 2005	
For: PRESENTING RECOGNISED HANDWRITTEN SYMBOLS	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

PETITION FOR EXTENSION OF TIME

Applicants petition for a three month extension of time to reply to the Decision regarding Applicants response to Notification of Missing Requirements mailed on February 7, 2006. A fee of $1,020 is enclosed.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

07/12/2006 MKAYPAGH 00000112 10524430
02 FC:1253 1020.00 OP

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: July 7, 2006

By: _____
Milan S. Kapadia
Reg. No. 55,982

IAP15 Rec'd PCT/PTO 18 AUG 2006
PCT



PATENT
Attorney Docket No. 08806.0174-00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	
Erika OKNELID et al.	Group Art Unit: Unassigned
Application No.: 10/524,430	Examiner: Unassigned
Filed: February 15, 2005	
For: PRESENTING RECOGNISED HANDWRITTEN SYMBOLS	Confirmation No.: 6160

RECEIVED
19 SEP 2006
Legal Staff
International Division

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. § 1.97(b)

Pursuant to 37 C.F.R. §§ 1.56 and 1.97(b), Applicants bring to the attention of the Examiner the documents on the attached listing. To the knowledge of the undersigned, this Information Disclosure Statement is being filed before the mailing date of a first Office Action on the merits for the above-referenced application.

Copies of the listed foreign documents are attached.

Applicants respectfully request that the Examiner consider the listed documents and indicate that they were considered by making appropriate notations on the attached form.

In lieu of a statement of relevance or translation of the non-English document, an English language version of the abstract of the non-English document is enclosed.

This submission does not represent that a search has been made or that no better art exists and does not constitute an admission that each or all of the listed

documents are material or constitute "prior art." If the Examiner applies any of the documents as prior art against any claim in the application and applicants determine that the cited documents do not constitute "prior art" under United States law, Applicants reserve the right to present to the Patent Office the relevant facts and law regarding the appropriate status of such documents.

Applicants further reserve the right to take appropriate action to establish the patentability of the disclosed invention over the listed documents, should one or more of the documents be applied against the claims of the present application.

If there is any fee due in connection with the filing of this Statement, please charge the fee to our Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: August 18, 2006

By: _____
Milan Kapadia
Reg. No. 55,982

IDS Form PTO/SB/08: Substitute for form [redacted] PTO	Comp[redacted] if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT	*Application Number*	10/524,430
	Filing Date	February 15, 2005
	First Named Inventor	Erika OKNELID et al.
	Art Unit	Unassigned
(Use as many sheets as necessary)	*Examiner Name*	Unassigned
Sheet 1 of 1	*Attorney Docket Number*	08806.0174-00

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MAR 13
AUG 18 2006
PATENT & TRADEMARK OFFICE

U.S. PATENTS AND PUBLISHED U.S. PATENT APPLICATIONS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-			
		US-			
		US-			

Note: Submission of copies of U.S. Patents and published U.S. Patent Applications is not required.

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	Translation[6]
		JP 09-223191	08/26/1997	Sharp KK		Abstract
		WO 00/13131	03/09/00	SPARR et al.		
		WO 97/18526	05/22/1997	Motorola, Inc.		

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	Translation[6]

Examiner Signature		Date Considered	

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

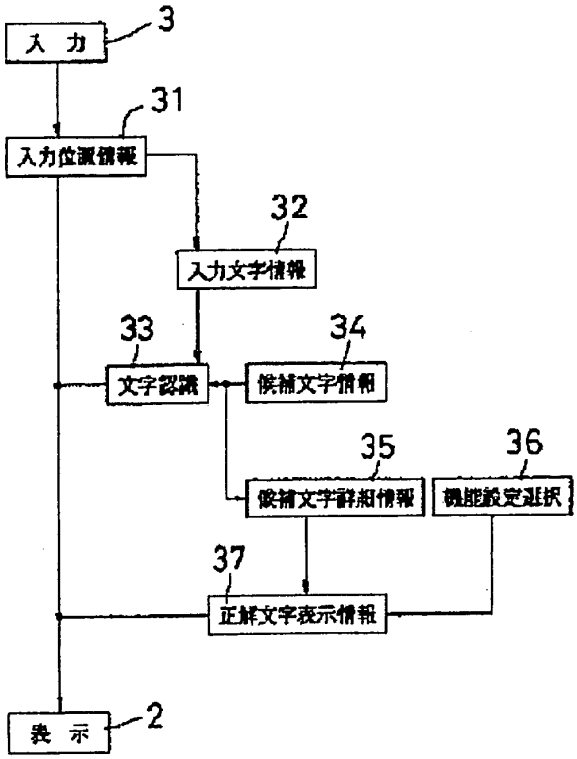
DEVICE FOR INPUTTING AND DISPLAYING HANDWRITTEN CHARACTER

Publication number: JP9223191
Publication date: 1997-08-26
Inventor: SHINO KATSUHIDE
Applicant: SHARP KK
Classification:
- international: ***G06F3/00; G06K9/00; G06K9/03; G06K9/62;*** **G06F3/00; G06K9/00; G06K9/03; G06K9/62;** (IPC1-7): G06K9/62; G06K9/03
- european:
Application number: JP19960032127 19960220
Priority number(s): JP19960032127 19960220

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Abstract of **JP9223191**

PROBLEM TO BE SOLVED: To improve a character recognition ratio by allowing an operator to learn the shape or the like of a character. SOLUTION: When a character is handwritten and inputted from a 1st display screen by the use of an input pen, an input part 3 outputs input character information including input position information expressing an instructed coordinate point. The inputted handwritten character is displayed on the 1st display screen. A character recognition part 33 arrays plural previously determined candidate character information to be recognized in the descending order of similarity to the inputted character information to prepare a candidate character string. When a 1st candidate character is not a required character and another character is selected, a correct character display information part 37 displays the detailed information of the selected candidate character on the 1st display screen under a condition such as superposition with the handwritten input character which is previously set up in a function setting/selecting part 36. An operator compares the handwritten input character with the selected character and learns the shape or the like of an accurate character.



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(19)日本国特許庁（ＪＰ）　(12) 公開特許公報（Ａ）　(11)特許出願公開番号

特開平9－223191

(43)公開日　平成９年(1997)８月26日

(51)Int.Cl.[6]		識別記号	庁内整理番号	ＦＩ		技術表示箇所
Ｇ０６Ｋ	9/62		9061－5H	Ｇ０６Ｋ	9/62	Ｇ
	9/03		9061－5H		9/03	Ｊ

審査請求　未請求　請求項の数14　ＯＬ　（全 13 頁）

(21)出願番号　特願平8－32127

(22)出願日　平成８年(1996)２月20日

(71)出願人　000005049
シャープ株式会社
大阪府大阪市阿倍野区長池町22番22号

(72)発明者　志野　勝英
大阪府大阪市阿倍野区長池町22番22号　シャープ株式会社内

(74)代理人　弁理士　西教　圭一郎

(54)【発明の名称】　手書き文字入力表示装置

(57)【要約】

【課題】　オペレータに文字の形状などを学習させて、文字認識率を向上する。

【解決手段】　入力ペンで第１表示面から文字を手書き入力すると、入力部３は指示された座標点を表す入力位置情報を含む入力文字情報を出力する。第１表示面には、入力された手書き文字が表示される。文字認識部３３では、候補文字情報部３４の予め定める認識対象となる複数の候補文字情報が入力文字情報に類似する度合の高い順に配列されて候補文字列が作成される。第１候補文字が所望の文字でなかったときに他の文字が選択されると、正解文字表示情報部３７は、選択文字の候補文字詳細情報を機能設定選択部３６に予め設定された条件、たとえば手書き入力文字に重ねるという条件で第１表示面に表示させる。オペレータは手書き入力文字と選択文字とを比較して見て、正確な文字の形状などを学習する。

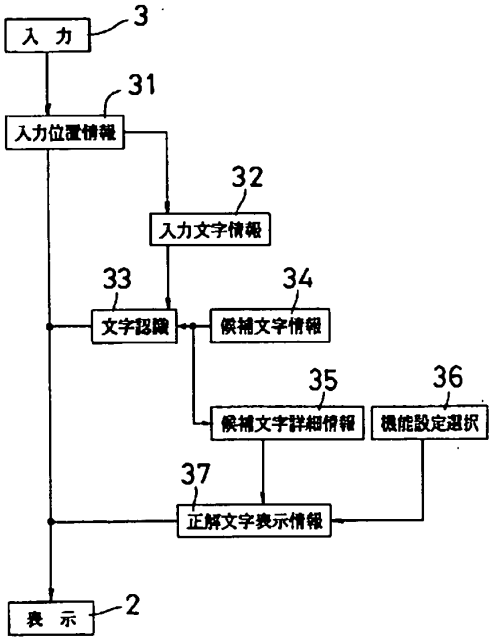


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【特許請求の範囲】

【請求項１】　直交座標が予め定められた透光性を有する入力面を備え、予め定める指示手段で指示された座標点を表す入力位置情報を含む入力文字情報を出力する入力手段と、

前記入力手段の入力面が重ねて配置される表示面を有し、入力手段からの入力位置情報に対応した表示面の座標位置に手書き入力文字を表示する第１表示手段と、

予め定める認識対象となる複数の基準文字情報を記憶する基準文字情報記憶手段と、

前記入力手段からの入力文字情報を文字として認識し、前記基準文字情報記憶手段に記憶された基準文字情報を前記入力文字情報に類似する度合の高い順に配列した候補文字列を作成して出力する第１の作成動作を実行する候補文字列作成手段と、

前記候補文字列を表示する第２表示手段と、

第２表示手段に表示された候補文字列の中から採用すべき文字を１文字だけ選択する文字選択手段と、

前記文字選択手段によって選択された文字が前記候補文字列の中の類似する度合の最も高い第１候補文字以外の文字である第２以降の候補文字であったときに、選択された文字を第１表示手段に表示させる制御手段とを含むことを特徴とする手書き文字入力表示装置。

【請求項２】　前記制御手段は、選択された文字を第１表示手段に表示された手書き入力文字を含む表示領域に手書き入力文字と重なる条件で表示させることを特徴とする請求項１記載の手書き文字入力表示装置。

【請求項３】　前記制御手段は、選択された文字を第１表示手段に表示された手書き入力文字を含む表示領域とは異なる所定の表示領域に手書き入力文字と並ぶ条件で表示させることを特徴とする請求項１記載の手書き文字入力表示装置。

【請求項４】　前記制御手段は、選択された文字を第１表示手段に表示された手書き入力文字とは異なる属性の条件で表示させることを特徴とする請求項１記載の手書き文字入力表示装置。

【請求項５】　前記制御手段は、選択された文字を第１表示手段に表示された手書き入力文字とは異なる表示色の条件で表示させることを特徴とする請求項１記載の手書き文字入力表示装置。

【請求項６】　前記制御手段は、選択された文字を１文字一斉に現れる条件で表示させることを特徴とする請求項１記載の手書き文字入力表示装置。

【請求項７】　前記制御手段は、選択された文字を予め定められる筆順で１画づつ時間間隔をあけた条件で表示させることを特徴とする請求項１記載の手書き文字入力表示装置。

【請求項８】　前記制御手段は、選択された文字を予め定められる筆順で１画づつ時間間隔をあけ、かつ１画づつ異なる表示色の条件で表示させることを特徴とする請求項１記載の手書き文字入力表示装置。

【請求項９】　前記制御手段は、文字選択手段によって文字が選択されたタイミングの条件で、当該選択された文字の第１表示手段への表示を開始することを特徴とする請求項１記載の手書き文字入力表示装置。

【請求項１０】　前記手書き文字入力表示装置は、さらに、基準文字情報記憶手段に記憶された複数の基準文字情報の中から採用すべき文字を１文字だけ指定する指定手段を含み、

前記制御手段は、指定手段によって文字が指定されたタイミングの条件で、当該指定された文字の第１表示手段への表示を開始することを特徴とする請求項１記載の手書き文字入力表示装置。

【請求項１１】　前記候補文字列作成手段は、第１の作成動作に加えて、制御手段によって第１表示手段に表示された選択された文字を前記指示手段でなぞったときの入力手段からの入力文字情報を文字として認識し、候補文字列を作成して出力する第２の作成動作を実行することを特徴とする請求項１記載の手書き文字入力表示装置。

【請求項１２】　直交座標が予め定められた透光性を有する入力面を備え、予め定める指示手段で指示された座標点を表す入力位置情報を含む入力文字情報を出力する入力手段と、

前記入力手段の入力面が重ねて配置される表示面を有し、入力手段からの入力位置情報に対応した表示面の座標位置に手書き入力文字を表示する第１表示手段と、

予め定める認識対象となる複数の基準文字情報を記憶する基準文字情報記憶手段と、

前記入力手段からの入力文字情報を文字として認識し、前記基準文字情報記憶手段に記憶された基準文字情報を前記入力文字情報に類似する度合の高い順に配列した候補文字列を作成して出力する第１の作成動作を実行する候補文字列作成手段と、

前記候補文字列を表示する第２表示手段と、

第２表示手段に表示された候補文字列の中から採用すべき文字を１文字だけ選択する文字選択手段と、

基準文字情報記憶手段に記憶された複数の基準文字情報の中から採用すべき文字を１文字だけ指定する指定手段と、

前記文字選択手段によって選択された文字または指定手段によって指定された文字を第１表示手段に表示させるための複数の条件の中から少なくとも１つの条件を設定する第１機能設定手段と、

前記文字選択手段によって選択された文字が前記候補文字列の中の類似する度合の最も高い第１候補文字以外の文字である第２以降の候補文字であったときに、あるいは前記指定手段によって文字が指定されたときに、選択された文字または指定された文字を、前記第１機能設定手段に設定された条件で第１表示手段に表示させる制御

Exhibit 1004
Page 268 of 617

手段とを含むことを特徴とする手書き文字入力表示装置。

【請求項１３】　前記第１機能設定手段は、前記文字選択手段によって選択された文字または指定手段によって指定された文字を第１表示手段に表示させるための複数の条件として、請求項１～１０記載の条件のうちの少なくとも１つの条件を含むことを特徴とする請求項１２記載の手書き文字入力表示装置。

【請求項１４】　前記候補文字列作成手段は、第１の作成動作に加えて、制御手段によって第１表示手段に表示された選択された文字または指定された文字を、前記指示手段でなぞったときの入力手段からの入力文字情報を文字として認識し、候補文字列を作成して出力する第２の作成動作を実行し、

前記手書き文字入力表示装置は、さらに、候補文字列作成手段が第２の作成動作を実行するか否かを設定する第２機能設定手段を含み、

候補文字列作成手段は、第２機能設定手段に第２の作成動作の実行が設定されたときのみに当該第２の作成動作を実行することを特徴とする請求項１２記載の手書き文字入力表示装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、ＣＲＴ（陰極線管）を用いた表示装置やＬＣＤ（液晶表示装置）などの表示装置の表示面上に配置される入力面を有するタブレットなどの入力装置を備え、たとえばパーソナルコンピュータやワードプロセッサなどの電子機器で実現され、前記入力装置および表示装置を用いて手書き文字入力および手書き文字表示が可能であり、入力された手書き文字を文字認識する手書き文字入力表示装置に関する。

【０００２】

【従来の技術】従来技術の手書き文字入力表示装置は、表示装置と、当該表示装置の表示面上に配置される透光性を有する入力面を有する入力装置とを備え、入力ペンを用いて入力面から文字を手書き入力すると、手書き入力された文字が表示面上に表示されるとともに、文字として認識する文字認識処理が実行され、認識結果が表示される。文字認識処理では、手書き入力された文字の特徴を表す入力文字情報が抽出され、当該入力文字情報と予め備えられる基準文字情報とが比較され、基準文字情報を入力文字情報に対する類似度の高い順番に配列した候補文字列が作成される。そして、第１候補文字を認識した文字として所定の表示領域に表示させたり、あるいは作成した候補文字列の中からオペレータが所望の文字を選択するようにし、選択された文字を認識した文字として所定の表示領域に表示させたりしている。また、予め定める類似度以上の候補文字がないときには、認識できないと判断して、この判断結果をオペレータに報知したりしている。

【０００３】このような手書き文字入力表示装置を用いた例は、たとえば特開平６－１９５５１９号公報に開示されている。当該公報に記載された技術は、作成した候補文字列の中に所望とする文字がなく、オペレータが文字を選択しなかったときに、再び文字を手書き入力して文字認識するものである。このようにして、たとえばキーボードなどの入力装置がなくても、認識した文字の修正を行えるようにしている。

【０００４】

【発明が解決しようとする課題】手書き文字入力表示装置において、文字の認識率を高めるためには、予め備えられる基準文字情報を増加させる、あるいは正確かつ確実な文字を手書き入力させる必要がある。このようにして、手書き入力された文字の入力文字情報と、予め備えられる基準文字情報との類似度を高めて認識率を高めることが可能である。しかしながら、基準文字情報を増加させるためには、基準文字情報を格納するたとえばＲＯＭが大型化し、またはＲＯＭの数が増加する。これによって、ＲＯＭを実装するためのスペースを増加させなければならなくなる。したがって、装置の大型化および製造コストの増加を引き起こす。

【０００５】また、オペレータに正確かつ確実に文字を手書き入力させるためには、たとえば文字の形状や筆順などが不適切であったことを把握させる必要がある。たとえば、前記公報に記載の技術では、再び文字を手書き入力するようにしているけれども、不適切であったことを把握しないオペレータが再び手書き入力するので、前回と同じ認識結果が得られる可能性が高い。このため、文字認識のために長い時間を要し、文字認識効率の著しく低いものとなる。

【０００６】本発明の目的は、所望とする文字であると認識することができない不適切な文字が手書き入力されたときに、正確な文字の特徴をオペレータに知らしめて文字認識効率を高めることができる手書き文字入力表示装置を提供することである。

【０００７】

【課題を解決するための手段】また本発明は、直交座標が予め定められた透光性を有する入力面を備え、予め定める指示手段で指示された座標点を表す入力位置情報を含む入力文字情報を出力する入力手段と、前記入力手段の入力面が重ねて配置される表示面を有し、入力手段からの入力位置情報に対応した表示面の座標位置に手書き入力文字を表示する第１表示手段と、予め定める認識対象となる複数の基準文字情報を記憶する基準文字情報記憶手段と、前記入力手段からの入力文字情報を文字として認識し、前記基準文字情報記憶手段に記憶された基準文字情報を前記入力文字情報に類似する度合の高い順に配列した候補文字列を作成して出力する第１の作成動作を実行する候補文字列作成手段と、前記候補文字列を表示する第２表示手段と、第２表示手段に表示された候補

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文字列の中から採用すべき文字を１文字だけ選択する文字選択手段と、前記文字選択手段によって選択された文字が前記候補文字列の中の類似する度合の最も高い第１候補文字以外の文字である第２以降の候補文字であったときに、選択された文字を第１表示手段に表示させる制御手段とを含むことを特徴とする手書き文字入力表示装置である。

本発明に従えば、第１表示手段の表示面上には、直交座標が予め定められた透光性を有する入力手段の入力面が重ねて配置される。予め定める指示手段で入力面を指示すると、入力手段は指示された座標点を表す入力位置情報を含む入力文字情報を出力する。入力手段からの入力位置情報に対応した第１表示手段の表示面の座標位置には、手書き入力文字が表示される。入力手段からの入力文字情報は、文字として認識される。すなわち、第１の作成動作によって、基準文字情報記憶手段に記憶された予め定める認識対象となる複数の基準文字情報が、入力手段からの入力文字情報に類似する度合の高い順に配列されて候補文字列が作成される。作成された候補文字列は第２表示手段に表示される。類似度の最も高い第１候補文字が所望の文字でなかったときには、第２以降の候補文字の中から採用すべき文字が１文字だけ文字選択手段によって選択される。選択された文字は、第１表示手段に表示される。

したがって、オペレータは第１表示手段に表示された文字、すなわち手書き入力文字と選択文字とを見ることによって、手書き入力した文字の形状などの不適切な部分を把握し、正確な文字の形状などを学習することができる。手書き文字入力表示装置は、当該装置自身がオペレータの癖などを学習し、この癖を考慮して文字認識するような構成ではないので、装置自身の構成は簡単かつ小型である。オペレータが学習することによって、次回の文字入力の際には、オペレータが望む認識結果が一度の文字認識処理で得られる適切な手書き文字を入力することができるようになり、文字認識率の向上に役立てることができる。

【０００８】また本発明は、前記制御手段は、選択された文字を第１表示手段に表示された手書き入力文字を含む表示領域に手書き入力文字と重なる条件で表示させることを特徴とする。

本発明に従えば、選択文字は、第１表示手段に表示された手書き入力文字を含む表示領域に表示される。すなわち、選択文字と手書き入力文字とは、重ねて表示される。このように表示させることによって、オペレータは手書き入力文字と選択文字との形状などの違いを把握し、正確な文字形状などを学習することができる。

【０００９】また本発明は、前記制御手段は、選択された文字を第１表示手段に表示された手書き入力文字を含む表示領域とは異なる所定の表示領域に手書き入力文字と並ぶ条件で表示させることを特徴とする。

本発明に従えば、選択文字は、第１表示手段に表示された手書き入力文字を含む表示領域とは異なる所定の表示領域に表示される。すなわち、選択文字と手書き入力文字とは、重ならないようにして並べて表示される。このように表示させることによって、オペレータは手書き入力文字と選択文字とを比較して見て、手書き入力文字の形状などの不適切な部分を確実に把握し、正確な文字形状などを確実に学習することができる。

【００１０】また本発明は、前記制御手段は、選択された文字を第１表示手段に表示された手書き入力文字とは異なる属性の条件で表示させることを特徴とする。

本発明に従えば、選択文字は、第１表示手段に表示された手書き入力文字とは異なる属性で表示される。したがって、オペレータは手書き入力文字と選択文字とを確実に区別して見ることができ、手書き入力文字の形状などの不適切な部分を確実に把握し、正確な文字の形状などを確実に学習することができる。

【００１１】また本発明は、前記制御手段は、選択された文字を第１表示手段に表示された手書き入力文字とは異なる表示色の条件で表示させることを特徴とする。

本発明に従えば、選択文字は、第１表示手段に表示された手書き入力文字とは異なる表示色で表示される。このように前記属性として色を選んで表示することによって、オペレータは手書き入力文字と選択文字とを色の違いによって区別して見て、手書き入力文字の形状などの不適切な部分を一見して確実に把握し、正確な文字の形状などを確実に学習することができる。

【００１２】また本発明は、前記制御手段は、選択された文字を１文字一斉に現れる条件で表示させることを特徴とする。

本発明に従えば、選択文字は、１文字一斉に表示される。したがって、オペレータは文字の形状の不適切な部分を把握し、正確な文字の形状を学習することができる。

【００１３】また本発明は、前記制御手段は、選択された文字を予め定められる筆順で１画づつ時間間隔をあけた条件で表示させることを特徴とする。

本発明に従えば、選択文字は、予め定められる筆順で１画づつ時間間隔をあけて表示される。したがって、オペレータは文字の筆順を把握し、正確な文字の筆順を学習することができる。

【００１４】また本発明は、前記制御手段は、選択された文字を予め定められる筆順で１画づつ時間間隔をあけ、かつ１画づつ異なる表示色の条件で表示させることを特徴とする。

本発明に従えば、選択文字は、予め定められる筆順で１画づつ時間間隔をあけて、かつ１画づつ異なる表示色で表示される。したがって、オペレータは文字の筆順を色で区別して確実に把握し、正確な文字の筆順を確実に学習することができる。

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【００１５】また本発明は、前記制御手段は、文字選択手段によって文字が選択されたタイミングの条件で、当該選択された文字の第１表示手段への表示を開始することを特徴とする。

本発明に従えば、文字選択手段によって文字が選択されたタイミングで、選択文字の第１表示手段への表示が開始される。したがって、第２以降の候補文字が選ばれたときには、選択文字を必ず直ちに第１表示手段に表示してオペレータへの学習を促すようにすることができる。

【００１６】また本発明は、前記手書き文字入力表示装置は、さらに、基準文字情報記憶手段に記憶された複数の基準文字情報の中から採用すべき文字を１文字だけ指定する指定手段を含み、前記制御手段は、指定手段によって文字が指定されたタイミングの条件で、当該指定された文字の第１表示手段への表示を開始することを特徴とする。

本発明に従えば、前記指定手段によって文字が指定されたタイミングで、当該指定された文字の第１表示手段への表示が開始される。指定手段は前記文字選択手段とは異なる手段である。たとえば、類似度が予め定められる値に満たないような場合には候補文字列を作成することができない。このような場合に、前記指定手段から複数の文字に対して個別的に付されるコード、たとえばＪＩＳコードを入力して基準文字情報の中から文字を指定して選択する。この場合も候補文字列の中から選択した場合と同様に、指定して選択された文字を第１表示手段に表示してオペレータが文字の形状などを学習することができる。

【００１７】また本発明は、前記候補文字列作成手段は、第１の作成動作に加えて、制御手段によって第１表示手段に表示された選択された文字を前記指示手段でなぞったときの入力手段からの入力文字情報を文字として認識し、候補文字列を作成して出力する第２の作成動作を実行することを特徴とする。

本発明に従えば、第２の作成動作によって、第１表示手段に表示された選択文字を前記指示手段でなぞったときにも、入力手段からの入力文字情報を文字として認識し、候補文字列を作成する。したがって、オペレータが学習した文字の形状や筆順によって所望の文字が確実に認識できるかどうかを確認することができる。このような機能によってオペレータの学習効果を高めることができる。

【００１８】また本発明は、直交座標が予め定められた透光性を有する入力面を備え、予め定める指示手段で指示された座標点を表す入力位置情報を含む入力文字情報を出力する入力手段と、前記入力手段の入力面が重ねて配置される表示面を有し、入力手段からの入力位置情報に対応した表示面の座標位置に手書き入力文字を表示する第１表示手段と、予め定める認識対象となる複数の基準文字情報を記憶する基準文字情報記憶手段と、前記入力手段からの入力文字情報を文字として認識し、前記基準文字情報記憶手段に記憶された基準文字情報を前記入力文字情報に類似する度合の高い順に配列した候補文字列を作成して出力する第１の作成動作を実行する候補文字列作成手段と、前記候補文字列を表示する第２表示手段と、第２表示手段に表示された候補文字列の中から採用すべき文字を１文字だけ選択する文字選択手段と、基準文字情報記憶手段に記憶された複数の基準文字情報の中から採用すべき文字を１文字だけ指定する指定手段と、前記文字選択手段によって選択された文字または指定手段によって指定された文字を第１表示手段に表示させるための複数の条件の中から少なくとも１つの条件を設定する第１機能設定手段と、前記文字選択手段によって選択された文字が前記候補文字列の中の類似する度合の最も高い第１候補文字以外の文字である第２以降の候補文字であったときに、あるいは前記指定手段によって文字が指定されたときに、選択された文字または指定された文字を、前記第１機能設定手段に設定された条件で第１表示手段に表示させる制御手段とを含むことを特徴とする手書き文字入力表示装置である。

本発明に従えば、選択された文字または指定された文字が、複数の条件の中から予め設定された条件で第１表示手段に表示される。したがって、選択文字または指定文字を最適な条件で表示させて学習することができる。オペレータが設定するようにすることによって、オペレータの望む条件で表示させることができ、利便性が著しく向上する。

【００１９】また本発明は、前記第１機能設定手段は、前記文字選択手段によって選択された文字または指定手段によって指定された文字を第１表示手段に表示させるための複数の条件として、請求項１～１０記載の条件のうちの少なくとも１つの条件を含むことを特徴とする。

本発明に従えば、前記複数の条件には請求項１～１０の条件のうちの少なくとも１つの条件が含まれる。したがって、上述したような条件を含む複数の条件の中から予め設定された条件で、選択された文字または指定された文字を表示することができる。

【００２０】また本発明は、前記候補文字列作成手段は、第１の作成動作に加えて、制御手段によって第１表示手段に表示された選択された文字または指定された文字を、前記指示手段でなぞったときの入力手段からの入力文字情報を文字として認識し、候補文字列を作成して出力する第２の作成動作を実行し、前記手書き文字入力表示装置は、さらに、候補文字列作成手段が第２の作成動作を実行するか否かを設定する第２機能設定手段を含み、候補文字列作成手段は、第２機能設定手段に第２の作成動作の実行が設定されたときのみに当該第２の作成動作を実行することを特徴とする。

本発明に従えば、第１表示手段に表示された選択文字を前記指示手段でなぞったときに、入力手段からの入力文

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字情報を文字として認識し、候補文字列を作成する第２の作成動作を実行するかどうかを設定することができる。したがって、オペレータがより深く学習したいときに第２の作成動作を実行するようにして、オペレータの望む条件で学習することができ、利便性が著しく向上する。

【００２１】

【発明の実施の形態】図１は、本発明の実施の一形態である手書き文字入力表示装置１の電気的構成を示すブロック図である。手書き文字入力表示装置１は、表示部２、入力部３、ＣＰＵ（中央演算処理装置）４、ＲＯＭ（リードオンリメモリ）５およびＲＡＭ（ランダムアクセスメモリ）６を含んで構成される。表示部２は、たとえばＬＣＤで実現され、その表示面上には入力部３が備える、たとえばタブレットの入力面が積層して配置される。前記入力面は透光性を有し、当該入力面を指示手段である入力ペン７で指示することによって各種の入力が実施される。

【００２２】ＣＰＵ４は、ＲＯＭ５に格納されたプログラムにしたがって手書き文字入力表示装置１全体の動作を制御する。ＲＯＭ５には、具体的に、前記入力ペンを用いて入力面から入力された手書き文字を表示部２の表示面に表示したり、文字として認識して候補文字列を作成したり、当該候補文字列を表示したりするための一連の動作プログラムが予め格納されている。また、ＲＯＭ５には、予め定める認識対象となる複数の基準文字情報が記憶されている。前記基準文字情報は、文字の筆順、画数、線分の方向性および線分間の位置関係などの文字の特徴を示す基準特徴データである。ＲＡＭ６は、ＣＰＵ４の内部処理用ワーク領域およびデータ格納領域などとして、アプリケーションデータや手書き文字認識に必要なデータなどを一時的に格納するために用いられる。

【００２３】前記入力部３のタブレットは、アナログ座標信号を出力する、たとえば抵抗膜式、電磁誘導式、または静電誘導式のものが用いられ、その入力面には直交座標が予め設定されている。そして、入力ペン７で指示された座標点を表す入力位置情報であるアナログ座標信号が出力される。当該アナログ座標信号は、アナログ／デジタル変換されて、ＣＰＵ４に与えられる。

【００２４】図２は、手書き文字入力表示装置１が備える手書き文字入力表示ボード１１を示す平面図である。手書き文字入力表示ボード１１は、表示部２の表示面上に入力部３の入力面を積層して配置して構成される。手書き文字入力表示ボード１１は、第１～第３表示面１２～１４と、各種機能の実行を指示するための複数のキー１５，１６とを有する。なお、第１表示手段に対応する第１表示面１２は、文字を手書き入力するための領域でもあり、４つの手書き文字入力枠１２ａ～１２ｄに分割されている。各枠には、入力ペン７を用いて文字が１文字ずつ手書き入力される。文字が手書き入力されると、入力された入力面の座標点と重なる第１表示面１２の座標点が表示状態となって手書き入力文字が表示される。

【００２５】手書き入力文字が文字として認識されて作成された候補文字列のうちの第１候補文字は第３表示面１４に表示され、第２以降の候補文字列は第２表示面１３に表示される。当該第２および第３表示面１３，１４は第２表示手段に対応する。

【００２６】認識キー１５は、手書き入力文字の文字認識の開始を指示するためのキーである。候補キー１６は、前記第２以降の候補文字列を第２表示面１３に表示することを指示するためのキーである。

【００２７】なお、文字認識の開始は認識キー１５の指示に基づくものに限らず、たとえば入力した入力枠とは異なる入力枠に文字が手書き入力されたとき、手書き文字入力後の予め定める期間内に文字が手書き入力されなかったとき、または入力枠以外の領域が入力ペン７で指示されたときに文字認識を開始するようにしても構わない。また、第２以降の候補文字列の第２表示面１３への表示は、候補キー１６の指示に基づくものに限らず、たとえば第３表示面１４に表示された第１候補文字を含む所定の領域が、入力ペン７で指示されたときに表示するようにしても構わない。

【００２８】図３は、手書き文字入力表示装置１が実行する文字認識機能、および所望とする文字であると認識することができない形状や筆順などが不適切な文字が手書き入力されたときに、正確な文字の特徴をオペレータに知らしめるための学習機能を説明するための機能ブロック図である。前記文字認識機能および学習機能は、入力位置情報部３１、入力文字情報部３２、文字認識部３３、候補文字情報部３４、候補文字詳細情報部３５、機能設定選択部３６および正解文字表示情報部３７によって実行される。

【００２９】一般的な文字認識機能は、前記入力位置情報部３１、入力文字情報部３２、文字認識部３３および候補文字情報部３４を用いて実行される。具体的には、文字が手書き入力されると、入力部３を介して、入力位置情報を含む入力文字情報が得られる。前記入力位置情報は、入力ペン７で指示された座標点を表す座標データである。また、入力文字情報とは、前記入力位置情報を含み、手書き入力された文字のたとえば筆順、画数、線分の方向性および線分間の位置関係などの入力文字の特徴を示す特徴データである。入力位置情報部３１は、前記入力文字情報の中の入力位置情報を表示部２に与える。この位置情報によって、入力部３の指示された座標に対応する表示部２の第１表示面１２の座標に入力文字が表示される。

【００３０】文字認識部３３には、入力文字情報部３２から前記入力文字情報が与えられる。文字認識部３３にはまた、候補文字情報部３４が有する候補文字情報が与えられ、文字認識部３３は第１の作成動作を実行する。

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すなわち、前記入力文字情報と候補文字情報とを照合し、候補文字情報を入力文字情報に対する類似度の高い順番に配列して候補文字列を作成する。作成した候補文字列は、表示部２に与えられ所定の表示面に表示される。すなわち、文字認識処理の終了後直ちに第１候補文字は第３表示面１４に表示され、第２以降候補文字列は、所定の指示に基づいて第２表示面１３に表示される。

【００３１】前記候補文字情報は、たとえばＲＯＭ５に格納された前記基準文字情報の中から選ばれるものであり、入力文字情報に対する類似度が予め定める値以上である基準文字情報が選ばれて、候補文字情報とされる。また、候補文字情報をＲＯＭ５に格納された全ての基準文字情報としても構わない。候補文字情報は、ＲＡＭ６内に設けられる候補文字情報部３４に格納される。

【００３２】図４は、前記候補文字情報部３４の構成を示す図である。候補文字情報部３４は、全候補文字数が格納される候補文字数領域４１と、１または複数の候補文字領域４２とを含んで構成される。候補文字領域４２は、文字種類領域４３と、たとえば２つの文字コード領域４４，４５とを含んで構成される。文字種類領域４３は、全角であるかどうかを表すデータが格納される全角領域４７、半角であるかどうかを表すデータが格納される半角領域４８、英字であるかどうかを表すデータが格納される英字領域４９、数字・記号であるかどうかを表すデータが格納される数字・記号領域５０、およびカタカナであるかどうかを表すデータが格納されるカタカナ領域５１を含んで構成される。文字コード領域４４，４５には、たとえば複数の文字に対して個別的に付されるＪＩＳコードなどが格納される。このような各領域に格納される情報を含んで、候補文字情報が構成される。

【００３３】前記候補文字詳細情報部３５および正解文字表示情報部３７は、上述のようにして文字認識され、手書き入力された文字に相当する認識文字が第１候補以外の文字である第２以降の候補文字列の中から選ばれたとき、すなわち所望とする文字であると認識することができない不適切な文字が手書き入力されたときに、前記学習機能を実行するために用いられる。

【００３４】第２以降の候補文字列の第２表示面１３への表示が指示されると、候補文字情報部３４の第２以降の候補文字情報の中から候補文字詳細情報が選ばれて、候補文字詳細情報部３５に与えられる。第２以降の候補文字列の中から文字が選択されると、正解文字表示情報部３７は、当該認識文字の詳細情報を機能設定選択部３６に予め設定された条件で表示部２に与える。この詳細情報によって選択された文字が、第１表示面１２に表示される。

【００３５】前記候補文字詳細情報とは、文字の筆順、文字形状および画数などの文字の詳細な特徴を示す特徴データである。図５は、前記候補文字詳細情報部３５の構成を示す図である。候補文字詳細情報部３５は、文字数領域５２と、１または複数の候補文字詳細領域５３とを含んで構成される。文字数領域５２には、候補文字詳細情報部３５に格納される全候補文字詳細情報の数が格納される。候補文字詳細領域５３は、筆順領域５４、文字形状領域５５および画数領域５６を含んで構成される。これらの領域に、候補文字の特徴データがそれぞれ格納され、各領域に格納される情報を含んで候補文字詳細情報が構成される。

【００３６】前記機能設定選択部３６では、第２以降の候補文字列の中から選ばれた文字を、第１表示面１２にどのように表示するかが設定される。たとえば、以下のような条件が設定される。図６（１）に示されるように、実線で示される手書き入力文字２７と同じ入力枠１２ａ内に、手書き入力文字２７とほぼ同じ大きさで破線で示されるように選択された選択文字２８を表示させて、手書き入力文字２７と選択文字２８とを重ねて表示するか、あるいは図６（３）に示されるように、手書き入力文字２７の入力枠１２ａとは異なる入力枠１２ｂ内に、手書き入力文字２７とほぼ同じ大きさで選択文字２８を表示させて、手書き入力文字２７と選択文字２８とが互いに重ならないように表示するかが設定される。また、図６（１）または図６（３）のように表示させるときに、手書き入力文字２７と選択文字２８とを同じ属性で表示するか、あるいは異なる属性で表示するかが設定される。前記属性としては、たとえば表示色が挙げられる。また、線分の種類や線分の太さなどであっても構わない。さらに、重ねてまたは重ねずに表示させるときに、図６（１）および図６（３）に示されるように、選択文字２８を１文字一斉に表示するか、あるいは図６（２）および図６（４）に示されるように、選択文字２８を１画２８ａ，２８ｂずつ時間間隔をあけて表示するかが設定される。このとき、たとえば１画ずつ同じ属性で、たとえば同じ表示色で表示するか、あるいは異なる属性で表示するかが設定される。

【００３７】図７は、文字認識および学習機能の実行時の動作を示すフローチャートである。図８は、前記動作を段階的に説明するための図である。ステップａ１では、候補文字列の格納領域が初期化される。すなわち、前記候補文字情報部３４が初期化される。ステップａ２では、たとえば入力枠１２ａに手書き文字２７が入力される。ステップａ３では、入力された文字２７が当該入力枠１２ａの表示領域内に表示される。さらに、入力位置情報を含む入力文字情報が抽出される。ステップａ４では、入力された手書き文字２７の文字認識処理が実行される。すなわち、抽出された入力文字情報とＲＯＭ３に予め格納されている基準文字情報とが照合され、ステップａ５で候補文字列が作成される。作成された候補文字列の中の第１候補文字は、ステップａ６で第３表示面１４に表示される。

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【００３８】ステップａ７では、作成された候補文字列の中の第２以降の候補文字の表示が指示されたかどうかが判断される。たとえば、第３表示面１４内の前記第１候補文字を含む所定の領域１４ａが入力ペン７で指示されて、第２以降の候補文字の表示が指示されるとステップａ８に移り、第２表示面１３に第２以降の候補文字列が表示される。このとき、前記候補文字詳細情報部３５には、第２以降の候補文字の詳細情報が格納される。ステップａ９で第２以降の候補文字が選択されたかどうかが判断される。たとえば、第２表示面１３に表示された所望の文字を含む所定の領域１３ａが入力ペン７で指示されると、ステップａ１０に移り、当該領域１３ａに表示されている文字を認識文字として確定する。ステップａ１１では、選ばれた文字が第３表示面１４に表示された第１候補文字に代わって当該表示面１４に表示されるとともに、前記正解文字表示情報部３７によって候補文字詳細情報部３５に格納された詳細情報が機能設定選択部３６で設定された条件で、第１表示面１２に選択文字２８として表示される。ステップａ１１の処理が終了すると、ステップａ１に戻る。

【００３９】前記ステップａ７で第２以降の候補文字の表示が指示されなかったステップａ１２では、第１候補文字が認識文字であると確定される。当該処理が終了するとステップａ１に戻る。

【００４０】図９は、文字のストロークデータを座標点の集合として抽出する場合の座標点抽出の一例を示す図である。図９（１）は、１ストロークのペンオン状態の筆記情報を抽出する方法の１例を簡略化して示す図である。１ストロークのペンオン状態の筆記情報は、ペンオン状態を表すデータと、ペンの位置を表す座標点のデータとからなる。筆記情報となるペンオン状態の座標点は、一般に、ペンオン状態の期間、ペンの移動に伴って一定の時間間隔で座標上のペンの位置の座標点を検出することによって得られる。

【００４１】ペンオン状態になった瞬間の点Ｒ１をストロークの始端とし、その座標点を検出してペンオン状態の筆記情報とする。ペンオン状態となった瞬間から、一定時間をおいて、ペンオン状態かどうかを判断し、ペンオン状態であるならばペンの位置Ｒ２の座標点を検出し、ペンオン状態の筆記情報とする。このとき、ペンオフ状態であればペンオフ状態の筆記情報とする。

【００４２】このようにして、ペンオフ状態が検出されるまで一定時間間隔でペンの座標点を検出し、ペンオン状態の筆記情報を繰返し得る。図９（１）では、「て」という文字のストローク上の点Ｒ１，Ｒ２，…，Ｒｉ，…，Ｒｍの座標点が、筆記情報とされていることを表している。

【００４３】図９（２）は、前記点Ｒ１～Ｒｍの中から、文字として認識するためのストロークの特徴を最もよく表す点として、点Ｑ１，Ｑ２，…，Ｑｊ，…，Ｑ１７の１７点が選び出された１例を示す図である。点Ｑ１～Ｑ１７は、ストロークの始端、終端、屈曲点などを表す点であり、これらの点に関する座標点などの特徴データが、文字認識の照合に用いられる。屈曲点は、曲線上の点であり、たとえば点Ｒｉ，Ｑｊなどのように、この点の両側で各点を結ぶ線分が鋭角をなす尖点などを含む。この文字認識のために選ばれる点の数は、認識プログラムに応じて任意に設定することができる。

【００４４】以上のように、本形態によれば、第２以降の候補文字列の中から認識すべき文字が選ばれたときに、選ばれた文字を第１表示面１２に表示するようにしたので、オペレータに正しい文字形状などを知らしめることができ、次回の手書き文字認識の際に、オペレータが望む文字が一度の認識処理で得られるような最適な文字を手書き入力させることができ、文字認識効率を高めることができる。

【００４５】また、選ばれた文字を第１表示面１２に表示させる条件を選ぶようにしたので、オペレータの望むように表示させて効率よく学習させることが可能となる。たとえば、手書き入力文字と選択文字とを重ねて表示することによって、互いの文字の形状の違いを学習することができる。また、重ならないように表示することによって、２つの文字をはっきりと区別して学習することができる。また、異なる属性で表示することによって、２つの文字をその形状などをはっきり区別して学習することができる。また、選択文字を１文字一斉に表示することによって、形状の違いを学習することができ、１画ずつ時間間隔をあけて表示することによって、筆順を学習することができる。また、この場合、１画ずつ異なる属性で表示することによって、より詳しく筆順を学習することができる。

【００４６】また、文字認識部３３は第２作成動作を実行する。すなわち、上述のようにして表示された選択文字を入力ペン７でなぞり、このときに入力部３を介して得られる入力文字情報を用いて、第１の作成動作と同様に、文字認識処理を行うようにすることも本発明の範囲に属するものである。このようにすることによって、オペレータは学習した文字の形状や筆順によって所望の文字が確実に認識できるかどうかを確かめることができ、学習機能を高めることができる。このような機能はまた、機能設定選択部３６を用いて実行するかしないかを設定するようにしても構わない。これによって、オペレータの望む学習機能を実行するようにし、確実に正確な文字形状や筆順を学習することができる。

【００４７】また本形態では、類似度が所定の値以上の候補文字がある場合において、表示された第２以降の候補文字列の中の所定の文字を含む領域が入力ペン７によって指示されて、当該領域内の文字が選択されたタイミングで、当該選択文字を第１表示面１２に表示するようにしているけれども、この場合、オペレータは候補文字

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の形状の違いによって所望の文字を選択しているので、文字の形状を確実に把握している場合に有効に利用することができる。

【００４８】これに対して、類似度が所定の値以上の候補文字がなく、「認識できない」と判断されるような場合では、候補文字列の作成および表示は不可能なので、上述のような学習機能は実施することができない。このような場合、前記ＲＯＭ５に格納された複数の基準文字情報の中の所定の文字を選択するための、前記入力ペン７とは異なる指定手段、たとえば数字キーやアルファベットキーを有するキーボードを含んで手書き文字入力表示装置１を構成するようにしておき、このようなキーボードから、たとえば複数の文字に対して個別的に付されるＪＩＳコードを入力することによって、入力されたＪＩＳコードで区分される文字を選択し、ＪＩＳコードの入力が完了したタイミングで選択文字を第１表示面１２に表示するようにしても構わない。この場合、オペレータがＪＩＳコードを確実に把握している場合に有効に利用することができる。

【００４９】また、前記ＪＩＳコードに代わって、読み方を入力するようにしても構わない。また、仮名／漢字変換機能を付加することによって、読み方を入力した後、漢字に変換するようにしても構わない。このような機能もまた、機能設定選択部３６を用いて実行するか否かを設定しても構わない。これによって、オペレータが確実に把握している条件によって文字を選択することができ、利便性が向上する。

【００５０】このような学習機能を用いて文字の形状や筆順などを学習することによって、以降の文字認識時には、オペレータの望む認識結果を早くかつ確実に得ることができ、認識効率が向上する。

【００５１】

【発明の効果】以上のように本発明によれば、第１候補文字が所望の文字でなかったときに選択された文字を第１表示手段に表示するようにしたので、オペレータは第１表示手段に表示された手書き入力文字と選択文字とを比較して見ることができ、手書き入力文字の形状などの不適切な部分を把握し、正確な文字の形状などを学習することができる。これによってオペレータは　次回の文字入力の際に、適切な形状などの条件で文字を手書き入力することができるようになり、文字認識率の向上に役立てることができる。手書き文字入力表示装置は、装置自身がオペレータの癖などを学習するような構成ではないので、装置自身の構成を簡単かつ小型化することができる。

【００５２】また本発明によれば、選択文字と手書き入力文字とを重ねて表示するようにしたので、オペレータは手書き入力文字と選択された文字とを比較して見ることができる。

【００５３】また本発明によれば、選択文字を第１表示手段に表示された手書き文字とは異なる所定の表示領域に並べて表示するようにしたので、オペレータは手書き入力文字と選択文字とを比較して見て、手書き入力文字の形状などの不適切な部分を確実に把握し、正確な文字の形状などを確実に学習することができる。

【００５４】また本発明によれば、選択文字を第１表示手段に表示された手書き文字とは異なる属性で表示するようにしたので、オペレータは手書き入力文字と選択文字とを区別して見て、手書き入力文字の形状などの不適切な部分を確実に把握し、正確な文字の形状などを確実に学習することができる。たとえば前記属性として色を選んで表示することができる。

【００５５】また本発明によれば、選択文字を１文字一斉に表示するようにしたので、オペレータは文字の形状の不適切な部分を把握し、正確な文字の形状を学習することができる。

【００５６】また本発明によれば、選択文字を予め定められる筆順で１画づつ時間間隔をあけて表示するようにしたので、オペレータは文字の筆順を把握し、正確な文字の筆順を学習することができる。また、選択文字を１画づつ異なる表示色で表示することによって、オペレータは文字の筆順を確実に把握し、正確な文字の筆順を確実に学習することができる。

【００５７】また本発明によれば、文字選択手段によって文字が選択されたタイミングで、選択文字の第１表示手段への表示を開始するようにしたので、第２以降の候補文字が選ばれたときには、選択された文字を必ず直ちに第１表示手段に表示してオペレータが学習するよう促すことができる。

【００５８】また本発明によれば、指定手段によって文字が指定されたタイミングで、当該指定された文字の第１表示手段への表示を開始するようにしたので、候補文字列が作成できなかった場合でも、指定手段によって文字を指定するとともに、オペレータが文字の形状などを学習することができる。

【００５９】また本発明によれば、第１表示手段に表示された選択文字を指示手段でなぞったときにも入力手段からの入力文字情報を文字として認識して候補文字列を作成するようにしたので、オペレータが学習した文字の形状や筆順によって所望の文字が確実に認識できるかどうかを確認することができる。このような機能によってオペレータの学習効果を高めることができる。

【００６０】また本発明によれば、選択された文字または指定された文字を複数の条件の中から予め設定された条件で第１表示手段に表示するようにしたので、選択文字または指定文字を最適な条件で表示させて学習することができる。オペレータが設定するようにすることによって、オペレータの望む条件で表示させることができ、利便性が著しく向上する。

【００６１】また本発明によれば、前記複数の条件には

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上述したような条件のうちの少なくとも１つの条件を含むようにしたので、上述したような条件を含む複数の条件の中から予め設定された条件で、選択された文字または指定された文字を表示することができる。

【００６２】また本発明にように、第２の作成動作を実行するかどうかを設定することができるようにしたので、オペレータがより深く学習したいときに第２の作成動作を実行するようにして、オペレータの望む条件で学習することができ、利便性が著しく向上する。

【図面の簡単な説明】

【図１】本発明の実施の一形態である手書き文字入力表示装置１の電気的構成を示すブロック図である。

【図２】前記手書き文字入力表示装置１が備える手書き文字入力表示ボード１１を示す平面図である。

【図３】前記手書き文字入力表示装置１が実行する文字認識機能および学習機能を説明するための機能ブロック図である。

【図４】候補文字情報部３４の構成を示す図である。

【図５】候補文字詳細情報部３５の構成を示す図である。

【図６】選択文字２８を第１表示面１２に表示させる方法を示す図である。

【図７】文字認識および学習機能の実行時の動作を示すフローチャートである。

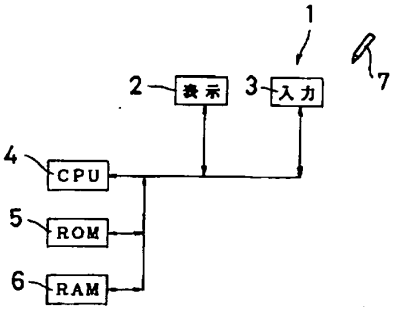
【図８】前記動作を段階的に説明するための図である。

【図９】文字のストロークデータを座標点の集合として抽出する場合の座標点抽出の一例を示す図である。

【符号の説明】

１　手書き文字入力表示装置
２　表示部
３　入力部
４　ＣＰＵ
５　ＲＯＭ
６　ＲＡＭ
７　入力ペン
１１　手書き文字入力表示ボード
１２　第１表示面
１２ａ～１２ｄ　入力枠
１３　第２表示面
１４　第３表示面
１５　認識キー
１６　候補キー
２７　手書き入力文字
２８　選択文字
３１　入力位置情報部
３２　入力文字情報部
３３　文字認識部
３４　候補文字情報部
３５　候補文字詳細情報部
３６　機能設定選択部
３７　正解文字表示情報部

【図１】



【図２】

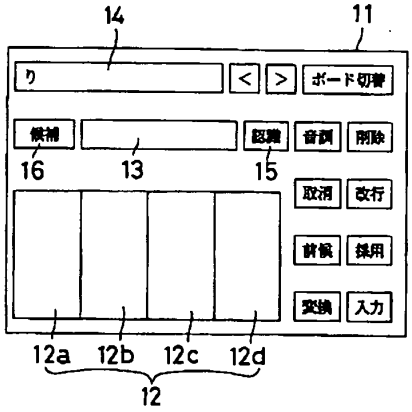
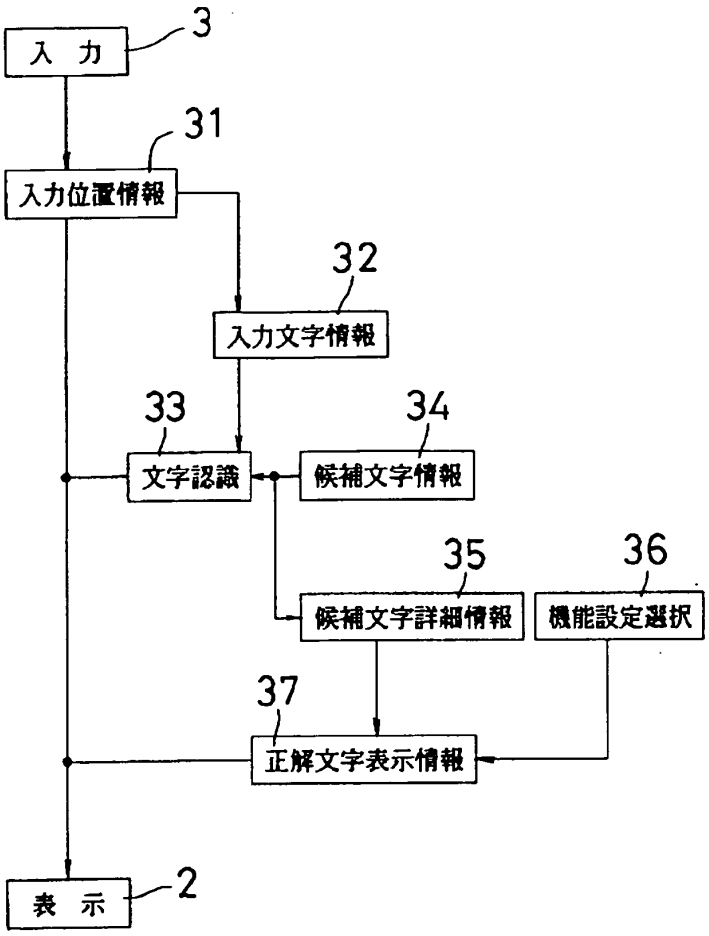
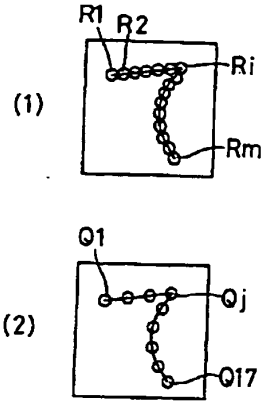


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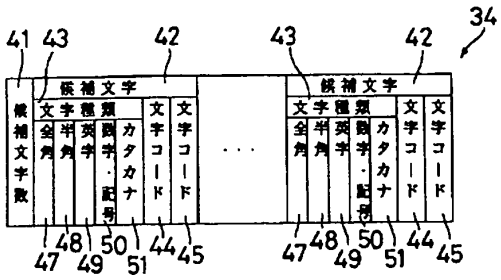
【図３】



【図９】



【図４】



【図５】

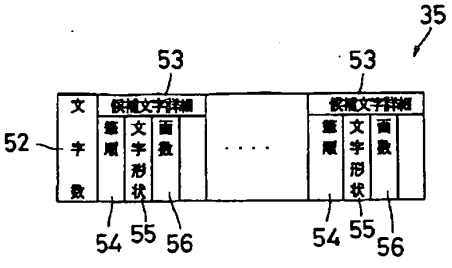
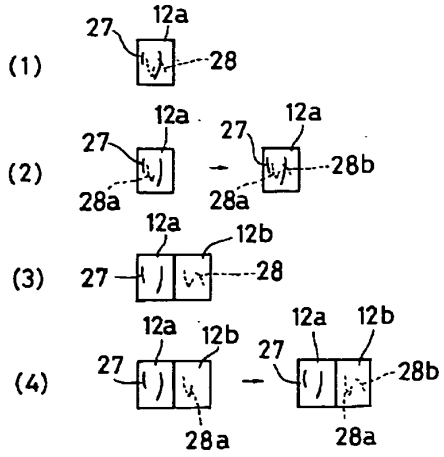


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【図６】



【図８】

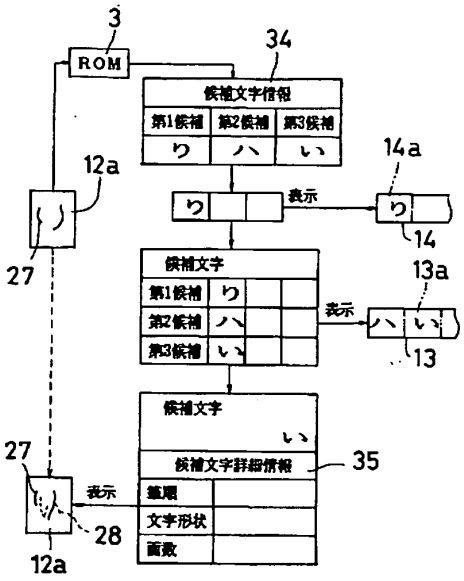


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【図7】

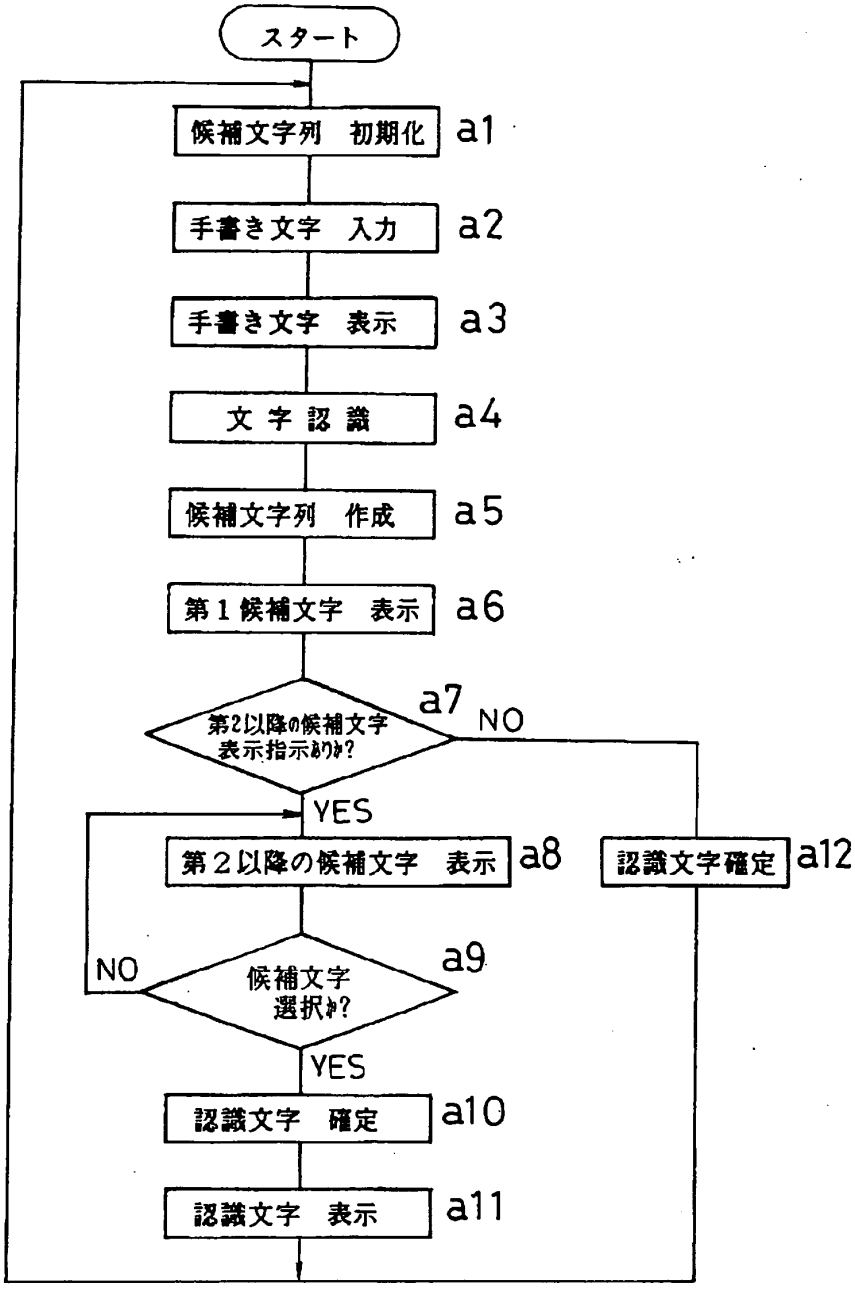


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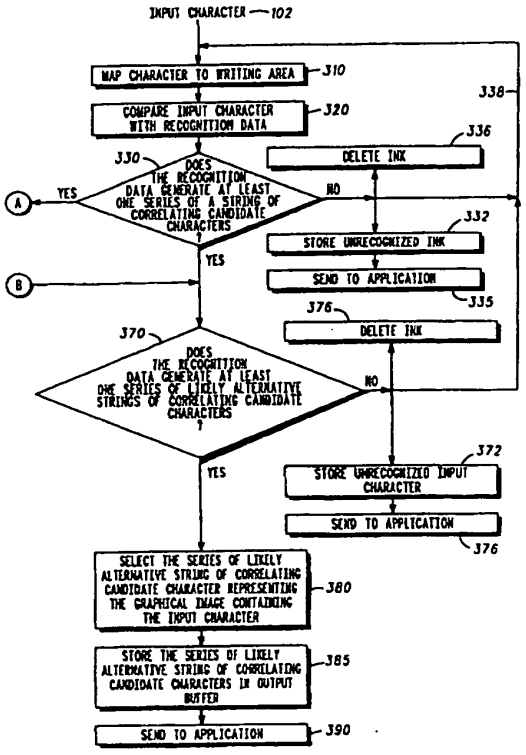
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(57) Abstract

A method and apparatus for character recognition interface is disclosed where input data (102) received from a writing area of a display (210) is compared with character recognition data (220). At least one likely candidate character representing a word likely to represent the input data is generated (230) and displayed (240). In a preferred embodiment, at least one candidate character representing an alternative word likely to represent the input data is generated and displayed (225). At least one series of correlating candidate characters for the at least one likely candidate character and for each alternative candidate character is generated and displayed (370). Each series of correlating candidate characters represents a series of correlating words likely to include a word representing the input data. The likely displaying candidate character is displayed in an output buffer area (385) of the display. Each alternative candidate character is displayed in a candidate list area of the display. Each character displayed can be stored in a memory.



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METHOD AND APPARATUS FOR CHARACTER RECOGNITION INTERFACE

Field of the Invention

This invention relates generally to data input interfaces, and more particularly to character recognition interfaces of large characters sets where each character includes one or more strokes.

Background of the Invention

Machine recognition of human handwriting is a very difficult problem, and with the recent explosion of pen-based computing and electronic devices, has become an important problem to be addressed. There exists various different computing and electronic devices that accept handwritten input. So called pen-based products, for example, computers, and personal digital assistants, and the like typically have a touch sensitive screen upon which a user can impose handwriting. These devices then function to digitize the handwritten input. Other devices, such as computers, advanced telephones, digital televisions, and other information processing devices, include or can access a digitizing tablet which can accept handwritten input. Still other devices can receive handwritten character input by means of a fax, scanned input, electronic mail, or other electronic transmission of data. These devices process the information and attempt to recognize the information content of the handwritten input; typically, the device then displays that information to the user for purposes of feedback, correction of errors in the processing, and for recognition of the handwritten character input.

There exists various approaches for recognition of handwritten input when the recognition is for characters sets having a limited finite number of characters, typically under a

hundred. However often such approaches do not work as well for character sets having large numbers of varied complex characters. Examples of large character sets that have been difficult to quickly and accurately recognize through recognition of handwritten input are several of the Asian ideograghic character/symbol languages, such as Chinese, simplified and traditional, Japanese, and other languages having large character sets. Some languages such as simplified Chinese consist of several thousand characters.

Traditional interface methods, such as keyboard entry, of inputting data and text supplied in one of these types of large character based languages is often very difficult; in part because of the large number and complexity of the character set. Additionally, many of these languages resort to phonetic based representations using Western characters in order to enter the characters with a keyboard. Hence, keyboard-type entry of such characters is difficult. An example of the difficulty of keyboard entry for a large character set based language is keyboard entry of the Chinese language. To enter data, or text, in Chinese, via a keyboard, the language is first Romanized. Western Characters, such as the English anglo-saxon alphabet, are used to phonetically represent the characters of the Chinese language. This is referred to as Pin-yin. Therefore, for a person wishing to enter data or text in Chinese through a keyboard, the person must first know Pin-yin, and the corresponding English character representation for the phonetic equivalent of the Chinese character they are trying to enter via the keyboard.

Another, difficulty encountered with traditional keyboard interface input for recognition of handwritten input of data, or text, based upon a language having a large character set is many of these languages have one or more forms of representing the same character, i.e., similar to print and cursive forms for the English angle-saxon alphabet. Additionally, such languages may have homophones for

example, the Chinese language has numerous homophones - words that are pronounced the same but have different meaning and written forms. Hence, the same Pin-yin can refer to a multiplicity of characters and the person entering Chinese character data must often select from a list of possible choices.

Typically, interface techniques used for data input of limited finite character sets of under hundred, do not produce accurate results for languages having large character sets, of several hundred or several thousand varied complex characters. Many of the interface techniques used for data input such as handwriting recognition of small character set languages are very slow when used for large character set languages.

Therefore, because of the increasing use of pen-based electronic input devices, the difficulty of keyboard entry for various languages, including large, complex, character set languages, a need exists for a method and apparatus for character recognition interface of handwritten input for various languages, complex, large character set languages, symbols, and numerals that is quick, accurate, and easy to use.

Brief Description of the Drawings

FIG. 1 Illustrates a perspective view of an apparatus of a preferred embodiment of the present invention.

FIG. 2 Illustrates a perspective view of an alternative apparatus of a preferred embodiment of the present invention.

FIG. 3 Illustrates a preferred method of character recognition interface of the present invention.

FIG. 4 Illustrates a flow diagram of operation of a preferred embodiment of the present invention.

FIG. 5. Illustrates the remaining portion of the flow diagram of operation of FIG. 4.

FIG. 6 Illustrates graphically a preferred method of character recognition interface having a language model phase.

FIG. 7 Illustrates graphically an alternative preferred method of character recognition interface having a language model phase.

FIG. 8 Illustrates a flow diagram of operation detailing a preferred embodiment of character recognition interface having language model phase in accordance with the present invention.

FIG. 9 Illustrates the remaining portion of the flow diagram of operation detailing a preferred embodiment of character recognition interface having language model phase in accordance with the present invention illustrated in FIG. 7.

FIG. 10. Illustrates graphically a preferred method of character recognition interface having an editing output buffer.

FIG. 11. Illustrates a flow diagram of operation detailing a preferred embodiment of character recognition interface having an editing output buffer in accordance with the present invention.

FIG. 12. Illustrates graphically a preferred method of character recognition interface having an on screen keyboard

FIG. 13. Illustrates a flow diagram of operation detailing a preferred embodiment of character recognition interface having an on screen keyboard in accordance with the present invention.

FIG. 14. Illustrates graphically a preferred method of character recognition interface having a plurality of user adaptable features

FIG. 15. Illustrates a flow diagram of operation detailing a preferred embodiment of character recognition interface having a plurality of user adaptable features in accordance with the present invention.

FIG. 16 Illustrates graphically a preferred method of character recognition interface having a plurality of user adaptable features

FIG. 17 Illustrates a flow diagram of operation detailing a preferred embodiment of character recognition interface

having a plurality of user adaptable features in accordance with the present invention.

FIG. 18 Illustrates an alternative interface in accordance with the present invention.

FIG. 19 Illustrates a flow diagram of the alternative interface of FIG. 18 in accordance with a preferred method of the present invention.

FIG. 20 Illustrates the remaining portion of the flow diagram in FIG. 19 of the alternative interface of FIG. 18 in accordance with a preferred method of the present invention.

Detailed Description of Preferred Embodiment

Generally, the present invention relates to a method and apparatus for character recognition interface of handwritten input; and preferably the present invention relates to a method and apparatus for character recognition interface of handwritten input representing one or more characters selected from a language or compilation of data having a large complex set of characters where each character includes one or more strokes. Generally, an alternative embodiment of the present invention relates to a method and apparatus for character recognition interface of handwritten input representing a graphical image of a signature or other such identifying set of characters.

Pursuant to a preferred embodiment of the present invention, candidate characters in support of a handwriting recognition method and apparatus of the present invention are developed through the compilation and statistical analysis of empirical data compiled from hundreds of samples of actual handwritten characters. Candidate characters produced through the development of templates derived from the compilation and statistical analysis of the empirical data are selectable as the recognized character of the handwritten input.

Referring now to the Figures, FIGS. 1 and 2 illustrate the general operation of a method and apparatus in accordance with a preferred embodiment of the present invention. With reference to FIGS. 1 and 2, examples of pen-based electronic entry devices are illustrated. A personal digital assistant is illustrated in FIG. 1 as generally depicted by the reference numeral 10. The personal digital assistant (10) depicted constitutes a generic representation, typically such devices include a housing (12) and a touch screen (18) upon which input can be handwritten using an appropriate hand manipulated stylus (15). Such devices typically include one or more microprocessors or other digital processing devices. As such, these devices comprise computational platforms that can be readily adapted in accordance with the teachings presented herein. Generally, such devices include one or more application programs, or target applications, operating under control of an operating system comprising instructions for the microprocessor or digital processing device. It should be understood that, while such personal digital assistants comprise a ready platform to accommodate the practice of the applicant's teachings, the teachings presented herein may be practiced in a variety of other operating environments as well. Some examples of such environments include, but are not limited to the following, computers or other electronic entry devices with digitizing screens, or connected to a digitizing input surface, or capable of receiving faxed, scanned, or other electronic input, digital or interactive televisions, modems, telephones, pagers as illustrated in FIG. 2, or other systems with the ability to capture handwritten input and process it. The references illustrated in FIG.. 2 refer to substantially similar elements as illustrated in FIG. 1. on an alternative device as illustrated in FIG. 2, i.e., device 20, touch screen 28, housing 22, stylus 25

Referring now to FIGS. 3, 4, and 5, FIG. 3 illustrates a preferred method of character recognition interface of the present invention and FIGS. 4 and 5 illustrate a flow diagram of

operation corresponding to FIG. 3. Typically a character is input into a device (100) having a memory by means of a stylus (115) or like device on a digitizing surface (117). In accordance with the present invention the input character (102) is mapped to a writing surface (100) or area on the host device (100) through the digitizing surface (117). Various known technology exists for mapping strokes to a selected region of a display area. The input data is compared with recognition data (220). The recognition data is obtained by accessing a recognizer designed to generate a least one most likely candidate character to represent the input character. Generally, the input character is preprocessed into a series of strokes and is processed by the recognizer by comparing the series of strokes with stored recognition data or templates to generate at least one most likely corresponding candidate character. In accordance with the present invention various recognizer and recognition data may be used.

In a preferred embodiment of the present invention the recognizer and recognition data are configuring to recognize and provide recognition data for the Chinese characters comprising the sets of GB1 and GB2. Additionally, a preferred recognizer and recognition data for the present invention are configured to recognize and provide recognition data for the Chinese character of GB1 and GB2 and the Taiwanese characters of Big 5-1 and Big 5-2. In a preferred embodiment of the present invention the recognition data generates a graphical image of at least one likely corresponding candidate character (230). If no such image can be generated by this comparison with the recognition data, a graphical image of the unrecognized input character can be stored in memory (232), in the output buffer (116) and sent to an application resident and operating in the device (235), or sent directly to an application. Alternatively the input character may be deleted (238). If at least one likely corresponding candidate character is generated by comparison with the recognition data, typically, a first most

likely candidate character is displayed (240). This candidate character can be displayed in various areas of the display screen; the writing area (110); the output buffer area (116); the candidate character list area (112); and the language model list area (114). Preferably, the first most likely candidate character is displayed in the output buffer area of the display (240). In accordance with the preferred invention comparing the input character with the stored recognition data can generate at least one likely alternative candidate character in addition to the likely candidate character. Further, in accordance with the preferred embodiment of the present invention, the number of alternative candidate characters generated and displayed can be set by the chosen recognizer; the user; or a default maximum. In a preferred embodiment the default maximum does not exceed ten for the number generated of likely alternative candidate characters. In accordance with the present invention various recognizer and recognition data, or templates, may be used. In a preferred embodiment of the present invention the recognition data generates a graphical image of at least one likely corresponding candidate character and a graphical image of at least one likely alternative candidate character. In a preferred embodiment the likely candidate character and the likely alternative candidate character can be displayed in various areas of the digitizing surface (117) or display screen (118); the writing area (110); the output buffer area (116); the candidate character list area (112); and the language model list area (118). If the most likely candidate character is not an accurate graphical representation of the input character (245), then at least one alternative corresponding candidate character is displayed if one is generated by the comparison of the input data with the recognition data (250). If no alternative correlating candidate character is generated that accurately represents the graphical image of the input character (250) then the user can select from at least one of the following

options: i) store the unrecognized input character (257) and send to a target application (259), ii) delete input (256), iii) input a new character (258). If an alternative corresponding candidate character exists, preferably the alternative candidate character representing the input is selected (260) replacing the first likely candidate character (265). In accordance with a preferred embodiment the selected alternative corresponding candidate character is stored or displayed in the output buffer display area (270). Preferably the alternative corresponding candidate can be sent directly to a target application, or sent to the target application from the output buffer (275).

Referring now to FIGS. 6, 7, 8, and 9, FIGS. 6 & 7 illustrate alternative preferred methods of character recognition interface of the present invention having language modeling; and FIGS. 8 & 9 illustrate a flow diagram of operation corresponding generally to FIGS. 6 & 7. In accordance with the preferred embodiment of the present invention, the feature, or option, of language modeling may be accessed through a plurality of methods. Language modeling for the purposes of the present invention is the combination of a series or string of characters, word, or symbols that have a likelihood of being associated or correlated to one another to form a phrase, mathematical expression, or other symbolic expression consisting of a plurality of characters. An example of a language model series or string of correlating candidate characters that may be generated from comparison of input data with an English language based recognizer and recognition data is the phrase "Thank God it's Friday". For purposes of the present invention the term character referred to throughout may mean a single letter, a word, one or more ideographic characters, symbols, numbers and the like. Further in accordance with the preferred embodiment of the present invention, the number of series of correlating candidate characters generated and displayed can be set by the chosen recognizer; the user; or a default maximum. In a preferred

embodiment the default maximum does not exceed ten for the number of series of correlating candidate characters generated to include the likely candidate character or generated to include each alternative likely candidate character.

A toolbar language model option as illustrated in FIG. 6 permits the language modeling feature to be activated. Alternatively, the language modeling feature may be displayed in a language modeling area of the display as illustrated in FIG. 7 and be activated from a mouse, stylus or other input device. In accordance with a preferred embodiment of the present invention, the toolbar of the present invention may be selectively enabled and disabled. Additionally, the toolbar may be selectively placed, or displayed, on various areas of the display. Preferably the toolbar is displayed above or below the writing area in some manner.

When the language modeling feature of the present invention is activated the input character (102) is compared with the recognition data to generate at least one series of a string of correlating candidate characters (330), where such series includes the graphical representation of the character input and a plurality of characters that are commonly combined and include the input character. For example, if a character input is the word "Friday", a language modeling series of correlating candidate characters generated by comparison with the recognition data may generate the phrase "Thank God its Friday". Preferably alternative series of strings of correlated candidate characters are also generated from which selection of an accurate series containing the character input may be made. The term correlated for purposes of the present invention means associated with, commonly combined together, or the like characters commonly associated, or combined together that include the input character.

In accordance with a preferred embodiment of language modeling of the present invention, an input character is received and mapped into a writing area of a display (310).

The input character is compared with recognition data (320). If the comparison with the recognition data does not generate at least one likely series of correlating candidate characters (330) various options can be selected including the following: i) store the unrecognized ink of the input character (332) and send to the target application (335), ii) delete the ink of the input charter (336), and iii) input a new character (338). In accordance with the present invention ink includes the digitized representation of the input character, the raw input character, regardless if the character is handwritten, scanned, or entered by some other means.

In a preferred embodiment, if the comparison with the recognition data does generate at least one likely series of correlating candidate characters (330) then the first, or most likely, series, or string, of correlating candidate characters is displayed (340). Preferably the series is displayed in a correlating candidate character area of the display. The correlating candidate character area of the display allows the series of correlating candidate characters to the selectively displayed from a language model list area (114) of the display, entered and displayed in the output buffer area (116) of the display, or be displayed by selection of the language model option on the toolbar (108). If the displayed first, or most likely, series of correlating candidate characters displayed accurately represents a string, or phrase of characters containing the graphical representation of the input character (350) then preferably the string is stored in the output buffer (355) and sent to the target application (358). However, if the first, most likely, series of correlating candidate characters does not accurately represent a string, or phrase of characters containing the graphical representation of the input character (350) then at least one alternative series of likely correlating candidate characters is displayed (360). If no alternative series of likely correlating candidate characters is generated by comparison of the input data with the recognition data that

accurately includes a graphical representation of the input data (370) then various options can be selected including the following: i) store the unrecognized ink of the input character (372) and send to the target application (375), ii) delete the ink of the input character (376), and iii) input a new character (378).

If the comparison with the recognition data does generate at least one likely series of alternative correlating candidate characters which accurately includes a graphical representation of the input data (370) then the string is selected (380) and preferably the string is stored in the output buffer (385) and sent to a target application (390). In accordance with preferred embodiments of the present invention when a language model series of correlating candidate characters is selected, the series can be inserted into an output buffer area of the display (116), sent to a target application, stored a language model area of the display (114), or stored in a language model toolbar option (108) to be retrieved upon selection of the toolbar option.

Referring now to FIGS. 12 & 13, FIG. 12 illustrates graphically a preferred method of character recognition interface having an output buffer which can be edited. FIG. 13 illustrates a flow diagram of operation detailing a preferred embodiment of character recognition interface having an output buffer that can be edited in accordance with the present invention. In accordance with a preferred embodiment of the present invention, a candidate character displayed in the output buffer area (116) of the display maybe edited by selecting the character through various selection means including but not limited to tapping on the character in the output buffer area (116) with a stylus (115) or selecting the character via some other input device such as a mouse. Preferably, once a candidate character has been selected from the output buffer directly for editing, at least one alternative candidate character is displayed, and presented, from which selection for replacement of the candidate character can be

made. In a preferred embodiment, the alternative candidate character is displayed in an alternative candidate character box (113) as illustrated in FIG. 10. Optionally, the alternative candidate character can be displayed and selected from the alternative candidate character list area (112).

Generally, the editing option occurs after a candidate character has been displayed in the output buffer area (118) of display. Optionally, editing may occur prior to displaying the candidate character in the output buffer area (118) of the display by selecting and displaying on alternative candidate character from the candidate character list area (114) of the display.

In a preferred embodiment the input character (102) is compared to the recognition data (410). Typically, a first candidate character representing the graphical image of the input character is selected or displayed (420). Preferably, the first candidate character is stored in the output buffer (430).

Typically, a candidate character is identified or selected for editing from where it is displayed or stored in the output buffer area of the display (435). As discussed above, various options exist to edit a particular candidate character from the output buffer area of the display (440). Preferably, the candidate character is selected by tapping on the character with a stylus or input device. Upon selection of the candidate character, at least one alternative corresponding candidate character is presented (445) if generated; preferably it is presented in an alternative candidate character box (113) that is displayed in close proximity to the candidate character selected for editing. If at least one alternative candidate character is generated that represents the graphical image of the input data (450) then preferably that alternative candidate character is selected (455). The candidate character that was displayed or stored in the output buffer for editing is replaced by the selected alternative candidate character (460). Preferably, the replacement occurs by simply tapping with a

stylus or input device on the selected alternative corresponding candidate character displayed in the alternative candidate character box. In accordance with the preferred embodiment, the selected alternative corresponding candidate character is then stored or displayed (465), preferably in the output buffer area of the display and then sent to the target application (470). Optionally, the selected alternative candidate character is sent directly to the target application (470).

If there are no alternative candidate characters that accurately represent the graphical image of the input character are generated than various options are provided. If the first stored, displayed candidate character in the output buffer is a graphic representation of the unrecognized ink of the input character (475) then a preferred editing selection is to delete the first stored candidate character (480). Alternatively, if the first stored candidate character is not a graphic representation of the unrecognized ink of the input character (475) then a preferred editing selection is to retrieve the unrecognized graphic image of the input character (485), replace the first stored candidate character with the unrecognized graphic image of the input character (490), store the unrecognized graphic image of the input character in the output buffer (495); and send the unrecognized graphic image of the input character to the target application (498).

Referring now to FIG 12 and FIG. 13, FIG. 12 illustrates graphically a preferred method of character recognition interface having an on screen keyboard (120). FIG. 13 illustrates a flow diagram of operation detailing a preferred embodiment of character recognition interface having an on screen keyboard in accordance with the present invention. Preferably the on screen keyboard is accessed through selection of the keyboard option on the toolbar (108). Upon selection of the keyboard option, at least one of several various keyboards are generated (530) to select from to receive input. Examples of on screen keyboards available in accordance with

the preferred embodiments of the present invention include but are not limited to the following: English; numeric; symbols; pin yin; zhuyin; and other non English languages. Once selection of the preferred keyboard is made (540), input characters may be entered onto the display by tapping the graphic representation on the selected keyboard (550). Preferably a display location is selected to map the input character too (560). Typically the input character is stored (570) then mapped to the location selected (580) and sent to the target application. (590)

Referring now to Figs 14 & 15; and FIGS. 16 & 17, FIGS. 14 and 16 illustrate graphically a preferred methods of character recognition interface having pluralities of user adaptable features. FIG. 15, & 17 illustrate a flow diagrams of 14 & 16 respectively, of operations detailing preferred embodiments of character recognition interfaces having pluralities of user adaptable features in accordance with the present invention. In accordance with the preferred embodiments of the present invention, various options are available to be selected through accessing the toolbar. Examples of such options include setup features, including but not limited to the following: pen (input device) (122) width (124), color (126), time out option (128), recognition selection (130), and output code selection (132). In accordance with adapting these options for various user preferences, the setup feature can be accessed through the tool bar (610, 710) and individually selected or selected in pregrouped combinations. The figures 14 through 17 illustrate the pregrouped combinations, but each option may be selected and processed individually in a similar manner. Preferably the desired set up combination is selected (620, 720), the various option or options are generated (630, 730), selection of at least one option is made (640, 740), input is received for the option by means of an input device entering input onto the graphical representation of the option (650, 750). The input is stored

(660, 760) and the option selection is closed (670, 770). In a preferred embodiment of the present invention, the recognizer option (130) of the setup option (122) permits selection of recognition data (134) that includes the ideographic Chinese characters referred to as GB 1; GB 2, and the Taiwanese characters referred to as Big5-1, and Big5-2, In a preferred embodiment of the present invention, the output code option (132) of the setup option (122) permits selection of the output code (132), wherein selection of the output can be made between the ideographic Chinese characters referred to as GB 1; GB 2, and the Taiwanese characters referred to as Big5-1, and Big5-2. Other languages can be easily adapted for the Recognition and output code options.

Referring now to FIGs. 18, 19, and 20. FIG. 18 Illustrates an alternative interface in accordance with the present invention. FIGS. 19 and 20 illustrate a flow diagram of the alternative interface of FIG. 18 in accordance with a preferred method of the present invention.

The alternative preferred embodiment of the present invention illustrated in FIGs. 18, 19, and 20 contemplates that many users will find it convenient to append a signature or other symbols to a document to provide some measure of authentication as to the origin of the document. Accordingly, upon user selection of the signature icon residing in the command area of the primary graphic user interface of FIG. 3, the user is presented with the graphic image shown. A handwritten personal signature or other symbols entered via this interface will be digitized via conventional techniques and the signature data representing the handwritten signature used as selected by the user.

As shown in FIG. 18, the signature graphic user interface comprises a graphical image 1000 having a menu area 1002, a command area (referred to by those skilled in the art as a toolbar) 1004, a signature area 1006, and a status area 1008.

By comparison of FIG. 18 to FIG. 3, it will be apparent that the toolbar 1004 and status area 1008 contain and convey different information to the user as appropriate given the different functionality offered by the two different graphical user interfaces illustrated in FIG. 3 and FIG. 18.

In the preferred embodiment, the toolbar 1004 of FIG. 18 offers a variety of command functions by presenting a series of icons to provide the functions of:

New (1010): to open a new signature file;
Open (1012): to open an existing signature file;
Save (1014): to save a signature file;
Copy (1016): to copy of signature file;
Send (1018): to send the signature file to a selected application;
Select (1020): to select an application prior to sending the signature file;
Config (1022): to configure some feature or the like;
About (1024): to inform the user about some feature or the like.

Using these commands, a user is afforded a simple and efficient interface to enter a personal signature or other symbols to be saved or appended to any of several documents prior to storing, printing, or transmitting the document to a recipient. In the example of FIG. 18, the signature "Earl St. John" 1026 has been handwritten onto the signature area 1006, which can be saved as signature data by selection of the Save icon 1014 or perhaps sent to the application designated (via the Select icon 1020) to receive the recognized handwritten input to be appended thereto as her signature (via the Send icon 1018).

The operational method for the signature graphical user interface can be readily understood with reference to FIG. 18, FIG. 19, and FIG. 20. Step 1100 of FIG. 19 presents the user with the graphical user interface 1000. Typically, the user would then select to create a new signature document or open an existing one. Decision 1102 determines whether the user has selected the New icon 1010, and if so, creates a new signature file (step 1104) so that the user can handwrite a signature or other symbols in the signature area 1006 of the graphical user interface 1000. Conversely, if the user selects the Open icon 1012, decision 1106 causes step 1108 to present a list of existing signature files to the user for his or her selection and opens the selected signature file (step 1110).

After a new signature file as been created or an existing signature file opened, the user may elect to save the file by selecting the Save icon 1014. Decision 1112 detects the user's selection of the Save icon and causes the currently active signature file to be saved into memory (step 1114) and before returning to await the next user command. In a similar manner, the user's selection of the Copy icon 1016 is detected by decision 1116 which causes step 1118 to copy the information representing whatever handwritten input has been entered in the signature area 1006 to be electronically copied into memory (commonly referred to as scratchpad memory) as signature data. In this way, the user may copy the signature data into other signature files or other applications.

The signature method of the present invention continues in FIG. 20, where decision 1200 determines whether the user has selected the Send icon 1018 causing the signature data to be sent to a user selected application (step 1202). To select a target application to receive the signature data, the user touches the stylus on the Select icon 1020, which is detected by decision 1204, and causes a list of potential applications to be presented to the user (step 1204), and may include a default selection of the application selected by the user to receive the

recognized handwritten input. After user selection of the intended application, step 1208 stores information enabling the signature data to be sent to the correct application upon the user's next selection of the Send icon 1016.

The present invention offers the user a great deal of signature or other authentication information via the ConFIG. icon 1022. Decision 1210 detects the user's selection of the ConFIG. icon 1022 and allows the user to configure (step 1212) several parameters such as the color and line width (referred to as the ink by those skilled in the art) of the presentation of the handwritten signature 1026.

The final command in the preferred embodiment of the present invention is the About icon 1024. Upon the user's selection of the About icon 1024, decision 1214 causes information to be presented to the user for his or her information (step 1216). This information may remain displayed until the user closes the information window, or may be presented for a time period after which the information window automatically closes and the signature method of the present invention awaits the next user instruction.

Those skilled in the art will find many embodiments of the present invention to be useful. One obvious advantage is ease of data, or text, input over traditional key-board entry methods, including the obvious advantage of the ease of entry of scanned or "off-line" handwritten input into printed data, or text. Another obvious advantage is recognition of handwritten input where the input represents a single character, data point, or other unitary identifying graphically representation, that is a subset of a large complex set of characters, data points, or other graphical representation.

It will be apparent to those skilled in the art that the disclosed invention may be modified in numerous ways and may assume many embodiments other than the preferred forms particularly set out and described above. Accordingly, it is intended by the appended claims to cover all modifications of

the present invention that fall within the true spirit and scope of the present invention and its equivalents.

What is claimed is:

1. A method comprising the steps of:

comparing input with recognition data stored in a memory to generate at least one candidate character having a likelihood of corresponding to said input;

displaying a graphical image having therein a graphically writing area from which the input data is accepted and a separate output area for presenting at least one candidate character; and

storing in a memory at least one candidate character for latter retrieval from said memory.

2. A method of comprising the steps of:

receiving input from a writing area of a display;

generating a plurality of candidate characters having a statistical likelihood of corresponding to said input by comparison of said input with recognition data stored in a memory;

displaying said plurality of candidate characters in a candidate list area of said display;

selecting a most likely candidate character from the plurality of candidate characters;

displaying the most likely candidate character in an output buffer area of said display.

3. The method of claim 2, further comprising the step of:

storing the most likely candidate character in a memory.

4. A method comprising the steps of:

receiving input data from a writing area of a display

comparing the input data with character recognition data to identify at least one likely candidate character likely to represent the input data, and identifying at least one

alternative candidate character likely to represent the input data;

displaying the at least one likely candidate character in an output buffer area of said display; and

displaying the at least one alternative candidate character in a candidate list area of said display.

5. The method of claim 4, further comprising the step of:

storing the at least one likely candidate character in a memory.

6. The method of claim 4, further comprising the step of:

storing the at least one alternative candidate character in a memory.

7. The method of Claim 4, further comprising the steps of:

replacing the at least one likely candidate character in the output buffer and stored in the memory with one of the alternative candidate characters selected from the at least one alternative candidate characters; and

displaying the selected alternative candidate character in the output buffer.

8. The method of Claim 4, wherein the at least one alternative candidate character can be accessed, displayed, and selected from, by selecting the at least one likely candidate character displayed in the output buffer for replacement, where the at least one likely candidate character and the at least one alternative candidate character were generated to represent the same input data.

9. A method comprising the steps of:

comparing input data received from a writing area of a display with character recognition data;

identifying at least one likely candidate character representing a word likely to represent the input data;

identifying at least one alternative candidate character representing an alternative word likely to represent the input data;

identifying at least one series of correlating candidate characters for the at least one likely candidate character and for each alternative candidate character, each series of correlating candidate characters representing a series of correlating words likely to include a word representing the input data;

displaying the at least one likely candidate character in an output buffer area of said display;

displaying the each alternative candidate character in a candidate list area of said display; and

displaying the at least one series of correlating candidate characters in a correlating candidate characters area of the display.

10. The method of claim 9, further comprising the steps of:

storing the at least one likely candidate character in a memory.

11. The method of claim 9, further comprising the steps of:

storing the plurality of alternative candidate characters in a memory.

12. The method of claim 9, further comprising the steps of:

storing the at least one series of correlating candidate characters in a memory.

13. The method of claim 9, further comprising the steps of:

replacing the at least one likely candidate character in the output buffer with one of the likely series of correlating candidate characters selected from the at least one likely series of correlating candidate characters displayed in the correlating candidate character area of the display; and

displaying the selected likely series of candidate characters in the output buffer.

14. The method of claim 13, wherein the correlating candidate characters area of the display is a language model area and the likely series of correlating candidate characters is selected from the at least one likely series of correlating candidate characters displayed in the language model area.

15. The method of claim 13, wherein the correlating candidate characters area of the display is displayed through selection of a toolbar language model option and the likely series of correlating candidate characters is selected from the at least one likely series of correlating candidate characters displayed by selecting the tool bar language model option.

16. The method of claim 9, further comprising the steps of:

replacing the at least one likely candidate character displayed in the output buffer with one of the alternative candidate characters selected from the at least one alternative candidate characters;

displaying the selected alternative candidate character in the output buffer;

replacing the alternative candidate character displayed in the output buffer and stored in the memory with one of the likely series of correlating candidate characters selected from the at least one likely series of correlating candidate characters; and

displaying the selected likely series of correlating candidate characters in the output buffer.

17. The method of claim 16, wherein the correlating candidate characters area of the display is displayed in a language model area and the likely series of correlating candidate characters is selected from the at least one likely series of correlating candidate characters displayed in the language model area.

18. The method of claim 16, wherein the correlating candidate characters area of the display is displayed through selection of a toolbar language model option and the likely series of correlating candidate characters is selected from the at least one likely series of correlating candidate characters displayed by selecting the tool bar language model option.

19. A method comprising the steps of:

comparing input data received into a writing area of a display with character recognition data

identifying at least one likely candidate character representing a word likely to represent the input data;

identifying at least one likely series of correlating candidate characters for the at least one likely candidate character representing a series of correlated words likely to include a word representing the input data;

displaying the at least one likely candidate character in an output buffer area of said display; and

displaying the at least one likely series of correlating candidate characters in a correlating candidate area of the display.

20. The method of claim 19, further comprising the steps of:

storing the at least one likely candidate character in a memory.

21. The method of claim 19, further comprising the steps of:

storing the at least one likely series of correlating candidate characters in a memory.

22. The method of claim 19, further comprising the steps of:

replacing the at least one likely candidate character in the output buffer and stored in the memory with one of the likely series of correlating candidate characters selected from

the at least one likely series of correlating candidate characters ; and

displaying the selected likely series of candidate characters in the output buffer.

23. The method of 19., wherein the correlating candidate characters area of the display is displayed in a language model area and the likely series of correlating candidate characters is selected from the at least one likely series of correlating candidate characters displayed in the language model area.

24. The method of claim 19, wherein the correlating candidate characters area of the display is displayed through selection of a toolbar language model option and the likely series of correlating candidate characters is selected from the at least one likely series of correlating candidate characters displayed by selecting the tool bar language model option.

25. A method comprising the steps of:

comparing input data received from a writing area of a display with character recognition data;

identifying at least one series of correlating candidate characters representing a series of correlated words likely to include a word representing the input data; and

displaying the at least one series of correlating candidate characters in an area of the display.

26. The method of claim 25, further comprising the steps of:

storing the at least one series of correlating candidate characters in a memory.

27. The method of claim 25, wherein the at least one series of correlating candidate characters is displayed in an output buffer area of the display.

28. The method of claim 25, wherein the at least one series of correlating candidate characters is displayed in language model list area of the display.

29. A method comprising the steps of:

comparing input data received into a writing area of a display with character recognition data;

identifying at least one likely series of correlating candidate characters representing a series of correlated words likely to include a word representing the input data;

identifying at least one alternative series of correlating candidate characters representing an alternative series of correlated words likely to include a word representing the input data;

displaying the at least one series of correlating candidate characters in an output buffer area of the display; and

displaying the at least one alternative series of correlating candidate characters in a language model area of the display.

30. The method of claim 29, further comprising the steps of:

storing the at least one series of correlating candidate characters in a memory.

31. The method of claim 29, further comprising the steps of:

storing the at least one alternative series of correlating candidate characters in a memory.

32. The method of claim 29, further comprising the steps of:

replacing the at least one likely series of correlating candidate characters in the output buffer and stored in the memory with one of the alternative series of correlating candidate characters selected from the at least one alternative series of correlating candidate characters ; and

displaying the selected alternative series of candidate characters in the output buffer.

33. A method, comprising the steps of:

displaying a graphical image having an area thereof for receiving handwritten characters for comparison with recognition data to provide candidate recognition information comprising at least one likely candidate character presented in an output area of the graphical image, at least one alternate candidate character presented in a candidate character area of the graphical image, and at least one series of correlating candidate characters representing at least one set of words or phrases likely to be associated with the at least one likely candidate character, the series of correlating candidate characters presented in the correlating candidate character area of the graphical image; and

processing user instructions to replace the at least one likely candidate character presented in the output area with a candidate character selected from the at least one alternative candidate characters presented in the candidate character area of the graphical image, and replacing the at least one series of correlating candidate characters in the correlating candidate character area with a second series of correlating candidate characters likely to be associated with the candidate character selected from the at least one alternative candidate characters.

34. The method of claim 4, further comprising the steps of:

providing a tool bar that is movable about a display area, said tool bar having a plurality of options from which to select including but not limited to the following: language model display; on screen keyboard options; setup options; status bar options; and copy, send, clear, and help options.

35. The method of claim 4, wherein the toolbar may be disabled.

36. The method of claim 34, wherein said on screen keyboard is displayed when the toolbar on screen option is selected; said on screen keyboard having a plurality keyboards from which to select and enter input data including but not limited to the following: English; numeric; symbol; pin yin; and shuyin.

36. The method of claim 34, wherein each of the plurality of options of the tool bar has a prestored default setting; each of said default settings is configured to be replaceable with a preferred option input setting.

37. The method of claim 36, wherein the preferred option input setting replaces the prestored default setting and is then stored as the prestored default setting.

38. A device, comprising:

a digitizing display, said display having an input display area, an output buffer display area, a candidate list display area, and language model display area, said digitizing display adapted to receive into the input display area handwritten input;

display processing circuitry for presenting a graphical image on the digitizing display representing the handwritten input, and for processing the handwritten input to provide handwritten information data;

a memory having at least recognition data stored therein;

digital processing circuitry for comparing the handwritten information data with the recognition data to provide to the display processing circuitry candidate recognition information including at least one likely candidate character representing at least one likely word corresponding to the handwritten input; at least one likely alternative candidate character representing at least one likely alternative word corresponding to the handwritten character, and at least one series of correlating

candidate characters representing a series of correlating words that include at least one likely word representing the handwritten input;

wherein the display circuitry displays for user interaction in an output buffer area the at least one likely candidate character, and displays in a candidate list area the at least one likely alternative candidate character, and displays in the language model display area at least one series of correlating candidate characters.

39. A device, comprising:

a digitizing display for digitizing into a plurality of graphical images that represent input data and for displaying the graphical images, said plurality of graphical images including at least one likely candidate character displayed in one portion of the digitizing display, at least one likely alternative candidate character displayed in a second portion of the digitizing display, and at least one series of correlating candidate characters displayed in a third portion of the digitizing display;

a memory having at least recognition data stored therein;

digital processing circuitry for processing input data to provide candidate character information for comparison with the recognition data to provide said plurality of graphical images that represents the input data for user interaction.

40. A device, comprising:

a digitizing display for presenting a graphical image on the digitizing display and for displaying a likely candidate character in one portion of the graphical image, other candidate recognition information in a second portion of the graphical image, and characters or words that may be likely characters or words to associate with the likely candidate character in a third portion of the graphical image;

display processing circuitry for displaying the graphical image on the digitizing display and for processing characters handwritten within a writing area of the graphical image to provide information representing the handwritten characters;

a memory having instructions and recognition data stored therein;

digital processing circuitry including a digital processing device for processing the instructions stored in the memory to compare the information representing the handwritten characters with the recognition data to provide candidate recognition information including at least the likely candidate character to the display processing circuitry, and for processing the instructions to generate the characters or words that may be likely characters or words to associate with the likely candidate character.

41. A device, comprising:

a digitizing display;

a memory having instructions and recognition data stored therein;

digital processing circuitry including a programmable digital processing device capable of performing a plurality of functions by processing at least portions of the instructions stored in the memory, the plurality of functions comprising;

displaying a graphical image on the digitizing display;

processing characters handwritten within a writing area of the graphical image to provide information representing the handwritten characters;

comparing the information representing the handwritten characters with the recognition data stored in the memory to provide candidate recognition information including at least a likely candidate character;

generating characters or words that may be likely characters or words to associate with the likely candidate character; and

displaying the likely candidate character in one portion of the graphical image, other candidate recognition information in a second portion of the graphical image, and characters or words that may be likely characters or words to associate with the likely candidate character in a third portion of the graphical image.

42. A device, comprising:

a digitizing display;

a memory having instructions and recognition data stored therein;

digital processing circuitry including a programmable digital processing device capable of emulating the functionality of a plurality of circuits by processing at least portions of the instructions stored in the memory, the plurality of circuits comprising;

display processing circuitry for displaying a graphical image on the digitizing display;

digitizing circuitry for processing characters handwritten within a writing area of the graphical image to provide information representing the handwritten characters;

comparison circuitry for comparing the information representing the handwritten characters with the recognition data stored in the memory to provide candidate recognition information including at least a likely candidate character to the display processing circuitry;

circuitry to generate characters or words that may be likely characters or words to associate with the likely candidate character; and

graphics generation circuitry for generating the graphical image and for displaying a likely candidate character in one portion of the graphical image, other candidate

recognition information in a second portion of the graphical image, and characters or words that may be likely characters or words to associate with the likely candidate character in a third portion of the graphical image.

43. A device, comprising:

a digitizing display;

a memory having an operating system and application programs stored therein, and including handwriting recognition instructions and recognition data;

digital processing circuitry including a programmable digital processing device capable of functional emulation of a plurality of circuits by processing the handwriting recognition instructions in accordance with the operating system, the plurality of circuits comprising;

display processing circuitry for displaying a graphical image on the digitizing display;

digitizing circuitry for processing characters handwritten within a writing area of the graphical image to provide information representing the handwritten characters;

comparison circuitry for comparing the information representing the handwritten characters with the recognition data stored in the memory to provide candidate recognition information including at least a likely candidate character to the display processing circuitry;

circuitry to generate characters or words that may be likely characters or words to associate with the likely candidate character; and

graphics generation circuitry for generating the graphical image and for displaying a likely candidate character in one portion of the graphical image, other candidate recognition information in a second portion of the graphical image, and characters or words that may be likely characters or words to associate with the likely candidate character in a third portion of the graphical image.

44. A device, comprising:

a digitizing display;

a memory having an operating system and application programs stored therein, and including handwriting recognition instructions and recognition data;

digital processing circuitry including a programmable digital processing device capable of functional emulation of a plurality of circuits by processing the handwriting recognition instructions in accordance with the operating system, the plurality of circuits comprising;

display processing circuitry for displaying a graphical image on the digitizing display;

digitizing circuitry for processing characters handwritten within a writing area of the graphical image to provide information representing the handwritten characters;

comparison circuitry for comparing the information representing the handwritten characters with the recognition data stored in the memory to provide candidate recognition information including at least a likely candidate character to the display processing circuitry;

circuitry to generate characters or words that may be likely characters or words to associate with the likely candidate character;

graphics generation circuitry for generating the graphical image and for displaying a likely candidate character in a first portion of the graphical image, other candidate recognition information in a second portion of the graphical image, and characters or words that may be likely characters or words to associate with the likely candidate character in a third portion of the graphical image;

the plurality of circuits further comprising at least one circuit selected from the group of circuits consisting of:

character editing circuitry capable of replacing the likely candidate character with selected candidate character

information from the second portion of the graphical image responsive to user instructions to present a corrected recognition character in the first portion of the graphical image;

phrase editing circuitry capable of presenting selected characters or words from the third portion of the digitizing display in the first portion of the graphic image responsive to user instructions;

data routing circuitry operating in accordance with the operating system for routing all characters presented in the first portion of the graphic image to at least one of the application programs responsive to user instructions selected in a command portion of the graphical image.

45. The device of claim 10, wherein the circuitry to generate characters or words that may be likely characters or words to associate with the likely candidate character further generates a second set of characters or words that may be likely characters or words to associate with the corrected candidate character provided by the character editing circuitry, whereby the graphics generation circuitry operates to replace the characters or words in the third portion of the graphic image with the second set of character or words.

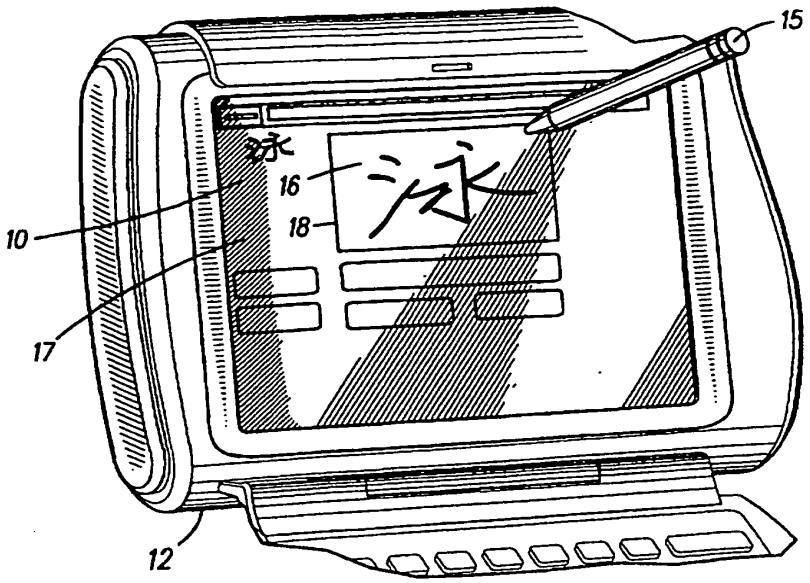


FIG.1

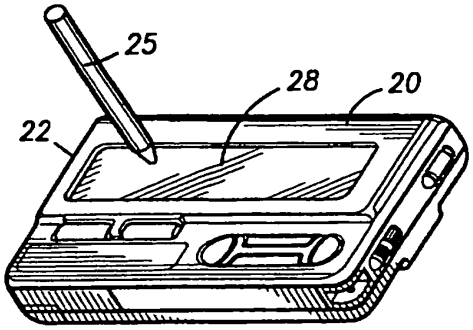


FIG.2

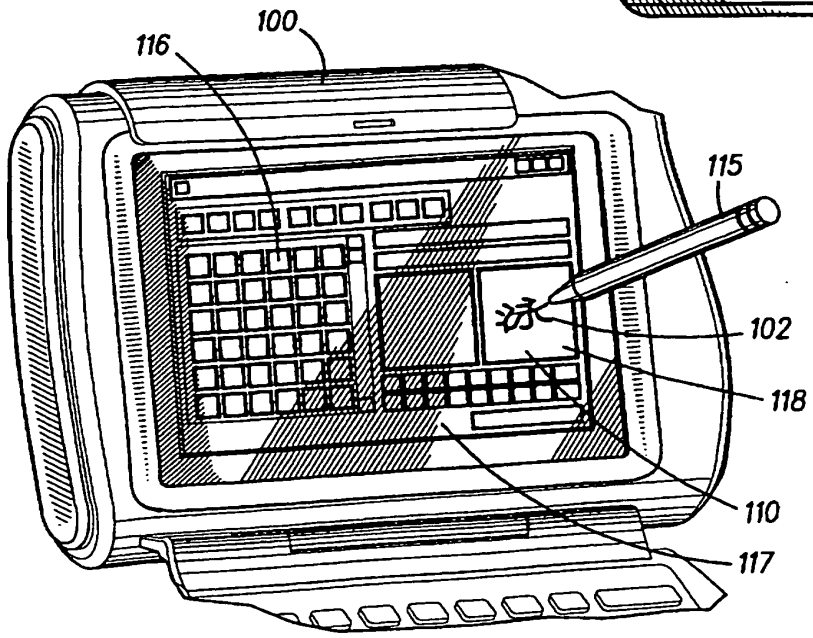


FIG.3

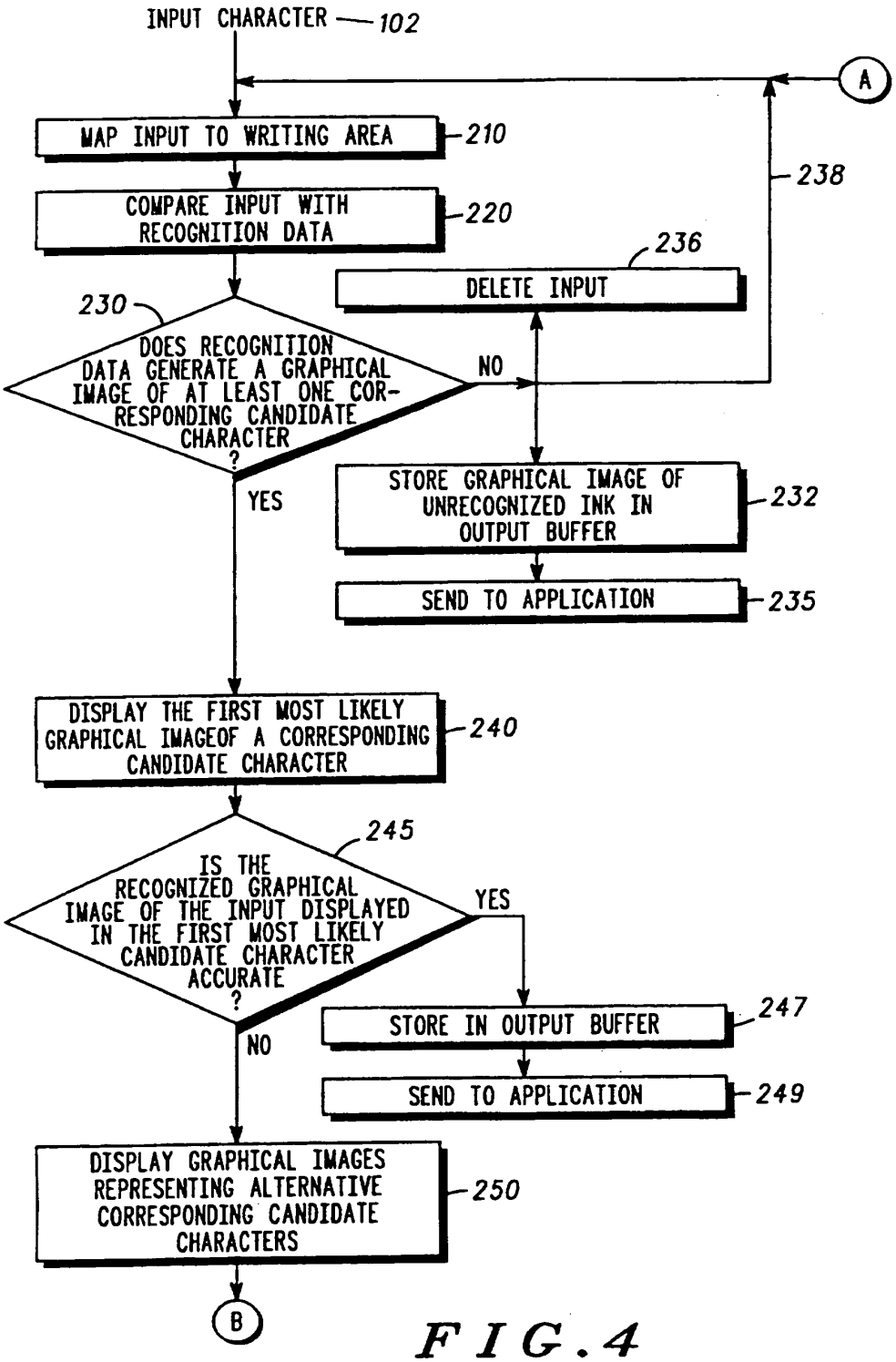

INPUT CHARACTER
102
A
MAP INPUT TO WRITING AREA
210
COMPARE INPUT WITH RECOGNITION DATA
220
238
236
DELETE INPUT
230
DOES RECOGNITION DATA GENERATE A GRAPHICAL IMAGE OF AT LEAST ONE CORRESPONDING CANDIDATE CHARACTER ?
NO
YES
STORE GRAPHICAL IMAGE OF UNRECOGNIZED INK IN OUTPUT BUFFER
232
SEND TO APPLICATION
235
DISPLAY THE FIRST MOST LIKELY GRAPHICAL IMAGEOF A CORRESPONDING CANDIDATE CHARACTER
240
245
IS THE RECOGNIZED GRAPHICAL IMAGE OF THE INPUT DISPLAYED IN THE FIRST MOST LIKELY CANDIDATE CHARACTER ACCURATE ?
YES
NO
STORE IN OUTPUT BUFFER
247
SEND TO APPLICATION
249
DISPLAY GRAPHICAL IMAGES REPRESENTING ALTERNATIVE CORRESPONDING CANDIDATE CHARACTERS
250
B

FIG. 4

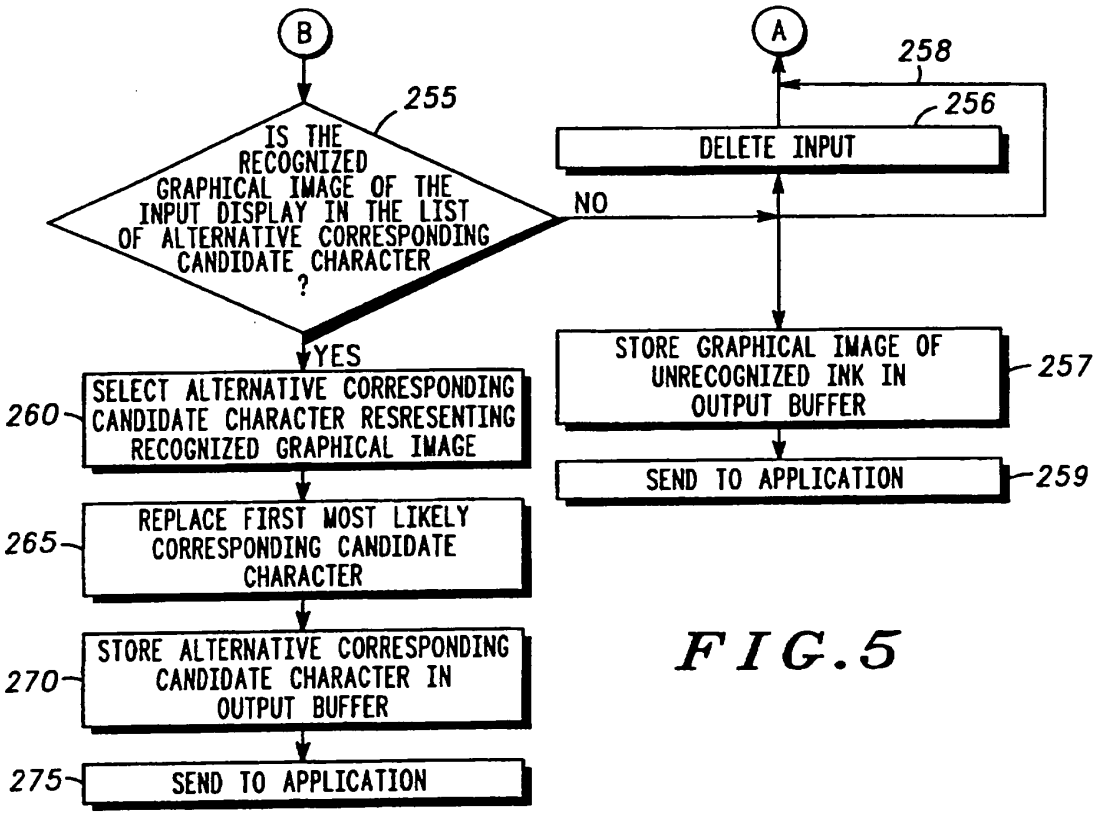

B
255
IS THE RECOGNIZED GRAPHICAL IMAGE OF THE INPUT DISPLAY IN THE LIST OF ALTERNATIVE CORRESPONDING CANDIDATE CHARACTER ?
YES
260
SELECT ALTERNATIVE CORRESPONDING CANDIDATE CHARACTER RESRESENTING RECOGNIZED GRAPHICAL IMAGE
265
REPLACE FIRST MOST LIKELY CORRESPONDING CANDIDATE CHARACTER
270
STORE ALTERNATIVE CORRESPONDING CANDIDATE CHARACTER IN OUTPUT BUFFER
275
SEND TO APPLICATION
A
258
256
DELETE INPUT
NO
STORE GRAPHICAL IMAGE OF UNRECOGNIZED INK IN OUTPUT BUFFER
257
SEND TO APPLICATION
259

FIG.5

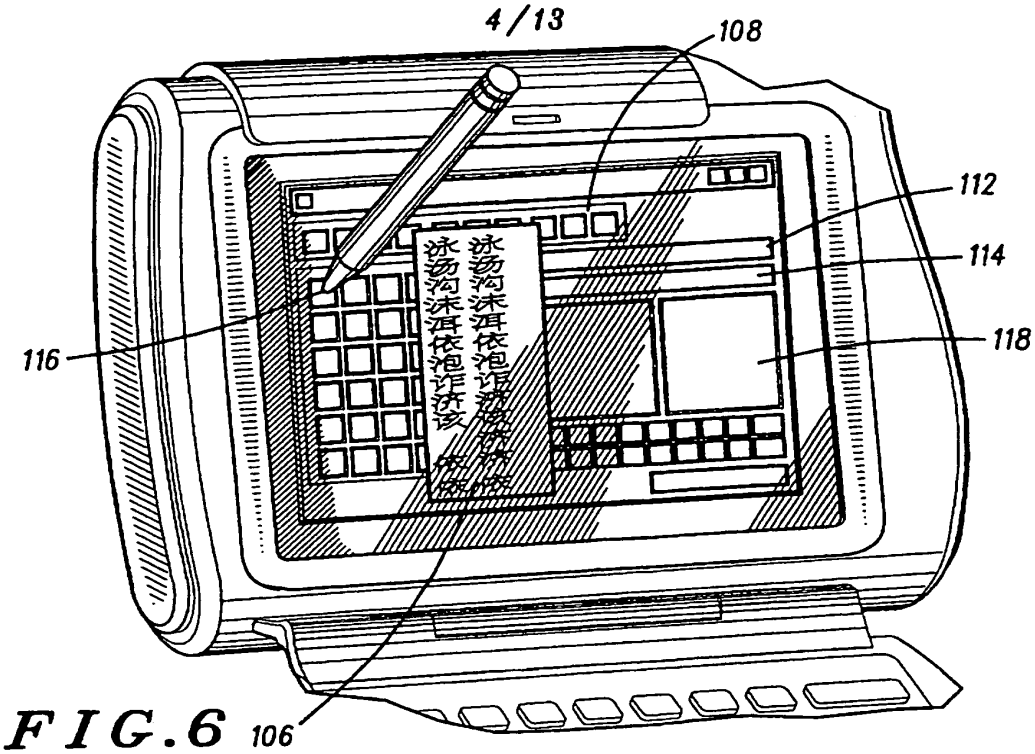


FIG.6

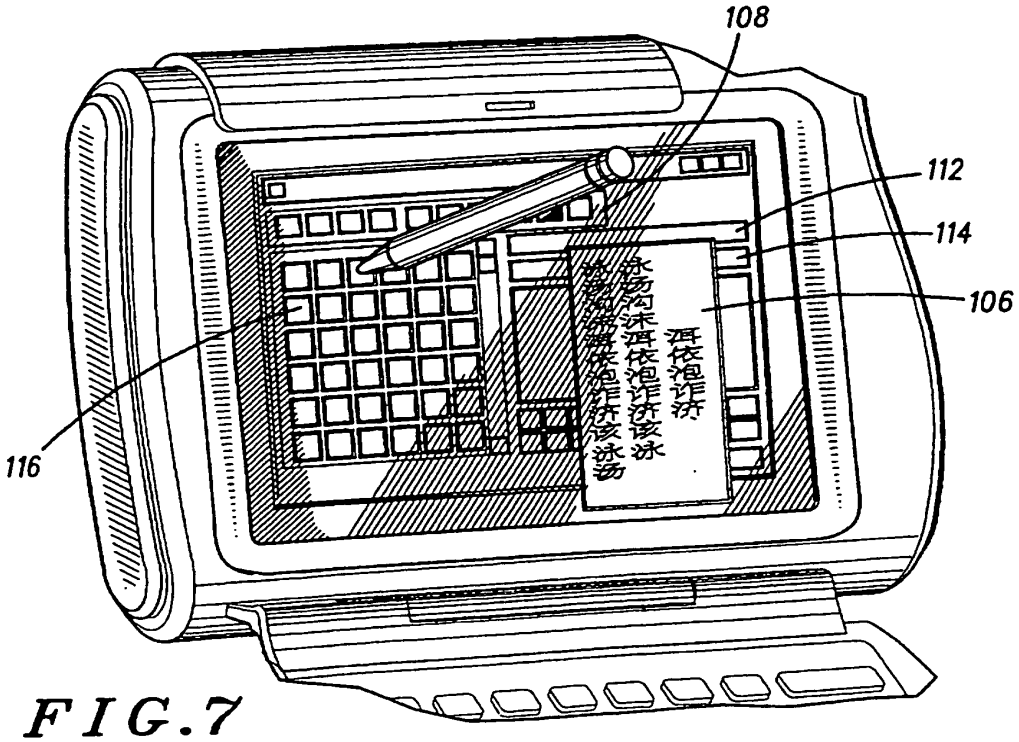


FIG.7

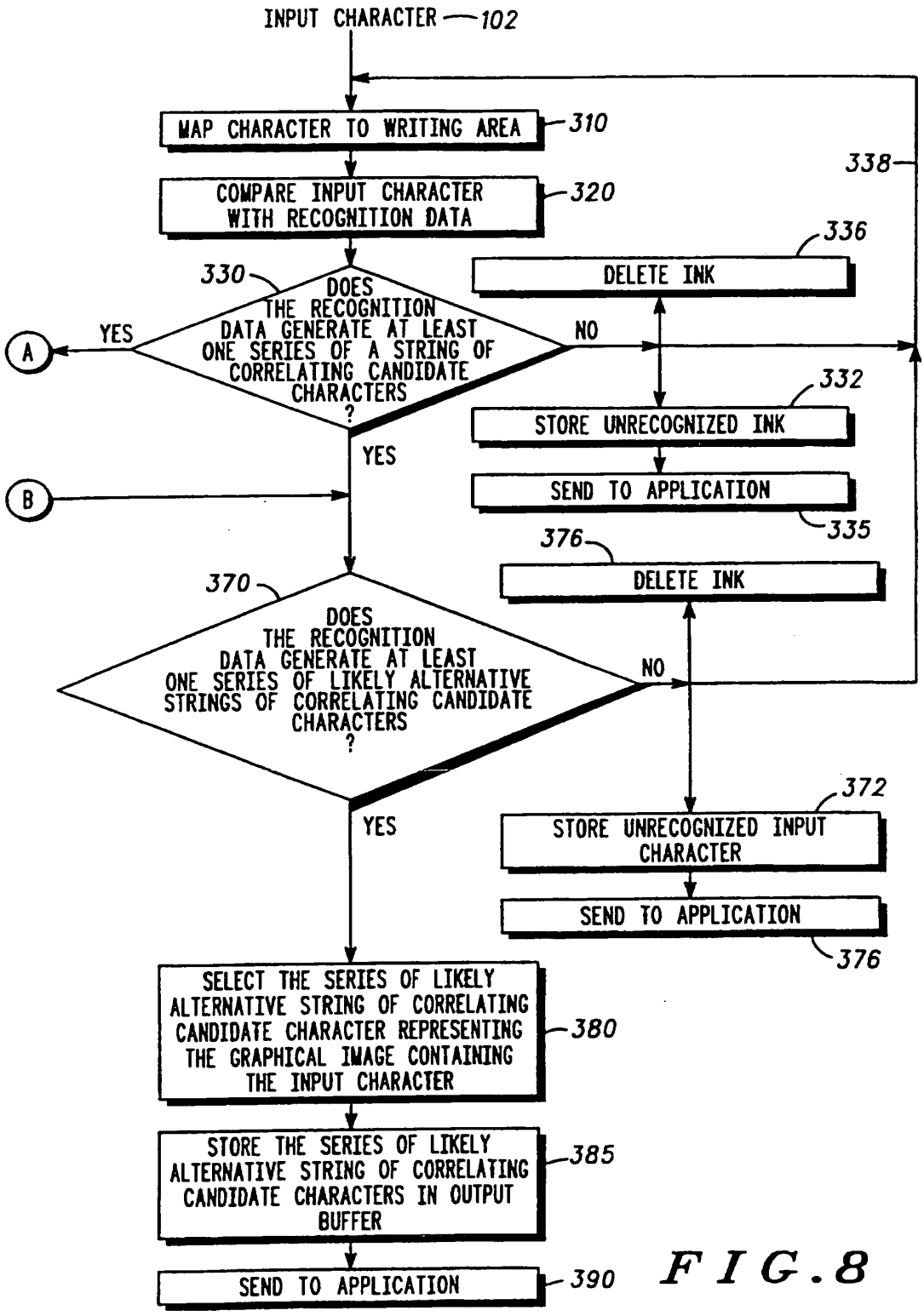
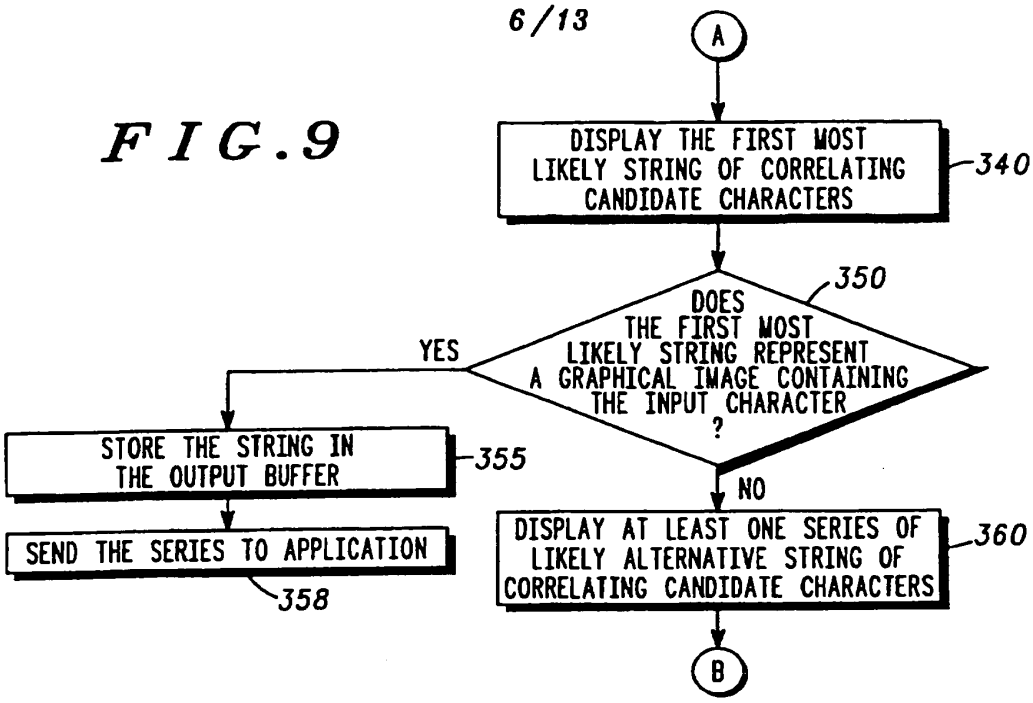

INPUT CHARACTER
102
MAP CHARACTER TO WRITING AREA
310
COMPARE INPUT CHARACTER WITH RECOGNITION DATA
320
338
336
DELETE INK
330
DOES THE RECOGNITION DATA GENERATE AT LEAST ONE SERIES OF A STRING OF CORRELATING CANDIDATE CHARACTERS ?
YES
NO
A
332
STORE UNRECOGNIZED INK
SEND TO APPLICATION
335
YES
B
376
DELETE INK
370
DOES THE RECOGNITION DATA GENERATE AT LEAST ONE SERIES OF LIKELY ALTERNATIVE STRINGS OF CORRELATING CANDIDATE CHARACTERS ?
NO
372
STORE UNRECOGNIZED INPUT CHARACTER
YES
SEND TO APPLICATION
376
SELECT THE SERIES OF LIKELY ALTERNATIVE STRING OF CORRELATING CANDIDATE CHARACTER REPRESENTING THE GRAPHICAL IMAGE CONTAINING THE INPUT CHARACTER
380
STORE THE SERIES OF LIKELY ALTERNATIVE STRING OF CORRELATING CANDIDATE CHARACTERS IN OUTPUT BUFFER
385
SEND TO APPLICATION
390

FIG. 8

FIG.9


A
DISPLAY THE FIRST MOST LIKELY STRING OF CORRELATING CANDIDATE CHARACTERS
340
350
DOES THE FIRST MOST LIKELY STRING REPRESENT A GRAPHICAL IMAGE CONTAINING THE INPUT CHARACTER ?
YES
NO
STORE THE STRING IN THE OUTPUT BUFFER
355
SEND THE SERIES TO APPLICATION
358
DISPLAY AT LEAST ONE SERIES OF LIKELY ALTERNATIVE STRING OF CORRELATING CANDIDATE CHARACTERS
360
B

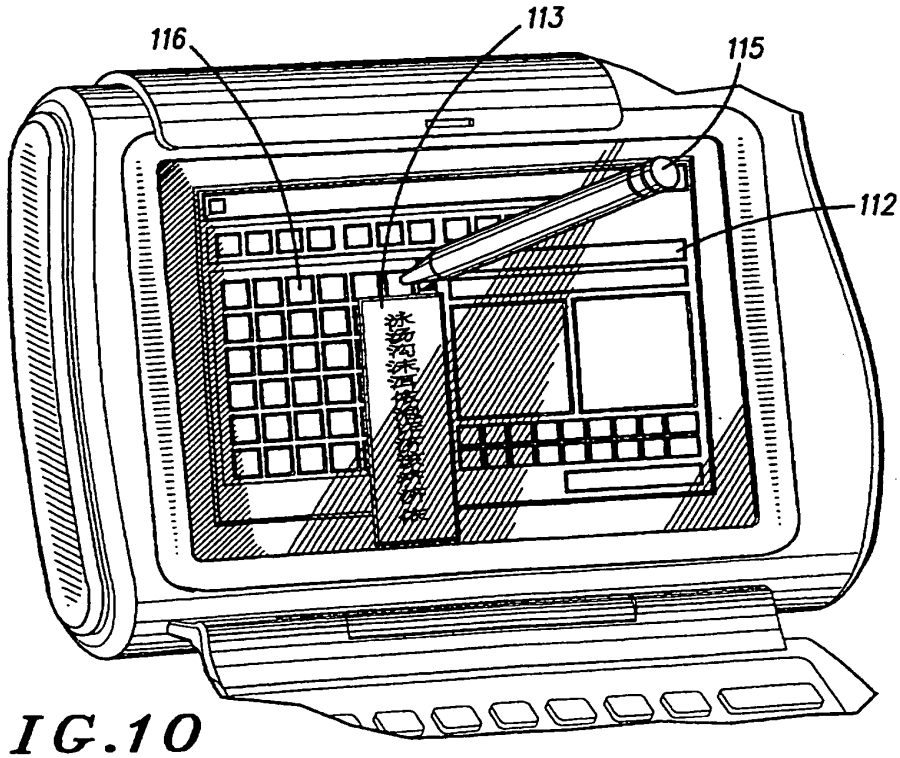

116
113
115
112

FIG.10

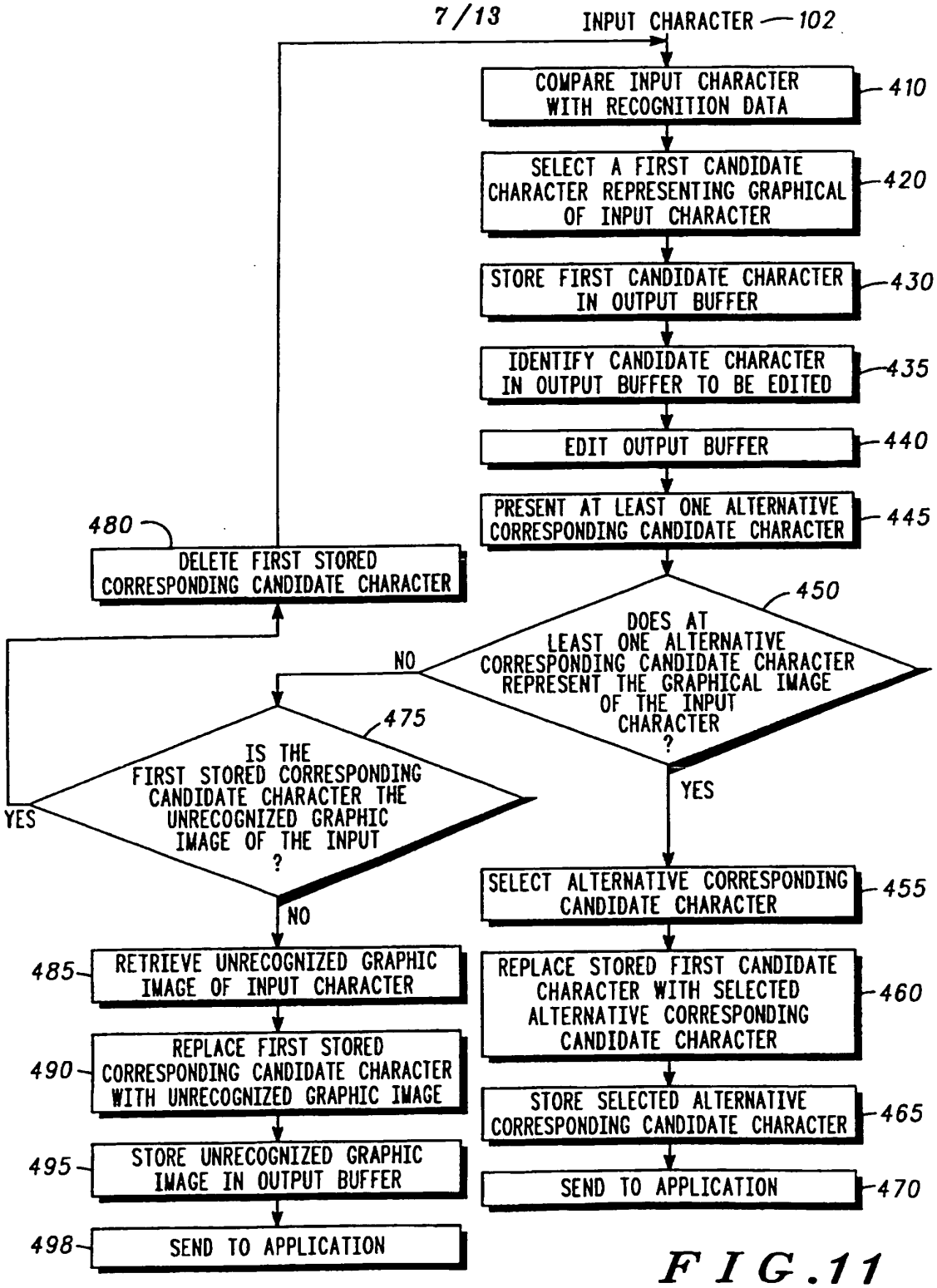

INPUT CHARACTER 102
COMPARE INPUT CHARACTER WITH RECOGNITION DATA
410
SELECT A FIRST CANDIDATE CHARACTER REPRESENTING GRAPHICAL OF INPUT CHARACTER
420
STORE FIRST CANDIDATE CHARACTER IN OUTPUT BUFFER
430
IDENTIFY CANDIDATE CHARACTER IN OUTPUT BUFFER TO BE EDITED
435
EDIT OUTPUT BUFFER
440
PRESENT AT LEAST ONE ALTERNATIVE CORRESPONDING CANDIDATE CHARACTER
445
DOES AT LEAST ONE ALTERNATIVE CORRESPONDING CANDIDATE CHARACTER REPRESENT THE GRAPHICAL IMAGE OF THE INPUT CHARACTER ?
450
NO
YES
SELECT ALTERNATIVE CORRESPONDING CANDIDATE CHARACTER
455
REPLACE STORED FIRST CANDIDATE CHARACTER WITH SELECTED ALTERNATIVE CORRESPONDING CANDIDATE CHARACTER
460
STORE SELECTED ALTERNATIVE CORRESPONDING CANDIDATE CHARACTER
465
SEND TO APPLICATION
470
480
DELETE FIRST STORED CORRESPONDING CANDIDATE CHARACTER
IS THE FIRST STORED CORRESPONDING CANDIDATE CHARACTER THE UNRECOGNIZED GRAPHIC IMAGE OF THE INPUT ?
475
YES
NO
485
RETRIEVE UNRECOGNIZED GRAPHIC IMAGE OF INPUT CHARACTER
490
REPLACE FIRST STORED CORRESPONDING CANDIDATE CHARACTER WITH UNRECOGNIZED GRAPHIC IMAGE
495
STORE UNRECOGNIZED GRAPHIC IMAGE IN OUTPUT BUFFER
498
SEND TO APPLICATION

FIG.11

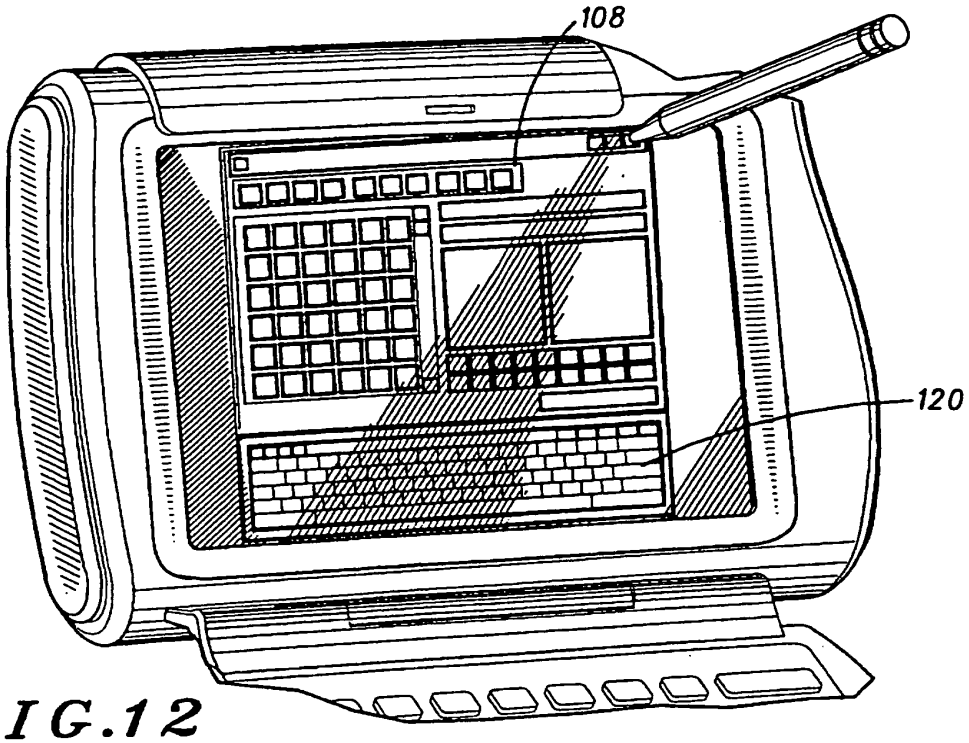
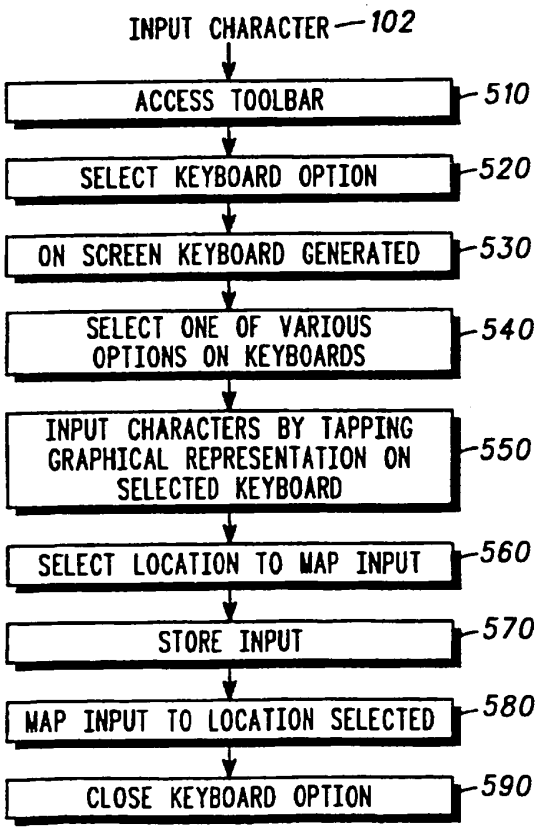

108
120

FIG.12

FIG.13


INPUT CHARACTER
102
ACCESS TOOLBAR
510
SELECT KEYBOARD OPTION
520
ON SCREEN KEYBOARD GENERATED
530
SELECT ONE OF VARIOUS OPTIONS ON KEYBOARDS
540
INPUT CHARACTERS BY TAPPING GRAPHICAL REPRESENTATION ON SELECTED KEYBOARD
550
SELECT LOCATION TO MAP INPUT
560
STORE INPUT
570
MAP INPUT TO LOCATION SELECTED
580
CLOSE KEYBOARD OPTION
590

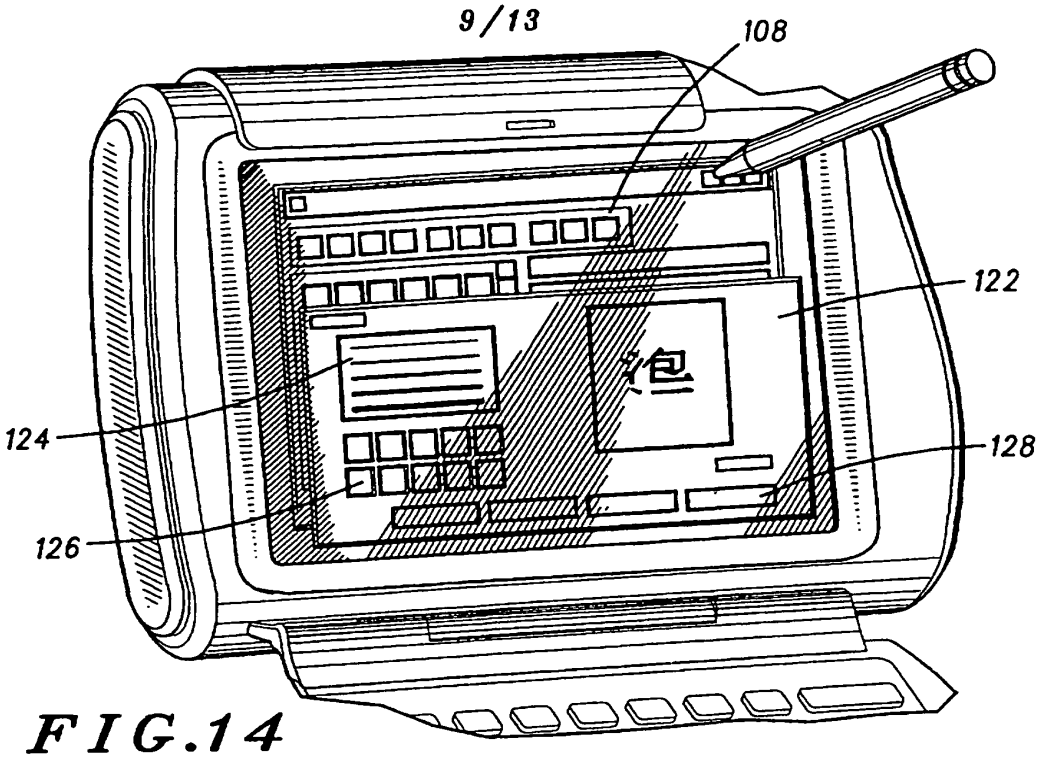

108
122
124
128
126

FIG.14

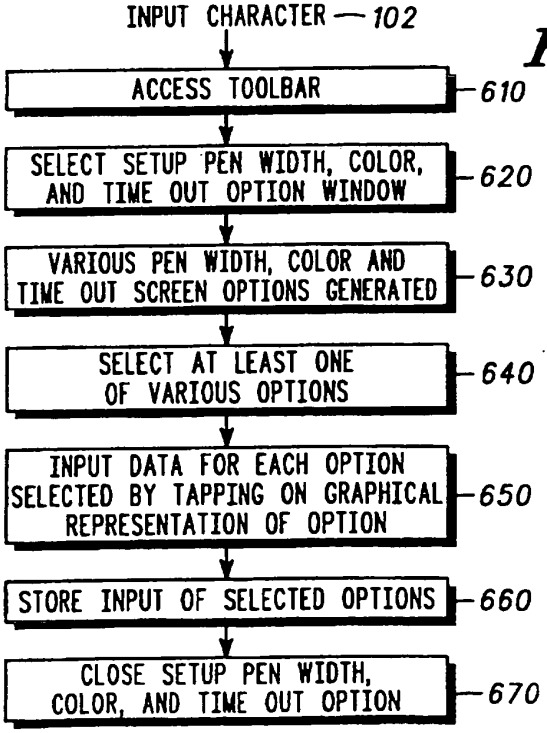

INPUT CHARACTER — 102
ACCESS TOOLBAR
610
SELECT SETUP PEN WIDTH, COLOR, AND TIME OUT OPTION WINDOW
620
VARIOUS PEN WIDTH, COLOR AND TIME OUT SCREEN OPTIONS GENERATED
630
SELECT AT LEAST ONE OF VARIOUS OPTIONS
640
INPUT DATA FOR EACH OPTION SELECTED BY TAPPING ON GRAPHICAL REPRESENTATION OF OPTION
650
STORE INPUT OF SELECTED OPTIONS
660
CLOSE SETUP PEN WIDTH, COLOR, AND TIME OUT OPTION
670

FIG.15

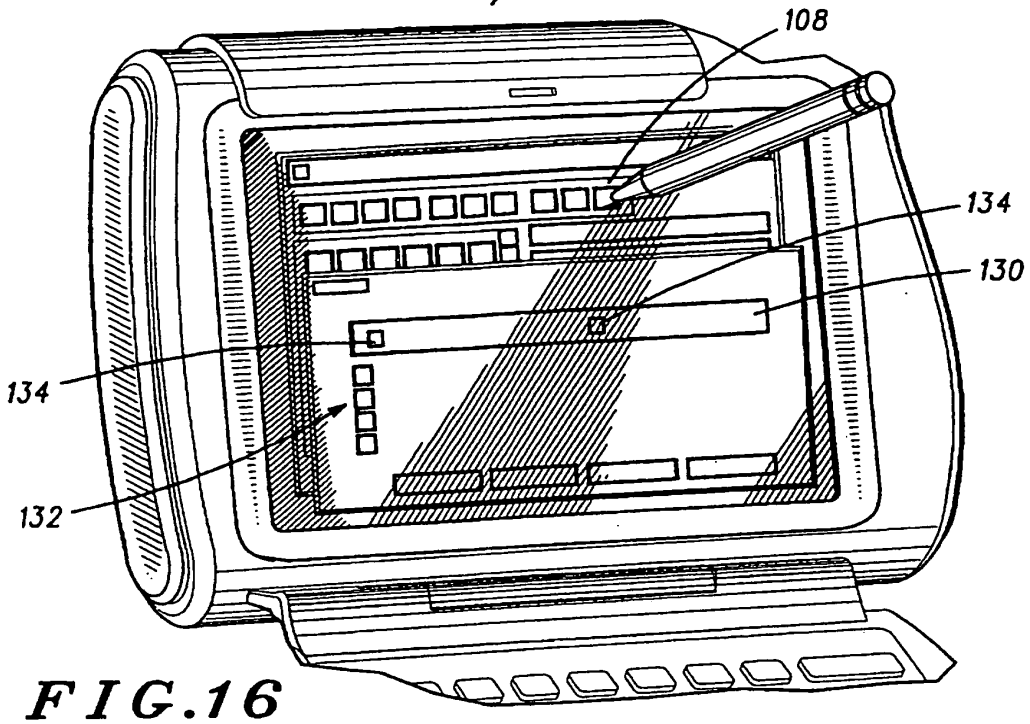

108
134
130
134
132

FIG.16

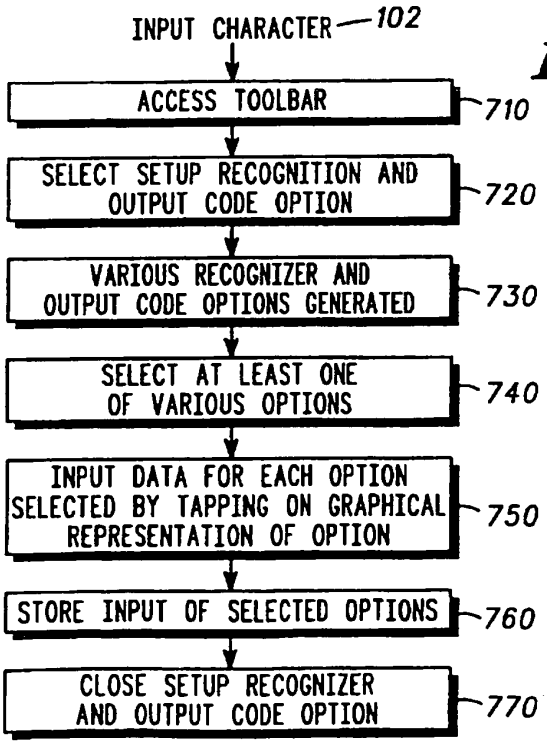

INPUT CHARACTER
102
ACCESS TOOLBAR
710
SELECT SETUP RECOGNITION AND OUTPUT CODE OPTION
720
VARIOUS RECOGNIZER AND OUTPUT CODE OPTIONS GENERATED
730
SELECT AT LEAST ONE OF VARIOUS OPTIONS
740
INPUT DATA FOR EACH OPTION SELECTED BY TAPPING ON GRAPHICAL REPRESENTATION OF OPTION
750
STORE INPUT OF SELECTED OPTIONS
760
CLOSE SETUP RECOGNIZER AND OUTPUT CODE OPTION
770

FIG.17

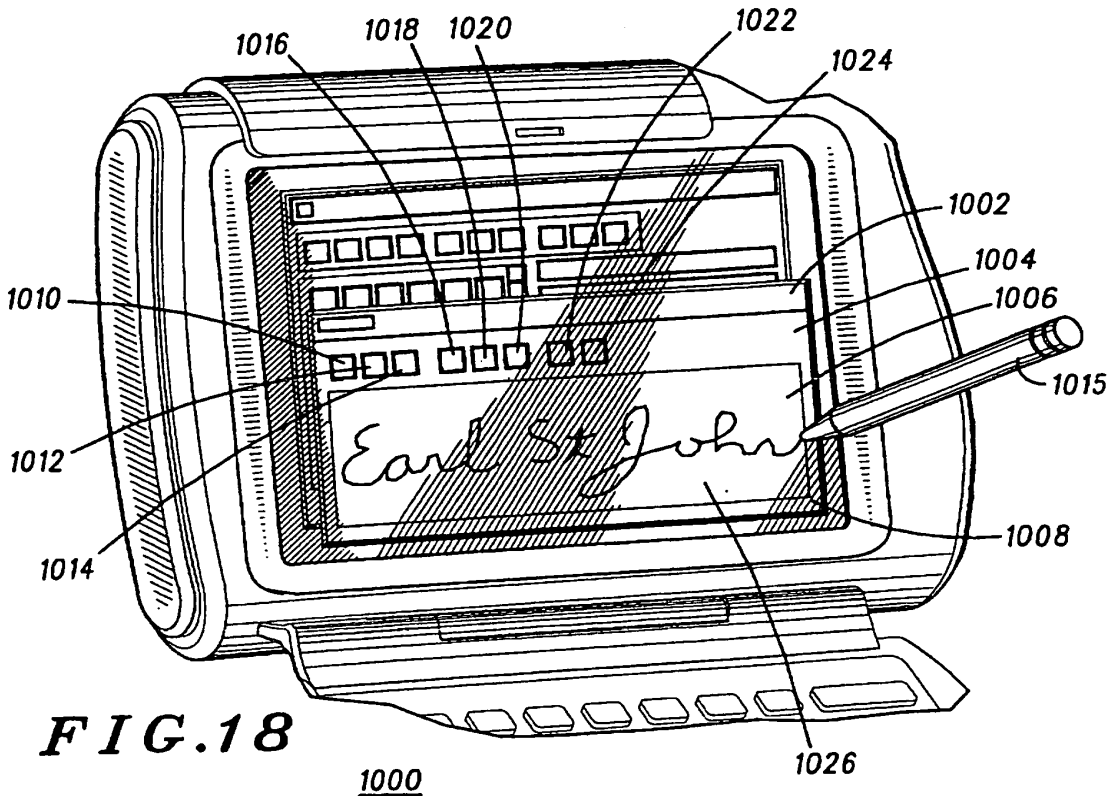

1016
1018
1020
1022
1024
1002
1004
1006
1010
1015
1012
1014
1008
1026
1000

FIG.18

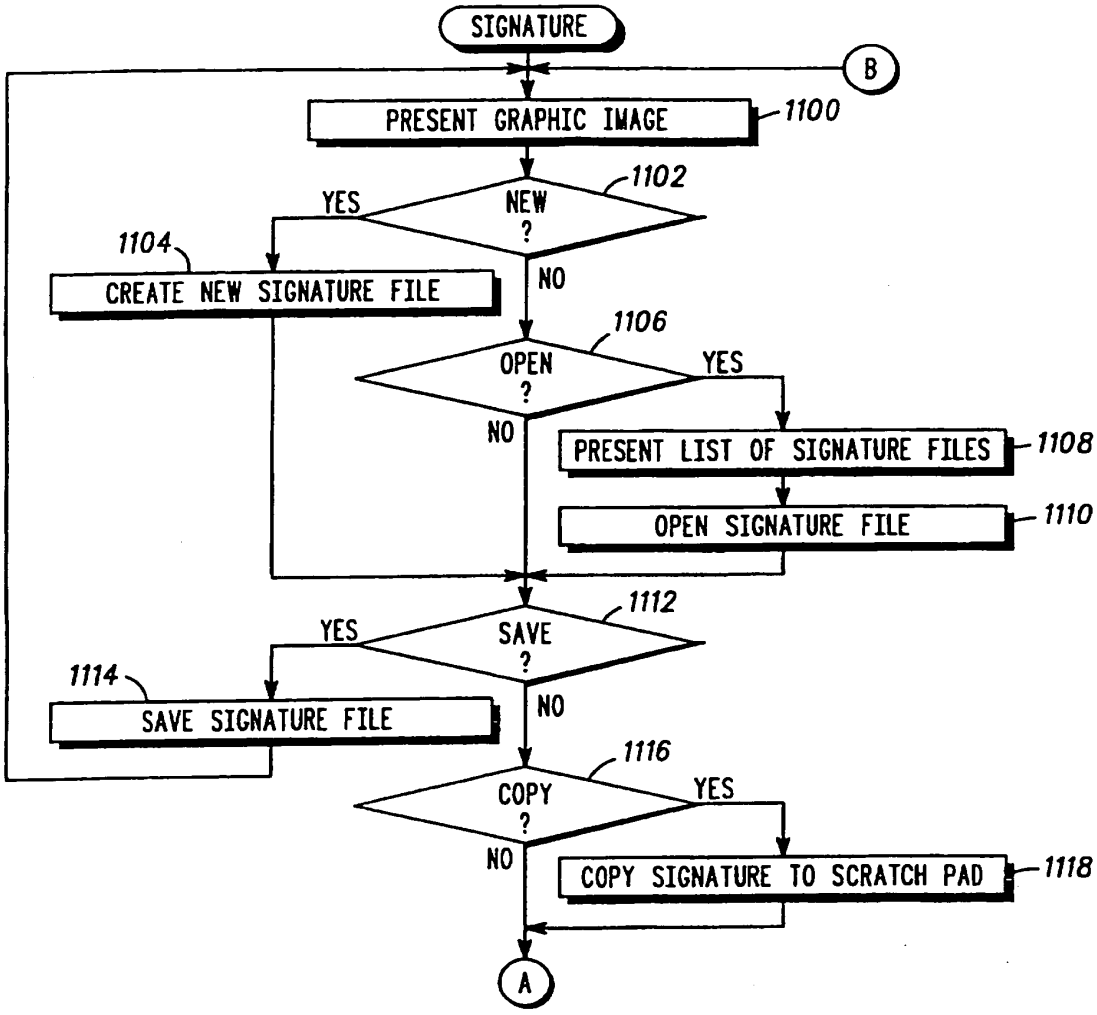

SIGNATURE
B
PRESENT GRAPHIC IMAGE
1100
NEW ?
1102
YES
NO
1104
CREATE NEW SIGNATURE FILE
OPEN ?
1106
YES
NO
PRESENT LIST OF SIGNATURE FILES
1108
OPEN SIGNATURE FILE
1110
SAVE ?
1112
YES
NO
1114
SAVE SIGNATURE FILE
COPY ?
1116
YES
NO
COPY SIGNATURE TO SCRATCH PAD
1118
A

FIG.19

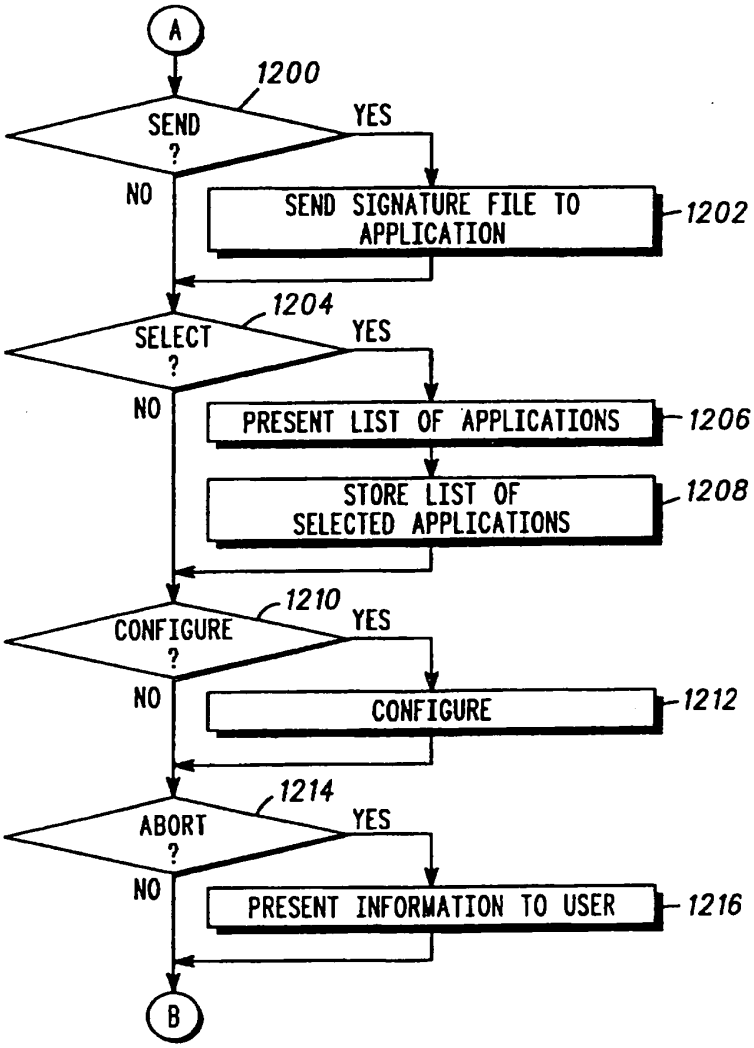

A
1200
SEND ?
YES
NO
SEND SIGNATURE FILE TO APPLICATION
1202
1204
SELECT ?
YES
NO
PRESENT LIST OF APPLICATIONS
1206
STORE LIST OF SELECTED APPLICATIONS
1208
1210
CONFIGURE ?
YES
NO
CONFIGURE
1212
1214
ABORT ?
YES
NO
PRESENT INFORMATION TO USER
1216
B

FIG. 20

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/18220

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :G06K 9/00, 9/03; G10L 3/02; G06F 15/00
US CL :382/187, 188, 189, 309; 395/2.6, 149

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. . 382/187, 188, 189, 309; 395/2.6, 149

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

MAYA ELECTRONIC SEARCH

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, A, 5,329,609 (SANADA ET AL) 12 July 1994, Abstract, Figures 1-16, col. 3, lines 7-32, col. 11, lines 10-43.	1-45
A	US, A, 5,020,117 (OOI ET AL) 28 May 1991, Abstract, Figures 1-14.	1-45
X	US, A, 5,410,612 (ARAI ET AL) 25 April 1995, Abstract, Figures 1-5.	1-45
X	US, A, 5,455,901 (FRIEND ET AL) 03 October 1995, Abstract, Figures 1-8.	1-45

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search
19 DECEMBER 1996

Date of mailing of the international search report
11 FEB 1997

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(71)(72) Applicants and Inventors: SPARR, Gunnar [SE/SE]; Vallkärra 6, S-225 91 Lund (SE). BERTHILSSON, Rikard [SE/SE]; Kämnärsvägen 7H:321, S-226 46 Lund (SE).

(74) Agent: AWAPATENT AB; P.O. Box 45086, S-104 30 Stockholm (SE).

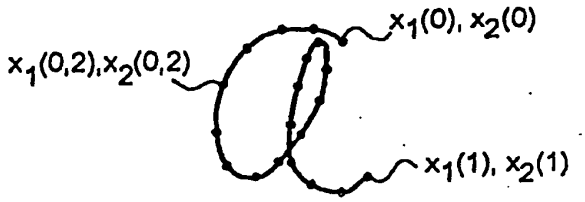
(81) Designated States: AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), DM, EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

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(54) Title: CHARACTER RECOGNITION

(57) Abstract

The invention relates to a method for character recognition comprising the steps of: detecting a union of characters, preprocessing the union of characters, comparing the preprocessed union of characters with one or more template symbols, and applying a decision rule in order to either reject a template symbol or decide that the template symbol is included in the union of characters. The step of preprocessing the union of characters comprising the steps of: representing the union of characters as one or more curves, and parameterising said curve or curves, and regarding various classes of transformation forming one or more shapes for said curve or curves. The step of comparing comprises the steps of: forming one or more geometric proximity measures, and determining for every shape the values of said geometric proximity measures between said shape and correspondingly determined shapes for the template symbols. Finally, the step of applying a decision rule comprises the step of: selecting one or more template symbols in consideration of said values.



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CHARACTER RECOGNITION

Technical Field

The present invention relates to a method for character recognition according to the preamble to claim 1. "Character" is in this compound neutral regarding number, i.e. separate characters, such as letters and numerals, as well as compositions of several characters, such as words, are here referred to. Both generally used characters and imaginary characters are, of course, included.

Background Art

There are a plurality of known methods for character recognition, especially for recognition of handwritten characters, which requires especially good interpretation of the character. Several of the known methods are based on the detection of each stroke of the pen when a handwritten character is being formed. Geometric characteristics, such as directions, inclinations and angles of each stroke or part of a stroke, are determined and compared to corresponding data for stored, known characters. The written character is supposed to be the stored character whose geometric characteristics best correspond to the geometric characteristics of the written character. The geometric characteristics are related to an xy-coordinate system, which covers the used writing surface. Such known methods are disclosed in, for instance, US-5,481,625 and US-5,710,916. A problem in such methods is that they are sensitive to rotation. For example, if one writes diagonally over the writing surface, the method has difficulties in correctly determining what characters are being written.

US-5,537,489 discloses a method for preprocessing the characters by normalising them. The written character is sampled, and each sample is represented as a pair of

coordinates. Instead of solely comparing the characters in the coordinate plane, the transformation is determined which best adjusts the written character to a model character. Indirectly, also rotation and certain types of deformations, which the above-mentioned methods cannot handle, are thus taken into account. The transformation is used to normalise the written character. In particular, the character is normalised by being translated so that its central point is in the origin of coordinates, where also the central point of the model character is found, after which the character is scaled and rotated in such a manner that it corresponds to the model character in the best possible way.

A disadvantage of this method is that the normalisation requires computing power and that in any case the choice of model characters has to take place by determining what model character the written character resembles the most.

Another method which certainly can handle rotations is disclosed in US-5,768,420. In this known method, curve recognition is described by means of a ratio that is named "ratio of tangents". A curve, for instance, a portion of a character is mapped by selecting a sequence of pairs of points along the curve, where the tangents in the two points of each pair intersect at a certain angle. The ratio between the distances from the intersection point to the respective points of the pair is calculated and makes up an identification of the curve. This method is in principle not sensitive to translation, scaling and rotation. However, it is limited in many respects. Above all, it does not allow certain curve shapes in which there are not two points whose tangents intersect at the determined angle. It is common that at least portions of a character comprise such indeterminable curve shapes for a selected intersection angle. This reduces the reliability of the method.

Summary of the Invention

An object of the invention is to provide a method for character recognition, which does not have the above-mentioned disadvantages, and which to a larger extent accepts individual styles of handwritten characters and unusual fonts of typewritten characters, and is easy to implement with limited computing power.

The object is achieved by a method according to the invention as defined in claim 1.

According to the invention, the term "template symbol" means, as defined in the claim, everything from a portion of a separate character, the portion being, for instance, an arc or a partial stroke and the character being a letter or a numeral, to compound words or other complex characters. In a similar way, the term "union of characters" means everything from a separate character to compositions of several characters. The extension of the mentioned terms will be evident from the following description of embodiments.

Brief Description of the Drawings

The invention and further advantages thereof will be described in more detail below by way of embodiments referring to the accompanying drawings, in which

Fig. 1 shows an example of a union of characters which comprises a handwritten character, and which illustrates some steps in a preferred embodiment of the method according to the invention,

Figs 2 and 3 show examples of various transformations of a union of characters which comprises a handwritten character,

Fig. 4 shows an example of recognition of a union of characters which comprises several characters, and

Fig. 5 shows an embodiment of a device for carrying out the method.

Description of Embodiments

According to the invention, the method for character recognition comprises a number of main steps:

a) a union of characters is detected,

b) the union of characters is preprocessed,

c) the preprocessed union of characters is compared with one or more template symbols, and

d) a decision rule is applied in order to determine whether or not any one of the template symbols is included in the union of characters.

According to a preferred embodiment, the various main steps are carried out in accordance with the following description. The embodiment is preferably intended for recognising unions of characters that are written on a pressure-sensitive display, which is available on the market. It should be noted that the invention is just as useful for recognising typewritten as handwritten unions of characters that originate from a hard copy, which for instance is scanned into a computer. An embodiment which is particularly adapted to recognition of typewritten, scanned unions of characters will be described below. In the following description of the steps of this embodiment, it will for the sake of simplicity be presumed that the union of characters comprises one character.

In step a), points on the character are detected at regular time intervals at the same time as the character is being written on the pressure-sensitive display. Thus, an ordered sequence of points is obtained. In step b), the following operations are carried out. By interpolation between the points, a curve representation of the character is generated. The curve representation comprises one or more curves which pass through the sequence of points. Any lifting of the pen is detected to prevent the interpolation from extending over spaces between points where the pen has been lifted. The interpolation results in characters such as "t", "ä" and "s" being considered to consist of one or more curves. Each curve or

composition of curves is perceived holistically as an indivisible geometric unit. This means, for instance, that the method according to the invention in many ways operates on complete characters (global character interpretation). Each point is represented as two coordinates, which indicate the position of the point in the limited plane that the display constitutes. One of the coordinates which in the following will be called x1 indicates the position laterally and the second, which will be named x2 below indicates the position in the vertical direction. The curve is conveniently parameterised as $\phi(t)=(\phi_1(t), \phi_2(t))$, $a \leq t \leq b$, where, for the sake of simplicity, a=0 and b=1 and are sampled in a number n of points $t_1 < t_2 \ldots < t_n$ according to any suitable parameterisation rule. To begin with, arc length is the rule according to which the parameterisation is preferably carried out, which means that the points become equidistantly located. It is to be noted that because of the irregular speed of motion of the writer, this is not the case with the initial coordinate samples. The use of the arc length can be seen as a standardisation of the parameterisation, which facilitates the following comparison with template symbols, which are parameterised and sampled in a corresponding manner. For some classes of transformation it may be necessary to reparameterise, which will also be described below.

In order to compare the character with template symbols it is necessary to shape a representation which allows quantitative comparisons. Some deviations from a template symbol defined in advance have to be allowed, i.e. for instance an "a" has to be interpreted as an "a", even if with respect to its shape, it differs to a certain extent from the template symbol. According to the invention, a definition is applied that is based on different transformations. Depending on demands for flexibility and exactness, various classes of transformation may be allowed, the classes comprising one or more types

of transformation such as translation, rotation, scaling, shearing and reflection. This is illustrated in Figs 2 and 3. Fig. 2 shows a handwritten "a" in box 2a. The other three characters have been subjected to various affine transformations. The class of transformation which is comprised by the affine transformations allows rotation, shearing, reflection, scaling and translation. The characters in boxes 2b and 2c have been subjected to translation, rotation, scaling and shearing in relation to the character in box 2a. The character in box 2d has been subjected to translation, reflection, rotation and scaling.

Fig. 3 illustrates positive similarity transformations that only comprise scaling, rotation and translation. In accordance with this embodiment of the method according to the invention, permissible deviations are limited to positive similarity transformations. This means that a written character or part of a character, which by a suitable combination of scaling, rotation and translation can be brought into correspondence with a template symbol, is interpreted as the same character or part of the character which is represented by the template symbol. The correspondence does not have to be complete, which will be described below.

The representation, which according to this invention is to be preferred, is provided by forming an invariant of the parameterised curve. Useful invariants should according to the invention allow an interpretation that is close to the interpretation a human being makes of a particular character. This means that characters which a human being with great accuracy of aim is able to interpret correctly, i.e. interpret as the characters which the writer says that he or she has written, should be interpreted correctly and with great accuracy of aim by the method according to the invention. It is thus important that a constructed invariant is selective in a well-balanced way. According to the invention, invariants

are therefore constructed on the basis of the following definition. If ϕ is a parameterised curve according to the above, and G is a group of transformations of curves, then the union is named $d(\phi)=\{\psi \mid \psi=g(\phi), g \in G\}$ and equivalent rewritings thereof are called the shape of ϕ. It will be appreciated by those skilled in the art that the definition allows many possible invariants, which, however, all have in common that they handle the curve as the above-mentioned indivisible unit.

According to the preferred embodiment of the invention, the shape corresponding to the group of positive similarity transformations is given by $s(\phi)=\text{linhull}(\{(\phi_1, \phi_2), (-\phi_2, \phi_1), (1,0), (0,1)\})$, i.e. a linear space constructed from the parameterised curve ϕ. As will be appreciated by those skilled in the art, $s(\phi)$ is precisely an equivalent paraphrase of $d(\phi)$. In practice, the use of this shape implies that all parameterised curves, which can be transferred into each other by positive similarity transformations, have the same linear space as shape.

On the contrary, according to another embodiment of the invention, affine transformations are permissible. Then the shape, after rewriting, is given by $s(\phi)=\text{linhull}(\phi_1, \phi_2, 1)$ which is described in more detail in, for instance, "Extension of affine shape", Technical report, Dept. of Mathematics, Lund Institute of Technology 1997, by R. Berthilsson.

In step c), the shape of the written character is compared with correspondingly formed shapes for a number of template symbols. In this embodiment of the invention, the template symbols are by way of introduction provided by letting a user write by hand on the display all the characters that he or she might need, one at a time, which are processed in accordance with the above-described steps a) and b) and are stored as template symbols. As mentioned above, each template symbol comprises one or more curves, which represent a portion of a character or the complete character, which in practice means

that several template symbols may be required to build a character. However, as will be further developed below, a template symbol can, on the contrary, also represent a sequence of several characters.

According to the invention, one way to compare the shapes is to use a geometric measure of proximity. For the above formed shapes according to the preferred embodiment and the alternative embodiment, respectively, a geometric proximity measure μ for shapes, which comprise linear sub-spaces within the space of possible parameterised curves S, may be used. An example of such a geometric proximity measure is:

$$\mu = \left\| (I - P_{s(\phi)} P_{s(\psi)} \right\|_{HS}$$

where *HS* represents the Hilbert-Schmidt norm and *I* is the identity.

In the definition, $s(\phi)$ and $s(\psi)$ represent such linear sub-spaces. $P_{S(\phi)}$ *and* $P_{S(\psi)}$ further represent orthogonal projections onto $s(\phi)$ and $s(\psi)$, respectively. *HS* represents the Hilbert-Schmidt norm and *I* is the identity. The calculation of the geometric proximity measure μ includes selecting a scalar product.

A general example of a scalar product of two functions $\phi(t)$ and $\psi(t)$ with values in $\mathbf{5}^n$ is:

$$\sum_{k=0}^{l} \int \frac{d^k \phi(t)}{dt^k} \cdot \frac{d^k \psi(t)}{dt^k} dm_k$$

where dm_K are positive Radon measures and $\cdot$ represents the scalar product on $\mathbf{5}^n$.

Since each sampled curve comprises a plurality of points, each with two coordinates, it is convenient to use matrix notation for comparative processing of the shapes. The steps of describing the curves in matrix no-

tation and constructing a geometric proximity measure can be described and carried out mathematically as follows.

Let us name the curve of the detected character $\psi(t)=(\psi_1(t), \psi_2(t))$, $0 \le t \le 1$, and the curve of a template symbol $\phi(t)=(\phi_1(t), \phi_2(t))$, $0 \le t \le 1$. By sampling the curve at the points of time $0=t_1< t_2 \ldots < t_n=1$, the following matrices may be formed

$$M_1 = \begin{pmatrix} \phi_1(t_1) & -\phi_2(t_1) & 1 & 0 \\ \phi_1(t_2) & -\phi_2(t_2) & 1 & 0 \\ \vdots & \vdots & \vdots & \vdots \\ \phi_1(t_n) & -\phi_2(t_n) & 1 & 0 \\ \phi_2(t_1) & \phi_1(t_1) & 0 & 1 \\ \phi_2(t_2) & \phi_1(t_2) & 0 & 1 \\ \vdots & \vdots & \vdots & \vdots \\ \phi_2(t_n) & \phi_1(t_n) & 0 & 1 \end{pmatrix} \qquad M_2 = \begin{pmatrix} \psi_1(t_1) & -\psi_2(t_1) & 1 & 0 \\ \psi_1(t_2) & -\psi_2(t_2) & 1 & 0 \\ \vdots & \vdots & \vdots & \vdots \\ \psi_1(t_n) & -\psi_2(t_n) & 1 & 0 \\ \psi_2(t_1) & \psi_1(t_1) & 0 & 1 \\ \psi_2(t_2) & \psi_1(t_2) & 0 & 1 \\ \vdots & \vdots & \vdots & \vdots \\ \psi_2(t_n) & \psi_1(t_n) & 0 & 1 \end{pmatrix}$$

The matrices are QR-factorised in a manner known to those skilled in the art, such that $M_1=Q_1R_1$ and $M_2=Q_2R_2$, where Q_1 and Q_2 are orthogonal matrices and R_1 and R_2 are upper triangular. The matrices Q_1 and Q_2 represent the shapes of the detected character and the template symbol, respectively, given the parameterisations and the sampling.

A geometric proximity measure μ may be constructed as follows

$$\mu(Q_1,Q_2) = \left\| Q_2 - Q_1 Q_1^T Q_2 \right\|_F^2$$

where the norm $\| \cdot \|_F$ denotes the Frobenius norm. When $1=0$ and dm_0 is the usual Lebesgue measure on the interval $[0, 1]$, in the above general example of a scalar product, exactly this geometric proximity measure is obtained. The choice of scalar product affects the performance of the method.

After the determination of the values of the proximity measure between the shape of the detected character and the shapes of all or a sub-union of the template sym-

bols, step d) is carried out. In this step, each value is compared with an individual acceptance limit which is defined for each template symbol. The template symbols whose values of the proximity measure are smaller than their respective acceptance limits are considered plausible interpretations of the written character. Of these plausible interpretations, the template symbol is selected whose value is the smallest. On the contrary, if no value is smaller than its acceptance limit, a refined determination is made. The acceptance limits may also be one and the same for all of the template symbols. An advantage of using individual acceptance limits is that more complicated characters, such as "@", tend to have a fairly high value of the proximity measure also in case of correspondence, while simpler characters, such as "1", generally have a low value of the proximity measure in case of correspondence. Further variants are possible, some of which will be described below.

Theoretically, the proximity measure has to fulfil $\mu(s(\phi), s(\psi)=0$ when ϕ and ψ are parameterisations of the same curve when the curves are obtained from each other with a positive similarity transformation. Since people when writing do not exactly stick to the permissible similarity transformations of the template symbols, the acceptance limits should, however, be selected to be greater than zero.

On the one hand, the acceptance limits are therefore determined to be values which are >0, and on the other hand the case where no value is smaller than its acceptance limit is not interpreted as if the written character does not have an equivalent among the template symbols. Instead, according to this embodiment a reparameterisation is carried out, since the parameterisation affects the final result to a fairly large extent. A preferred reparameterisation of the curve ψ means that it is put together with a one-to-one function $\gamma: [0,1] \rightarrow [0,1]$. For instance $\gamma(t)=1-t$ fulfils this, which means that the

character is written in the opposite direction. What sort of reparameterisation has to be done is determined by solving the problem of minimisation

$$\min_{\gamma} \mu(s(\phi), s(\psi \circ \gamma))$$

where the minimisation is performed over all of the γ which have been described above.

The above-described steps are then repeated and new values of the proximity measure are obtained. If none of these is below its acceptance limit, the written character is rejected and the user is informed about this, for instance by requesting him or her to rewrite the character. If one wishes to speed up the determination of the proximity measure after the reparameterisation, a group consisting of the smallest, for example the three smallest, values of the proximity measures from the first determination can be selected and in the second determination, only be compared with the template symbols that are included in the group. However, in certain cases this may produce a final result other than in the case where all the template symbols are taken into consideration in the second determination.

The geometric proximity measure μ does not only result in a ranking order between different interpretations of a character, but it also gives a measure of how similar two characters are. This yields the possibility of also using the present method for verification and identification, respectively, of signatures (initials are here perceived as signatures). In this use, the arc-length parameterisation is, however, not a preferred type of parameterisation since it excludes information of the dynamics when writing. Such information is valuable in this use. There are, however, other variants that are more suitable.

The preferred embodiment has hitherto been described on the basis of the fact that there are suitable template

symbols with which the written character can be compared. Furthermore, the description has been made for one character. Normally, it is not separate characters, but running text with complete words that are written on the display. From the user's point of view, it is desirable to be able to write running text, which demands much of the method.

A problem in the context is that the union of characters may contain a plurality of character combinations. It is unreasonable to ask the user to write all possible characters or words as template symbols.

At the same time, it is advantageous if a limitation of the shapes of the writing can be avoided. If the user were strictly limited, for instance, only allowed to write one character at a time so that the above-described case always exists, the situation is relatively clear, but not user-friendly. According to the invention, the user is allowed to write running text. It is thus difficult to know where in the curve/curves, for instance, a character ends and starts. The points indicating the beginning and the end of a character are named breakpoints, and finding possible breakpoints adds complexity to the problem of recognition. This problem of complexity is solved in accordance with an embodiment of the method according to the invention in the following manner. It should be mentioned that the above steps are carried out in the same way in this embodiment. The following description essentially concerns the step of preprocessing the union of characters and the step of comparing.

If the pen is lifted after each character in a word, this may be taken advantage of. Each lifting of the pen gives rise to a discontinuity and may be detected by two points being relatively far apart in space or time. Naturally, this detection is carried out before the arc-length parameterisation. The union of characters here consists of n curves. The points of discontinuity may be taken as plausible breakpoints to distinguish two charac-

ters from one another. This focuses on the problem of characters containing several strokes that are being written by lifting the pen in between. Such a character will be represented by several curves by means of the detection of discontinuity. However, each curve may be parameterised with rescaled arch-length, which means that each curve contains the same number of sampling points. Assume that l_1, l_2,..., l_n are the curves and that s_k is a composition of the curves l to k. Compare the compositions of curves s_1, s_2,..., s_k with the database of template symbols, where k is the largest number of curves included in any template symbol. Assume that s_{k1} is the longest composition of curves which gives correspondence/correspondences, i.e. which, when comparing with template symbols, gives one or more values of proximity measures that are below the acceptance limit/acceptance limits. Even if s_{k1} corresponds to one or more template symbols, it is not certain that this gives a correct interpretation. In accordance with this embodiment of the method, a plausibility test is therefore carried out, which will be described below. If the interpretation is not plausible, s_{k1} is shortened to the longest composition of curves s_{k2} but one, which gives correspondence. The plausibility test is carried out once more.

If no interpretation is plausible for any s_k, the best interpretation of s_1 is selected. The remaining curves are processed correspondingly. Only the points of discontinuity are not sufficient as plausible breakpoints as far as coherent writing is concerned, but there may also be breakpoints within a curve. It is to be noted that as a matter of fact the above procedure to find breakpoints is achieved with reparameterisations of the composition of all written curves.

The term "plausibility tests" covers, inter alia, so-called confidence sets. The above reasoning of the recognition of unions of characters consisting of several characters, and characters consisting of several curves,

respectively, will now be exemplified by means of Fig. 4, the confidence sets being used as plausibility tests.

Assume that the written character is "äta" (English "eat"), i.e. a complete word written in accordance with Fig. 4a. By means of detection of discontinuities and reparameterisation with rescaled arch length, "ä" has been identified and "t" is the next in turn. The horizontal as well as the vertical stroke can be interpreted as an "l", i.e. "t" can be interpreted as "ll". The template symbols are stored with associated confidence sets according to Fig. 4b, where the template symbols "l" and "t" are shown with the respective confidence sets as the shaded area. Assume that the vertical stroke of "t" is interpreted as the template symbol "l". The transformation $a:\mathbb{S}^2 \rightarrow \mathbb{S}^2$ may then be determined - within the class that generates the shape - which transfers the template symbol in the vertical stroke. If a is applied to the confidence set, the result of Fig. 4c is achieved. The next curve, i.e. the horizontal stroke, is in the confidence set, which is forbidden, and the interpretation is classified as implausible. The confidence sets do not need to be identified by only straight strokes, as those skilled in the art will realise, but may have a more general appearance. To each template symbol another confidence set can be connected which contains the first set. If then the next curve is also outside the second confidence set, it will be interpreted as if the next character is the first one in a new word.

An alternative plausibility test means that the transformation which was determined in the description of confidence sets is studied. If the transformation is beyond a certain scope, the interpretation will be classified as implausible. Such scope may, for instance, determine how much the transformation is allowed to turn the character in relation to how much earlier interpreted characters have been turned. Also excessive deformations may be excluded. In order to distinguish, for example,

"S" from "s", the enlargement of the transformation can be calculated in relation to the enlargement of symbols that have been interpreted before.

The above-described embodiments of the method according to the invention should only be seen as non-limiting examples, and many modifications apart from the above-mentioned ones are possible within the scope of the invention as defined in the appended claims. Examples of further such modifications follow below.

As an alternative to the above-described reparameterisation, the decision is taken directly on the basis of the first determined smallest value of proximity measure.

Examples of other modifications are the choice of another proximity measure, various choices of values of acceptance limits that demand a certain adaptation to various users, different types of reparameterisation and different types of shape, for instance, an affine shape.

As far as various types of shape are concerned, two or more shapes are, as an alternative, used in parallel for each union of characters. This means that several invariants are provided for each union of characters and are then processed in parallel in the following steps. This gives a higher degree of accuracy and a faster recognition.

In practice, the method according to the invention can be used, for instance, in electronic notebooks and the like and in mobile telephones with an enhanced possibility of communication by a writable window.

The method according to the invention can be implemented as a computer program in a computer by using a commercially available programming language for mathematical calculations, such as C, C++ or FORTRAN, or as a specially built device according to the invention, which will be described below. In both cases, the template symbols are stored as a database. If needed, the database can be changed.

As shown in Fig. 5, an embodiment of a device, which realises the method, comprises a pressure-sensitive display 42, a display communication unit 44 with a detector 46, a control unit 48, a memory control unit 50, a memory unit 52 and a processing unit 54. The display communication unit 44, the control unit 48, the memory control unit 50 and the processing unit 54 communicate via a bus 56 transferring data, address and control signals between the units. Unions of characters are written on the display 42 and are detected by the detector 46, which provides the ordered sequence of points. In the memory unit 52, the template symbols and the detected unions of characters are stored. By means of the processing unit, calculation operations are carried out, which comprise the interpretation of the sequences of points as one or more curves, the parameterisation of each curve, the comparison of the preprocessed union of characters with template symbols and the application of the decision rule. In the memory unit 50, also software for carrying out the method is stored. The control unit 48 runs the program and communicates with the user via the display communication unit 44 and the display 42.

The device is also adapted for optional settings which, inter alia, may comprise the choice of shapes, the choice of proximity measure, the choice of parameterisations and the choice of decision rule. The choices are made via the display 42.

Above, the description has essentially been made on the basis of the characters being written on a display and being detected at the same time as they are written. An alternative is that the characters are detected, for instance scanned, as they are already written on a piece of paper. This concerns handwritten characters as well as typewritten ones. Thus, the detection comprises, instead of the operation of recognising the display writing, the operation of reading (scanning) the characters on the piece of paper. Advantageously, read data is transformed

into said ordered sequence of points by edge detection. However, it is also a modification within the scope of the invention. In this embodiment, the preprocessing comprises forming one or more characteristic curves, for instance the edge curve or edge curves of the character, on the basis of said edge detection and parameterisation. When the edge curves thus have been defined, the following steps are the same as in the above-described, preferred embodiment.

The decision rule may be selected in many different ways. A variant of the above-mentioned is that all the template symbols for which the value of the proximity measure below the acceptance limit is selected. Subsequently, the template symbols may be processed further in accordance with any refined determination of the above-described type. It is also possible to make a combination with another selection method, which points out the most plausible alternative. One example of such a method is statistics of characters that indicate the probability of the presence of separate characters or compositions of characters in texts.

Moreover, an alternative for determining the acceptance limits is that the template symbols are grouped, in which case the same limit applies within a group.

The method according to the invention is reliable in that it is able to recognise rather deformed characters and manages running text. The contents of the database are not crucial, but in principle a set of separate characters is sufficient. In order to recognise a variety of fonts and handwritings with a high degree of accuracy, it may, however, be an advantage to store several variants of each character, which comprise deformations that are outside the class of transformation which is appropriate and permissible in the comparison. It may also be advantageous to store certain compositions of characters, for instance to be able to more safely distinguish two l's "ll", which are connected, from "u".

CLAIMS

1. A method for character recognition comprising the steps of:

- detecting a union of characters,
- preprocessing the union of characters,
- comparing the preprocessed union of characters with one or more template symbols, and
- applying a decision rule in order to either reject a template symbol or decide that the template symbol is included in the union of characters, the step of preprocessing the union of characters comprising the steps of:
- representing the union of characters as one or more curves, and
- parameterising said curve or curves, characterised in that the step of preprocessing the union of characters further comprises the step of forming, regarding various classes of transformation, one or more shapes for said curve or curves, and that the step of comparing comprises the steps of:
- forming one or more geometric proximity measures,
- determining for every shape the values of said geometric proximity measures between said shape and correspondingly determined shapes for the template symbols, and that the step of applying a decision rule comprises the step of:
- selecting one or more template symbols in consideration of said values.

2. A method as claimed in claim 1, characterised in that the step of detecting a union of characters comprises the step of representing the union of characters as a set of points, and that the step of representing the union of characters as one or more curves comprises the steps of:

- generating an ordered sequence of points from said set of points, and

- interpolating between the points to generate said one or more curves.

3. A method as claimed in claim 1 or 2, c h a r a c t e r i s e d in that the step of parameterising comprises the steps of:

- arranging according to a convenient rule of parameterisation a function which follows the curve, and

- sampling the function in a plurality of equidistant points.

4. A method as claimed in claim 3, c h a r a c t e r i s e d in that the rule of parameterisation is an arc length.

5. A method as claimed in any one of the preceding claims, the union of characters being detected on a display on which it is written directly, c h a r a c t e r i s e d in that the step of detecting is carried out during the writing.

6. A method as claimed in any one of claims 1-4, c h a r a c t e r i s e d in that the union of characters is detected in a data quantity that originates from a scanner.

7. A method as claimed in claim 6, c h a r a c t e r i s e d in that the step of preprocessing the union of characters comprises edge detecting the union of characters.

8. A method as claimed in any one of the preceding claims, c h a r a c t e r i s e d in that the step of applying a decision rule comprises determining acceptance limits of the values of said proximity measures and selecting a template symbol only if at least one value related to the template symbol is within said acceptance limits.

9. A method as claimed in claim 8, c h a r a c t e r i s e d in that individual acceptance limits are assigned to each template symbol.

10. A method as claimed in claim 8, c h a r a c - t e r i s e d in that at least two template symbols have the same acceptance limits.

11. A method as claimed in any one of claims 8-10, c h a r a c t e r i s e d in that the step of reparameterising a parameterised curve if all the values of said proximity measures between the shape of the parameterised curve and the template symbols are beyond the acceptance limits so that one or more values of the corresponding proximity measure decreases between the template symbols and the shape of the reparameterised curve.

12. A method as claimed in any one of claims 8-11, c h a r a c t e r i s e d in that the acceptance limits are determined on the basis of the fact that only similarity transformations are permitted.

13. A method as claimed in any one of the preceding claims, c h a r a c t e r i s e d in that the step of applying a decision rule comprises carrying out a plausibility test of the selected template symbols.

14. A method as claimed in claim 13, c h a r a c - t e r i s e d in that the plausibility test is based on the confidence sets.

15. Use of the method as claimed in any one of the preceding claims for verification or identification of signatures.

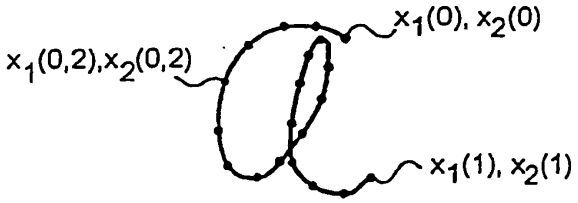


Fig. 1



Fig. 4a

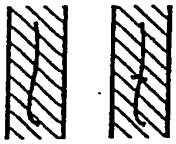


Fig. 4b

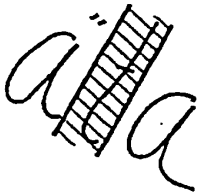


Fig. 4c

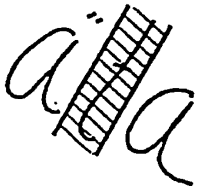


Fig. 4d

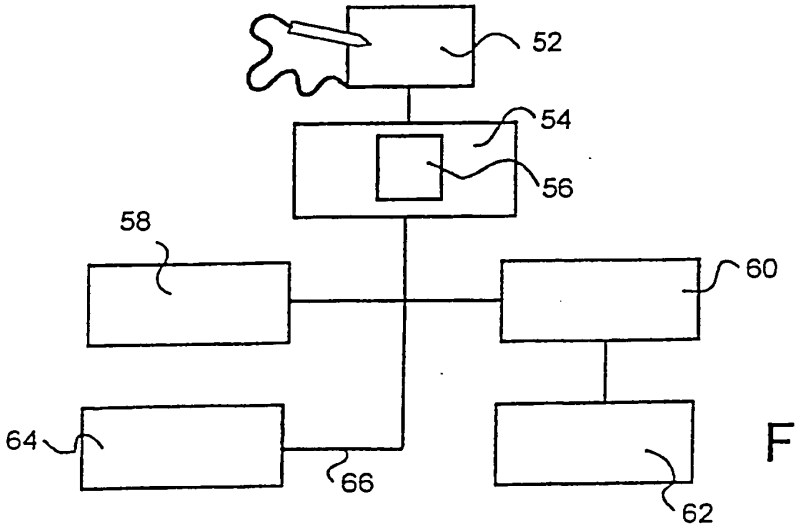


Fig. 5

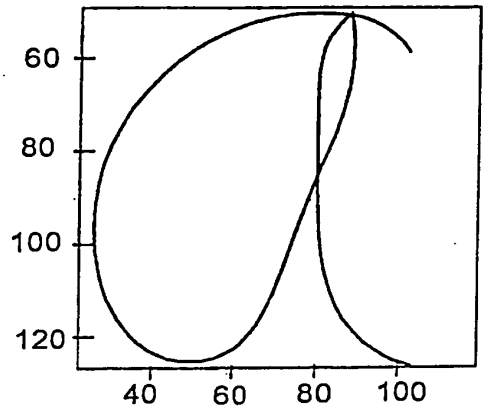


Fig. 2a

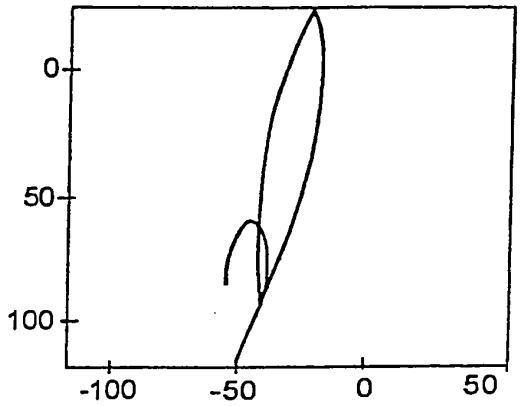


Fig. 2b

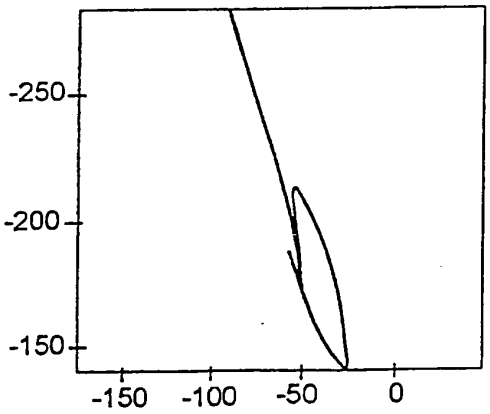


Fig. 2c

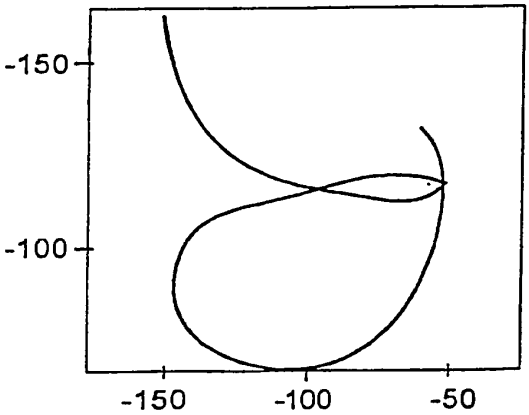


Fig. 2d

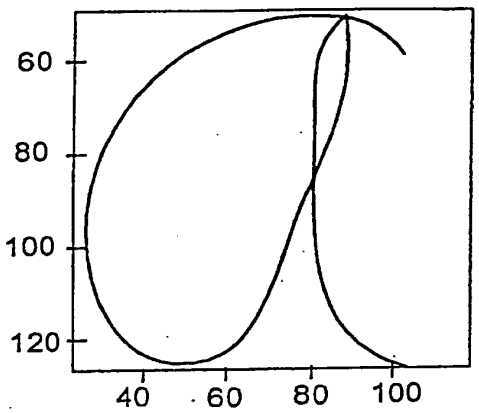


Fig. 3a

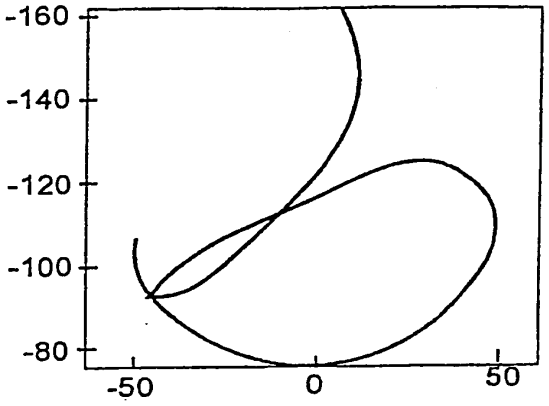


Fig. 3b

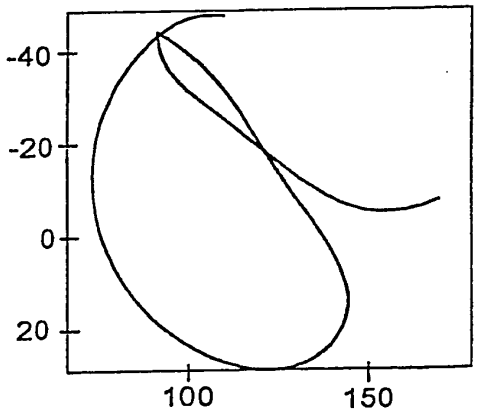


Fig. 3c

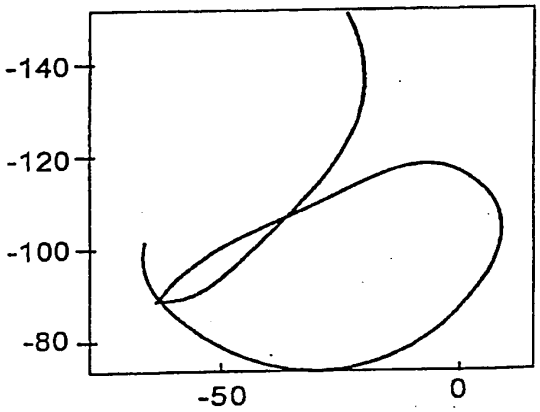


Fig. 3d

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 99/01448

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G06K 9/00, G06K 9/68
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G06K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5768420 A (M.BROWN ET AL.), 16 June 1998 (16.06.98), column 3, line 53 - column 4, line 17; column 5, line 14 - line 34; column 6, line 42 - line 58	1-10,12-14
	--	
A	US 55598897 A (M.K.BROWN ET AL.), 24 Sept 1996 (24.09.96), column 10, line 28 - line 35	1-14
	--	
A	EP 0782090 A2 (AT & T CORP), 2 July 1997 (02.07.97), abstract	1-14
	--	

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 January 2000	17.01.2000
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Patrik Blidefalk/AE Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 99/01448

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9404992 A1 (COMMUNICATION INTELLIGENCE CORPORATION), 3 March 1994 (03.03.94), page 4, line 32 - page 5, line 35 --	1-14
A	WO 9720286 A1 (MOTOROLA INC.), 5 June 1997 (05.06.97), page 15, line 5 - line 14 --	13-14

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INTERNATIONAL SEARCH REPORT
Information on patent family members

02/12/99

International application No.
PCT/SE 99/01448

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5768420 A	16/06/98	EP 0762313 A	12/03/97
		JP 9128485 A	16/05/97
		US 5559897 A	24/09/96
		US 5875256 A	23/02/99
		US 5878164 A	02/03/99
		CA 2136369 A	22/07/95
		EP 0664535 A	26/07/95
		JP 7219578 A	18/08/95
		US 5699456 A	16/12/97
		US 5719997 A	17/02/98
		US 5907634 A	25/05/99
US 55598897 A	24/09/96	NONE	
EP 0782090 A2	02/07/97	CA 2190664 A	28/06/97
		JP 9288729 A	04/11/97
		US 5828772 A	27/10/98
WO 9404992 A1	03/03/94	US 5933514 A	03/08/99
WO 9720286 A1	05/06/97	AU 1124397 A	19/06/97
		US 5854855 A	29/12/98

Form PCT/ISA/210 (patent family annex) (July 1992)

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FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

In re Application of	:	
OKNELID, Erika et al.	:	
Application No.: 10/524,430	:	DECISION ON
PCT No.: PCT/SE03/01226	:	
Int. Filing Date: 18 July 2003	:	PETITION
Priority Date: 16 August 2002	:	
Attorney's Docket No.: 08806.0174-00	:	UNDER 37 CFR 1.182
For: PRESENTING RECOGNISED HANDWRITTEN SYMBOLS	:	

This is a decision regarding applicants' response to "Petition For Name Change Under 37 C.F.R. §1.182," filed 07 July 2006.

BACKGROUND

On 07 February 2006, the Office mailed Decision, indicating that the inventors on the declaration did not match the inventors on the international application.

On 07 July 2006, applicants filed this petition to correct the name of Erika Oknelid to Erika Prymus.

DISCUSSION

The inventors in the international application are Erika Oknelid and Magnus Persson. The inventors on the declaration are Erika Prymus and Magnus Persson. When an inventor listed in the international application changes his or her name, a petition as described in MPEP 605.04(c) is required.

The balance of the $400 petition fee will be charged to deposit account no. 06-0916, as authorized. Erika Prymus has supplied a declaration stating that she is an inventor in the international application, was known as Oknelid prior to her marriage and is now Prymus. This submission satisfies the requirements of MPEP 605.04(c).

CONCLUSION

Applicant's petition under 37 CFR 1.182 is **GRANTED**.

This application is being forwarded to the National Phase Processing Branch Division of PCT Operations for further processing. The application has a 35 U.S.C. 371(c)(1), (c)(2) and (c)(4) date of 09 August 2005.

Erin P. Thomson

Erin P. Thomson
Attorney Advisor
PCT Legal Administration

Telephone: 571-272-3292
Facsimile: 571-273-0459

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U.S. APPLICATION NUMBER NO.	FIRST NAMED APPLICANT	ATTY. DOCKET NO.
10/524,430	Erika Prymus	08806-0174

INTERNATIONAL APPLICATION NO.	
PCT/SE03/01226	
I.A. FILING DATE	PRIORITY DATE
07/18/2003	08/16/2002

22852
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

CONFIRMATION NO. 6160

371 ACCEPTANCE LETTER

OC000000020790272

Date Mailed: 10/12/2006

NOTICE OF ACCEPTANCE OF APPLICATION UNDER 35 U.S.C 371 AND 37 CFR 1.495

The applicant is hereby advised that the United States Patent and Trademark Office in its capacity as a Designated / Elected Office (37 CFR 1.495), has determined that the above identified international application has met the requirements of 35 U.S.C. 371, and is ACCEPTED for national patentability examination in the United States Patent and Trademark Office.

The United States Application Number assigned to the application is shown above and the relevant dates are:

08/09/2005	08/09/2005
DATE OF RECEIPT OF 35 U.S.C. 371(c)(1), (c)(2) and (c)(4) REQUIREMENTS	DATE OF COMPLETION OF ALL 35 U.S.C. 371 REQUIREMENTS

A Filing Receipt (PTO-103X) will be issued for the present application in due course. **THE DATE APPEARING ON THE FILING RECEIPT AS THE " FILING DATE" IS THE DATE ON WHICH THE LAST OF THE 35 U.S.C. 371 (c)(1), (c)(2) and (c)(4) REQUIREMENTS HAS BEEN RECEIVED IN THE OFFICE. THIS DATE IS SHOWN ABOVE.** *The filing date of the above identified application is the international filing date of the international application (Article 11(3) and 35 U.S.C. 363).* Once the Filing Receipt has been received, send all correspondence to the Group Art Unit designated thereon.

The following items have been received:

- Copy of the International Application filed on 02/15/2005
- Copy of the International Search Report filed on 02/15/2005
- Copy of IPE Report filed on 02/15/2005
- Preliminary Amendments filed on 02/15/2005
- Information Disclosure Statements filed on 02/15/2005
- Oath or Declaration filed on 08/09/2005
- U.S. Basic National Fees filed on 02/15/2005
- Assignment filed on 02/15/2005
- Priority Documents filed on 02/15/2005
- Power of Attorney filed on 08/09/2005
- Specification filed on 08/09/2005

- Claims filed on 08/09/2005
- Abstracts filed on 08/09/2005
- Drawings filed on 08/09/2005

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

PAULETTE R KIDWELL
Telephone: (703) 308-9140 EXT 216

PART 3 - OFFICE COPY

FORM PCT/DO/EO/903 (371 Acceptance Notice)

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UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NUMBER	FILING OR 371(c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/524,430	08/09/2005	Erika Prymus	08806-0174

CONFIRMATION NO. 6160

22852
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER
LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC20001-4413

Title: Presenting recognised handwritten symbols

Publication No. US-2007-0014475-A1
Publication Date: 01/18/2007

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 703-305-3028.

Pre-Grant Publication Division, 703-605-4283

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,430	08/09/2005	Erika Prymus	08806-0174	6160

22852 7590 11/23/2007

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
RASHID, DAVID	

ART UNIT	PAPER NUMBER
2624	

MAIL DATE	DELIVERY MODE
11/23/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/524,430	PRYMUS ET AL.	
	Examiner	Art Unit	
	David P. Rashid	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 February 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 February 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *2/15/2005, 8/18/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

All of the examiner's suggestions presented herein below have been assumed for examination purposes, unless otherwise noted.

Amendments

1. This office action is responsive to the preliminary claim amendment received on 2/15/2005.

Priority

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d) (Application # 0202446-1, filed 2/15/2005), which papers have been placed of record in the file.

Specification

3. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. **Claim 12**, line 3 recites the limitation "the presenting pattern". There is insufficient antecedent basis for this limitation in the claim.

6. **Claim 30**, line 3 recites the limitation "the presenting interpretation". There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. **Claims 1 – 8** and **11** are rejected under 35 U.S.C. 102(b) as being anticipated by Comerford et al. (US 5,303,312 A).

Regarding **claim 1**, Comerford discloses a method for presenting a recognized handwritten symbol (symbols being characters of the English language "A", "B", and so forth), comprising the steps of:

detecting a handwritten pattern (FIG. 5, elements b, d) that is entered by a user;

recognizing the detected handwritten pattern (FIG. 5, elements c, e), wherein said step of recognizing comprises comparing the handwritten pattern to a plurality of templates (FIG. 5, elements 35, 36, 37 wherein the templates are each of the character "A", "B", etc recognized by a reference 37, not the "templates" as disclosed in Comerford), wherein each of the plurality of templates represents at least one of a plurality of writing symbol patterns (each character (template) is comprised of at least three writing symbol patterns (e.g. "A" in FIG. 4 has two capitalized writing symbol patterns and one lowercase writing symbol pattern, all three being the writing symbol patterns for template "A")) of ways of writing symbols, and returning a best template selected from the plurality of templates that represents one of the plurality of writing symbol patterns as a best writing symbol pattern (from what the user wrote in FIG. 5, elements b, d – the best template was chosen in element e when snapped) which, according to a predefined rule (the rule of snapping), is most similar to the handwritten pattern (FIG. 5, elements b, d), wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol (character "A" template has three writing symbol patterns, character "B" template also has three writing symbol pattern; and so forth as shown in FIG. 4); and

presenting the best writing symbol pattern of the best template on a screen (FIG. 5, element 38).

Regarding **claim 2**, Comerford discloses the method according to claim 1, wherein the at least one of the plurality of writing symbol patterns of each of the plurality of templates is represented by geometrical information (FIG. 5, element 36) relating to an appearance (the template to the left of element 35 in FIG. 5 wherein the geometric information "3, 9, 10, 11..." relates to the appearance of what was written that is recognized by reference 37) of said writing symbol pattern.

Regarding **claim 3**, Comerford discloses the method according to claim 2, wherein the geometrical information comprises information of positions of a number of dots (FIG. 5, element 36 wherein the encoded string of numbers representing the writing symbol pattern gives position of the number of dots (e.g. number "3" represents a line drawn between two known dots as shown in the template to the left of element 35 in FIG. 5)) representing the at least one of the plurality of writing symbol patterns, said at least one of the plurality of writing symbol patterns being presented by lines drawn between the dots.

Regarding **claim 4**, Comerford discloses the method according to claim 1, wherein the step of presenting comprises presenting the whole best writing symbol pattern of the best template at once (the snapping operation suggests that a user who completes a desired character that represents a writing symbol pattern will automatically snap to that writing symbol pattern, and thus would be the "whole best writing symbol pattern").

Regarding **claim 5**, Comerford discloses the method according to claim 3, wherein the step of presenting comprises presenting lines one at a time (FIG. 5, element 36 gives encoded

sequence, each number representing a line, and thus and string of numbers presenting lines "one at a time").

Regarding **claim 6**, Comerford discloses the method according to claim 1, further comprising, before the step of presenting, manipulating the best writing symbol pattern of the best template according to characteristics of the handwritten pattern (FIG. 5 character "A" which was the "best writing symbol pattern" snapped to when written can be rewritten as that in the bottom of FIG. 6 to be the new "best writing symbol pattern" for character "A" when it is acknowledged as a "NEW ENTRY" for character "A").

Regarding **claim 7**, Comerford discloses the method according to claim 6, wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant (slant occurs when constructing the new "best writing symbol pattern" as shown in FIG. 6) and scaling.

Regarding **claim 8**, Comerford discloses the method according to claim 1, wherein the handwritten pattern is entered (FIG. 5, elements b, d) on an input area on the screen (FIG. 1, element 12) and the best writing symbol pattern of the best template is presented in a presentation area (same spot) on the screen (FIG. 5, element 3 that finally snaps to the best writing symbol pattern (capital "A") of the best template (character "A"), wherein said presentation area overlaps the input area (the input and presentation areas are the same area, thus overlapping).

Regarding **claim 11**, Comerford discloses the method according to claim 1, wherein each of the plurality of templates (FIG. 5, elements 35, 36, 37 wherein the templates are each of the character "A", "B", etc recognized by a reference 37, not the "templates" as disclosed in

Comerford) is associated with a category (the category being the character (e.g. "A")) defining what kind of symbol is represented by each of the plurality templates.

9. **Claims 1 – 5, 8,** and **33** are rejected under 35 U.S.C. 102(b) as being anticipated by Beernink et al. (US 5,666,438 A).

Regarding **claim 1**, Beernink'438 discloses a method for presenting a recognized handwritten symbol (FIG. 6A), comprising the steps of:

detecting a handwritten pattern (the handwritten pattern entered by element 38 on tablet-screen 52 in FIG. 3)that is entered by a user;

recognizing the detected handwritten pattern, wherein said step of recognizing comprises comparing the handwritten pattern to a plurality of templates (each template being a character of the English alphabet), wherein each of the plurality of templates represents at least one of a plurality of writing symbol patterns of ways of writing symbols(each character of the English alphabet comprises different ways of writing each character (e.g. FIG. 6A, element 74 gives 4 different ways), each different way being a writing symbol pattern), and returning a best template selected from the plurality of templates that represents one of the plurality of writing symbol patterns as a best writing symbol pattern which, according to a predefined rule, is most similar to the handwritten pattern (once preferences are saved, Beernink'438 uses those preferences to recognize characters), wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol (character "A" template has four writing symbol patterns, character "F" template also has four writing symbol pattern; and so forth as shown in FIG. 6A, FIG. 8); and

presenting the best writing symbol pattern of the best template on a screen (FIG. 3, element 52).

Regarding **claim 2**, claim 20 recites identical features as in claim 2. Thus, references/arguments equivalent to those presented below for claim 20 are equally applicable to claim 2.

Regarding **claim 3**, claim 21 recites identical features as in claim 3. Thus, references/arguments equivalent to those presented below for claim 21 are equally applicable to claim 3.

Regarding **claim 4**, claim 22 recites identical features as in claim 4. Thus, references/arguments equivalent to those presented below for claim 22 are equally applicable to claim 4.

Regarding **claim 5**, claim 23 recites identical features as in claim 5. Thus, references/arguments equivalent to those presented below for claim 23 are equally applicable to claim 5.

Regarding **claim 8**, claim 26 recites identical features as in claim 8. Thus, references/arguments equivalent to those presented below for claim 26 are equally applicable to claim 8.

Regarding **claim 33**, claim 1 recites identical features as in claim 33. Thus, references/arguments equivalent to those presented above for claim 1 are equally applicable to claim 33.

The means-plus-function language is anticipated by the computer of Beernink'438 (FIG. 1, element 12; FIG. 1).

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. **Claims 6 – 7, 9 – 16, 18 – 32,** and **34** are rejected under 35 U.S.C. 103(a) as being unpatentable over Beernink et al. (US 5,666,438 A) in view of Beernink et al. (US 5,682,439 A).

Regarding **claim 6**, claim 24 recites identical features as in claim 6. Thus, references/arguments equivalent to those presented below for claim 24 are equally applicable to claim 6.

Regarding **claim 7**, claim 25 recites identical features as in claim 7. Thus, references/arguments equivalent to those presented below for claim 25 are equally applicable to claim 7.

Regarding **claim 9**, while Beernink'438 discloses the method according to claim 1, Beernink'438 does not disclose wherein the step of recognizing comprises returning at least one alternative template selected from the plurality of templates.

Beernink'439 discloses a boxed input correction system and method for pen based computer systems (FIG. 1) that teaches wherein the step of recognizing comprises returning at least one alternative template (those templates listed in FIG. 5, element 170 of the character "C", some being "C" and "c") selected from the plurality of templates.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the method of Beernink'438 to include wherein the step of recognizing comprises returning at least one alternative template selected from the plurality of templates as taught by Beernink'439 to provide "a correction method for when the selected word is the string of one or more well defined characters and the correction input is a character editing input overwriting a given box.", Beernink'439, Col. 2, lines 51 – 54.

Regarding **claim 10**, claim 28 recites identical features as in claim 10. Thus, references/arguments equivalent to those presented below for claim 28 are equally applicable to claim 10.

Regarding **claim 11**, while Beernink'438 discloses the method according to claim 1, Beernink'438 does not disclose wherein each of the plurality of templates is associated with a category defining what kind of symbol is represented by each of the plurality templates.

Beernink'439 discloses a boxed input correction system and method for pen based computer systems (FIG. 1) that teaches wherein each of a plurality of templates (the plurality of templates given in FIG. 5, element 170 wherein the template in question is character "C") is associated with a category ("C" is "associated" with the capitalized letter category) defining what kind of symbol (the symbol would then be a capitalized character "C", which is "C") is represented by each of the plurality templates.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the method of Beernink'438 to include wherein each of the plurality of templates is associated with a category defining what kind of symbol is represented by each of the plurality templates as taught by Beernink'439 to provide "a correction method for when the selected word

is the string of one or more well defined characters and the correction input is a character editing input overwriting a given box.", Beernink'439, Col. 2, lines 51 – 54.

Regarding **claim 12**, claim 30 recites identical features as in claim 12. Thus, references/arguments equivalent to those presented below for claim 30 are equally applicable to claim 12.

Regarding **claim 13**, claim 31 recites identical features as in claim 13. Thus, references/arguments equivalent to those presented below for claim 31 are equally applicable to claim 13.

Regarding **claim 14**, claim 32 recites identical features as in claim 14. Thus, references/arguments equivalent to those presented below for claim 32 are equally applicable to claim 14.

Regarding **claim 15**, while Beernink'438 discloses the method for sequentially presenting a plurality of recognized handwritten symbols (FIG. 6A), comprising for each handwritten pattern the steps of:

detecting the handwritten pattern (the handwritten pattern entered by element 38 on tablet-screen 52 in FIG. 3) that is entered by a user;

recognizing the detected handwritten pattern, wherein said step of recognizing comprises comparing the handwritten pattern to a plurality of templates (each template being a character of the English alphabet), wherein each of the plurality of templates represents at least one of a plurality of writing symbol patterns of ways of writing symbols (each character of the English alphabet comprises different ways of writing each character (e.g. FIG. 6A, element 74 gives 4 different ways), each different way being a writing symbol pattern) and returning a best

interpretation of the handwritten pattern (once preferences are saved, Beernink'438 uses those preferences to recognize characters), said best interpretation being based on one of the plurality of writing symbol patterns as a best writing 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 one of the plurality of writing symbol patterns which represent different ways of writing a single symbol (character "A" template has four writing symbol patterns, character "F" template also has four writing symbol pattern; and so forth as shown in FIG. 6A, FIG. 8), and

presenting the best interpretation on a screen (FIG. 3, element 52), Beernink'438 does not directly teach wherein the different ones of the plurality of writing symbol patterns of said at least two of the plurality of templates return different best interpretations when being most similar to the handwritten pattern.

Beernink'439 discloses a boxed input correction system and method for pen based computer systems (FIG. 1) that teaches wherein the different ones of the plurality of writing symbol patterns (each character of the English alphabet comprises different ways of writing each character (e.g. FIG. 5, element 74 gives 2 different ways – capitol and lowercase) each different way being a writing symbol pattern) of said at least two of the plurality of templates (each template being a character of the English alphabet) return different best interpretations (FIG. 5, element 168 is a window displayed that allows user to pick the best character (e.g. character "C" can be either "C" or "c")) when being most similar to the handwritten pattern.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the method of Beernink'438 to include wherein the different ones of the plurality

of writing 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 taught by Beernink'439 to provide "a correction method for when the selected word is the string of one or more well defined characters and the correction input is a character editing input overwriting a given box.", Beernink'439, Col. 2, lines 51 – 54.

Regarding **claim 16**, while Beernink'438 in view of Beernink'439 disclose the method of claim 15, Beernink'438 discloses further comprising, before the step of presenting, retrieving as the best interpretation, from a database (FIG. 10) comprising allographs (the allographs in FIG. 6A, element 76), a best allograph that is associated with the best writing symbol pattern of the best template (refer to claim 15 for references/arguments cited).

Regarding **claim 18**, while Beernink'438 in view of Beernink'439 disclose the method of claim 16, Beernink'438 discloses wherein the step of presenting comprises presenting the best allograph (the allographs in FIG. 6A, element 76) represented by a number of arcs (it is inherent that each allograph is "represented by a number of arcs" as each allograph consists of a series of arcs) depicting the way of writing symbols of the best template.

Regarding **claim 19**, while Beernink'438 in view of Beernink'439 disclose the method of claim 15, Beernink'438 discloses wherein the best interpretation is the writing symbol pattern of the best template (FIG. 13, element 154), and wherein the step of presenting comprises presenting the best writing symbol pattern of the best template on the screen (Beernink'438 discloses picking the best writing symbol pattern of the best template on the screen 52 (e.g. user writes "a", the algorithm will find the best "a" writing symbol pattern based on the particular handwriting style, "a" already being of template character "A").

Regarding **claim 20**, while Beernink'438 in view of Beernink'439 disclose the method of claim 19, Beernink'438 discloses wherein each of the plurality of writing symbol patterns of a template is represented by geometrical information (it is inherent that ach of the plurality of writing symbol patterns of a template is "represented by geometrical information" as each of the plurality of writing symbol patterns of a template consists of geometrical information such as height, width, etc) relating to an appearance of each of said plurality of writing symbol patterns.

Regarding **claim 21**, while Beernink'438 in view of Beernink'439 disclose the method of claim 20, Beernink'438 discloses wherein the geometrical information (it is inherent that ach of the plurality of writing symbol patterns of a template is "represented by geometrical information" as each of the plurality of writing symbol patterns of a template consists of geometrical information such as height, width, etc) comprises information of positions of a number of dots (it is again inherent that the tablet-screen 52 of FIG. 3 will pick up individual pixels from which the user writes, each pixel being a dot that represents additional positional information on the tablet-screen) representing each of the plurality writing symbol patterns (each character of the English alphabet comprises different ways of writing each character (e.g. FIG. 6A, element 74 gives 4 different ways), each different way being a writing symbol pattern), said each of the plurality of writing symbol patterns being presented by lines (a stroke of a character written on tablet-screen 52 of FIG. 3 will contain a string of pixels (dots) that are presented by lines drawn between the pixels, take the "Letter Styles" in FIG. 6A for instance) drawn between the dots.

Regarding **claim 22**, while Beernink'438 in view of Beernink'439 disclose the method of claim 15, Beernink'438 discloses wherein the step of presenting comprises presenting the whole

best writing symbol pattern (Beernink'438 discloses only one interpretation thus being the "best interpretation" of the writing symbol pattern, this occurs "at once" when element 85b on element 81 is turned up to "fast, less accurately" in FIG. 6A) represented by the best interpretation at once.

Regarding **claim 23**, while Beernink'438 in view of Beernink'439 disclose the method of claim 21, Beernink'438 discloses wherein the step of presenting comprises presenting the lines one at a time (each time the user writes a stroke to be recognized, that stroke consists of pixels (dots) and lines between the pixels, and each time the user writes a new stroke another line is constructed and thus lines are being presented one at a time).

Regarding **claim 24**, while Beernink'438 in view of Beernink'439 disclose the method of claim 15, Beernink'438 does not disclose further comprising, before the step of presenting, manipulating the best writing symbol pattern represented by the best interpretation according to characteristics of the handwritten pattern.

Beernink'439 discloses a boxed input correction system and method for pen based computer systems (FIG. 1) that teaches comprising, before the step of presenting, manipulating (manipulation by the ability to change the best writing symbol pattern in element 170, FIG. 5) the best writing symbol pattern (the best writing pattern being the top of the list in element 170 of FIG. 5) represented by the best interpretation according to characteristics of the handwritten pattern (refer to references/arguments cited in claim 15).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the method of Beernink'438 to include comprising, before the step of presenting, manipulating the best writing symbol pattern represented by the best interpretation according to

characteristics of the handwritten pattern as taught by Beernink'439 to provide "a correction method for when the selected word is the string of one or more well defined characters and the correction input is a character editing input overwriting a given box.", Beernink'439, Col. 2, lines 51 – 54.

Regarding **claim 25**, while Beernink'438 in view of Beernink'439 disclose the method of claim 24, Beernink'438 does not disclose wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling.

Beernink'439 discloses a boxed input correction system and method for pen based computer systems (FIG. 1) that teaches wherein the step of manipulating (manipulation by the ability to change the best writing symbol pattern in element 170, FIG. 5) is done in consideration of at least one characteristic in the group of translation (it is possible for the user to select the best writing symbol pattern "C" to be "c" from the first to second on the list in element 170, thus a translation from "C" to "c"), rotation, slant and scaling.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the method of Beernink'438 to include wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling as taught by Beernink'439 to provide "a correction method for when the selected word is the string of one or more well defined characters and the correction input is a character editing input overwriting a given box.", Beernink'439, Col. 2, lines 51 – 54.

Regarding **claim 26**, while Beernink'438 in view of Beernink'439 disclose the method of claim 24, Beernink'438 discloses wherein the handwritten pattern is entered on an input area (the area wherever the user writes on) on the screen (FIG. 3, element 53) and the best interpretation

(Beernink'438 discloses only one interpretation thus being the "best interpretation" of the writing symbol pattern) is presented in a presentation area (the area wherever the user writes on) on the screen (FIG. 3, element 53), whereby said presentation area overlaps the input area (when the recognition of the handwriting updates, it is performed right over the same spot, thus overlapping).

Regarding **claim 27**, while Beernink'438 in view of Beernink'439 disclose the method of claim 24, Beernink'438 does not disclose wherein the step of recognizing comprises returning at least one alternative interpretation.

Beernink'439 discloses a boxed input correction system and method for pen based computer systems (FIG. 1) that teaches wherein the step of recognizing comprises returning at least one alternative interpretation (the alternative interpretations are given in element 170 of FIG. 5).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the method of Beernink'438 to include wherein the step of recognizing comprises returning at least one alternative interpretation as taught by Beernink'439 to provide "a correction method for when the selected word is the string of one or more well defined characters and the correction input is a character editing input overwriting a given box.", Beernink'439, Col. 2, lines 51 – 54.

Regarding **claim 28**, while Beernink'438 in view of Beernink'439 disclose the method of claim 27, Beernink'438 does not disclose wherein the step of presenting comprises presenting the at least one alternative interpretation at the request of a user.

Beernink'439 discloses a boxed input correction system and method for pen based computer systems (FIG. 1) that teaches wherein the step of presenting comprises presenting the at least one alternative interpretation at the request of a user ("FIG. 5 illustrates a response of the boxed input correction system to the selected word 164 being selected to invoke a pop-up corrector 168", Beernink'439, Col. 10, lines 17 - 19.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the method of Beernink'438 to include wherein the step of presenting comprises presenting the at least one alternative interpretation at the request of a user as taught by Beernink'439 to provide "a correction method for when the selected word is the string of one or more well defined characters and the correction input is a character editing input overwriting a given box.", Beernink'439, Col. 2, lines 51 – 54.

Regarding **claim 29**, while Beernink'438 in view of Beernink'439 disclose the method of claim 15, Beernink'438 does not disclose wherein the best interpretation is associated with a category defining what kind of symbol is represented by the best interpretation.

Beernink'439 discloses a boxed input correction system and method for pen based computer systems (FIG. 1) that teaches wherein the best interpretation (the top of the list in FIG. 5, element 170, character (best template and best writing symbol "C") is associated with a category ("C" is "associated" with the capitalized letter category) defining what kind of symbol (the symbol would then be a capitalized character "C", which is "C") is represented by the best interpretation.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the method of Beernink'438 to include wherein the best interpretation is associated

with a category defining what kind of symbol is represented by the best interpretation as taught by Beernink'439 to provide "a correction method for when the selected word is the string of one or more well defined characters and the correction input is a character editing input overwriting a given box.", Beernink'439, Col. 2, lines 51 – 54.

Regarding **claim 30**, while Beernink'438 in view of Beernink'439 disclose the method of claim 29, Beernink'438 does not disclose wherein the step of presenting comprises masking the presentation of the presented interpretation according to which category the best interpretation is associated with.

Beernink'439 discloses a boxed input correction system and method for pen based computer systems (FIG. 1) that teaches wherein the step of presenting comprises masking the presentation of the presented interpretation according to which category the best interpretation is associated with (the masking is performed in step 170 of FIG. 5 of the best interpretation being presented being the top of the list, among other possibilities of which include "C" and "c" for the character "C").

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the method of Beernink'438 to include wherein the step of presenting comprises masking the presentation of the presented interpretation according to which category the best interpretation is associated with as taught by Beernink'439 to provide "a correction method for when the selected word is the string of one or more well defined characters and the correction input is a character editing input overwriting a given box.", Beernink'439, Col. 2, lines 51 – 54.

Regarding **claim 31**, while Beernink'438 in view of Beernink'439 disclose the method of claim 30, Beernink'438 does not disclose wherein the category is indicated by a certain color of

a background to the at least one of the plurality of writing symbol patterns represented by the presented interpretation.

Beernink'439 discloses a boxed input correction system and method for pen based computer systems (FIG. 1) that teaches wherein the category ("C" is "associated" with the capitalized letter category in FIG. 5, element 170) is indicated by a certain color of a background (the background color is white that indicates "C" is capitalized) to the at least one of the plurality of writing symbol patterns represented by the presented interpretation (presented interpretations being those listed in element 170, FIG. 5 with the top on the list being the best interpretation).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the method of Beernink'438 to include wherein the category is indicated by a certain color of a background to the at least one of the plurality of writing symbol patterns represented by the presented interpretation as taught by Beernink'439 to provide "a correction method for when the selected word is the string of one or more well defined characters and the correction input is a character editing input overwriting a given box.", Beernink'439, Col. 2, lines 51 – 54.

Regarding **claim 32**, while Beernink'438 in view of Beernink'439 disclose the method of claim 30, Beernink'438 does not disclose wherein the category is indicated by a certain color of the at least one of the plurality of writing symbol patterns (represented by the presented interpretation.

Beernink'439 discloses a boxed input correction system and method for pen based computer systems (FIG. 1) that teaches wherein the category ("C" is "associated" with the capitalized letter category in FIG. 5, element 170) is indicated by a certain color of the at least

one of the plurality of writing symbol patterns (the color is black that indicates "C" is capitalized) represented by the presented interpretation (presented interpretations being those listed in element 170, FIG. 5 with the top on the list being the best interpretation).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the method of Beernink'438 to include wherein the category is indicated by a certain color of the at least one of the plurality of writing symbol patterns represented by the presented interpretation as taught by Beernink'439 to provide "a correction method for when the selected word is the string of one or more well defined characters and the correction input is a character editing input overwriting a given box.", Beernink'439, Col. 2, lines 51 – 54.

Regarding **claim 34**, claim 15 recites identical features as in claim 34. Thus, references/arguments equivalent to those presented above for claim 15 are equally applicable to claim 34.

The means-plus-function language is anticipated by the computer of Beernink'438 (FIG. 1, element 12; FIG. 1).

12. **Claim 17** is rejected under 35 U.S.C. 103(a) as being unpatentable over Beernink et al. (US 5,666,438 A) in view of Beernink et al. (US 5,682,439 A) and Kadashevich et al. (US 5,970,170 A).

Regarding **claim 17**, while Beernink'438 in view of Beernink'439 disclose the method according to claim 16, wherein the step of presenting comprises presenting the best allograph represented by an image (FIG. 7, element 76 of Beernink'438 are images; FIG. 5, element 170 of

Beernink'439 are images) depicting the way of writing symbols of the best template, Beernink'438 in view of Beernink'439 do not disclose wherein the image is a bitmap image.

Kadashevich discloses a character recognition system identification of scanned and real time handwritten characters that includes teaching a bitmap image (Col. 8, lines 60 – 67; Col. 9, lines 17 – 22; Col. 13, lines 16 – 20).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the image of Beernink'438 in view of Beernink'439 to be a bitmap image as taught by Kadashevich to provide an "array wherein each bit in the array represents a pixel of the...image, with the state of bit (0 or 1) representing whether the corresponding pixel is a background or foreground pixel and the location of the bit in the array representing the coordinates of the corresponding pixel in the image.", Kadashevich, Col. 8, lines 60 – 67.

Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David P. Rashid whose telephone number is (571) 270-1578. The examiner can normally be reached Monday - Friday 8:30 - 17:00 ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vikkram Bali can be reached on (571) 272-7415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David P. Rashid/
Examiner, Art Unit 2624

David P Rashid
Examiner
Art Unit 2624

VIKKRAM BALI
PRIMARY EXAMINER

10/524430

IDS Form PTO/SB/08: Substitute for form 1449/PTO	Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT	Application Number	Unassigned
	Filing Date	February 15, 2005
	First Named Inventor	Erika OKNELID
	Art Unit	~~Unassigned~~ 2624
(Use as many sheets as necessary)	Examiner Name	~~Unassigned~~ David Rashid
Sheet 1 of 1	Attorney Docket Number	08806.0174

15 FEB 2005

U.S. PATENTS AND PUBLISHED U.S. PATENT APPLICATIONS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
/D.R./		US-5,732,152	03/24/1998	Sakai et al.	
/D.R./		US-2001/0026262 A1	10/04/2001	Van Gestel et al.	
		US-			
		US-			
		US-			
		US-			

Note: Copies of the U.S. Patent Documents are not Required in IDS filed after October 21, 2004

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	Translation[6]
/D.R./		EP 0 254 561	01/27/1988	Linus Technologies Limited		
/D.R./		WIPO 98/33141	07/301988	Co-Operwrite Limited		

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	Translation[6]
/D.R./		J.R. Parker, "Vector Templates and Handprinted Digit Recognition", IEEE, Vol. 2, pp. 457-459, 1994.	

Examiner Signature	/David Rashid/	Date Considered	11/13/2007

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

IDS Form PTO/SB/08: Substitute for form [redacted] PTO				Comp[redacted] if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Application Number	10/524,430
				Filing Date	February 15, 2005
				First Named Inventor	Erika OKNELID et al.
				Art Unit	~~Unassigned~~ 2624
(Use as many sheets as necessary)				Examiner Name	~~Unassigned~~ David Rashid
Sheet	1	of	1	Attorney Docket Number	08806.0174-00

OIPE AUG 18 2006 PATENT & TRADEMARK OFFICE

U.S. PATENTS AND PUBLISHED U.S. PATENT APPLICATIONS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-			
		US-			
		US-			

Note: Submission of copies of U.S. Patents and published U.S. Patent Applications is not required.

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	Translation[6]
/D.R./		JP 09-223191	08/26/1997	Sharp KK		Abstract
/D.R./		WO 00/13131	03/09/00	SPARR et al.		
/D.R./		WO 97/18526	05/22/1997	Motorola, Inc.		

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	Translation[6]

Examiner Signature	/David Rashid/	Date Considered	11/13/2007

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Notice of References Cited	Application/Control No. 10/524,430	Applicant(s)/Patent Under Reexamination PRYMUS ET AL.	
	Examiner David P. Rashid	Art Unit 2624	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,666,438	09-1997	Beernink et al.	382/189
*	B	US-5,682,439	10-1997	Beernink et al.	382/187
*	C	US-5,970,170	10-1999	Kadashevich et al.	382/187
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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BIB DATA SHEET

CONFIRMATION NO. 6160

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/524,430	08/09/2005 RULE	380	2624	08806-0174

APPLICANTS

Erika Prymus, Bara, SWEDEN;
Magnus Persson, Malmo, SWEDEN; DPR

**** CONTINUING DATA ***************************

This application is a 371 of PCT/SE03/01226 07/18/2003 DPR

**** FOREIGN APPLICATIONS ***************************

SWEDEN 0202446-1 08/16/2002 DPR

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

Foreign Priority claimed	35 USC 119(a-d) conditions met	Verified and Acknowledged	Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
☑ Yes ☐ No	☑ Yes ☐ No	/DAVID RASHID/ Examiner's Signature	☐	SWEDEN	6	34	4
			DPR Initials				

ADDRESS

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER
LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413
UNITED STATES

TITLE

Presenting recognised handwritten symbols

FILING FEE RECEIVED	FEES: Authority has been given in Paper	
1930	No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10524430	PRYMUS ET AL.
	Examiner	Art Unit
	Rashid, David P	2624

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	11/15/2007								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
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	28	✓								
	29	✓								
	30	✓								
	31	✓								
	32	✓								
	33	✓								
	34	✓								

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10524430	PRYMUS ET AL.
	Examiner	Art Unit
	Rashid, David P	2624

SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
382/186,187 (text search only - see search history printout)	11/15/2007	DPR

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

App #: 10-524430

EAST SEARCH HISTORY

Databases: US-PGPUB; USPAT; USOCR; EPO; JPO; IBM_TDB

Ref#	Hits	Search Text
S1	1	10/524430
S2	2	(("5732152") or ("20010026262")).PN.
S4	1240	(382/187).CCLS.
S3	395	(382/186).CCLS.
S6	395	(382/186).CCLS.
S7	1240	(382/187).CCLS.
S8	140	S5 and (S7 or S6)
S9	128	S8 and (pen or stylus)
S10	320	((handwrit$4 or signature) near recognition) and (database or memory) and (($4writ$4 or signature) near style) and (character or letter or symbol)
S11	6	((handwrit$4 or signature) near recognition) and (database or memory) and ((recognition or recogniz$3) near ($4writ$4 or signature) near style) and (character or letter or symbol)
S12	7	((handwrit$4 or signature) near recognition) and ((recognition or recogniz$3) near ($4writ$4 or signature) near style)
S13	123	S10 and @pd<"20020718"
S14	271	(382/189).CCLS.
S15	200	(S6 or S7 or S14) and (style near ($4writ$4 or signature))
S16	6	(S6 or S7 or S14) and (style near ($4writ$4 or signature) near (recognition or recogniz$4))
S17	1	("6647145").PN.
S18	1	09/355217
S19	39	("4423286" | "4532376" | "4641354" | "4794208" | "4806707" | "4820886" | "4831216" | "4835347" | "4853499" | "4905007" | "4953226" | "4972496" | "5029223" | "5155813" | "5303312" | "5465325" | "5521986" | "5544262" | "5544265" | "5555363" | "5559942" | "5566248" | "5583946" | "5590219" | "5596350" | "5608624" | "5615285" | "5621817" | "5623345" | "5627914" | "5633955" | "5656804" | "5666438" | "5673337" | "5675665" | "5677710" | "5682439" | "5959260" | "6011865").PN.
S20	5	((handwrit$4 or signature) near (recognition or recognizing) near style)
S21	10	(($4writ$4 or signature) near (recognition or recognizing) near style)
S5	1537	((handwrit$4 or signature) near recognition) and (database or memory) and dots
S22	7	((handwrit$4 or signature) near recognition) and (database or memory) and dots and capit$2 and lowercase
S23	21	("3776454" | "4132976" | "4953226").PN. OR ("5303312").URPN.
S24	1	("6154758").PN.
S26	1	S25 and bitmap
S25	19	(US-20010026639-$).did. or (US-5588073-$ or US-5559897-$ or US-5610996-$ or US-5105468-$ or US-6101280-$ or US-6144764-$ or US-5970170-$ or US-6370269-$ or US-5454046-$ or US-5303312-$ or US-5239592-$ or US-5682439-$ or US-6021218-$ or US-5802205-$ or US-6647145-$ or US-5559942-$ or US-5666438-$ or US-6226403-$).did.
S27	37	(PRYMUS adj ERIKA) or (PERSSON adj MAGNUS)

PATENT
Customer No.: 22,852
Attorney Docket No.: 08806.0174

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
Erika PRYMUS et al.	)	Group Art Unit: 2624
	)	
Application No.: 10/524,430	)	Examiner: Rashid, David
	)	
Filed: February 15, 2005	)	
	)	
For: PRESENTING RECOGNISED HANDWRITTEN SYMBOLS	)	Confirmation No.: 6160

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

PETITION FOR EXTENSION OF TIME

Applicant hereby petitions for a one-month extension of time to reply to the Office Action mailed November 23, 2007. A fee payment of $120.00 will be paid electronically at the time of filing.

Please grant any further extensions of time required to enter this response, and charge any additional required fees to our Deposit Account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Thomas Ho

Dated: March 21, 2008

By:_____
Thomas Y. Ho
Reg. No. 61,539

PATENT
Customer No.: 22,852
Attorney Docket No.: 08806.0174

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
Erika PRYMUS et al.	)	Group Art Unit: 2624
	)	
Application No.: 10/524,430	)	Examiner: Rashid, David
	)	
Filed: February 15, 2005	)	
	)	
For: PRESENTING RECOGNISED HANDWRITTEN SYMBOLS	)	Confirmation No.: 6160
	)	

Mail Stop - Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

REPLY TO OFFICE ACTION

In reply to the Office Action mailed November 23, 2007, the period for response being extended to March 24, 2007 (March 23, 2007 falling on a Sunday) by the Petition for Extension of Time and fee payment filed herewith, please amend the above-identified application as follows:

Amendments to the Claims are reflected in the listing of claims beginning on page 2 of this reply.

Remarks follow the amendments sections of this reply.

Attachments to this reply include a **Substitute Abstract**.

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Previously Presented) A method for presenting a recognized handwritten symbol, comprising the steps of:

detecting a handwritten pattern that is entered by a user;

recognizing 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 writing symbol patterns of ways of writing symbols, and returning a best template selected from the plurality of templates that represents one of the plurality of writing symbol patterns as a best writing 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 writing symbol patterns which represent different ways of writing a single symbol; and

presenting the best writing symbol pattern of the best template on a screen.

2. (Previously Presented) The method according to claim 1, wherein the at least one of the plurality of writing symbol patterns of each of the plurality of templates is represented by geometrical information relating to an appearance of said writing symbol pattern.

3. (Previously Presented) 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 writing symbol patterns being presented by lines drawn between the dots.

4. (Previously Presented) The method according to claim 1, wherein the step of presenting comprises presenting the whole best writing symbol pattern of the best template at once.

5. (Original) The method according to claim 3, wherein the step of presenting comprises presenting lines one at a time.

6. (Previously Presented) The method according to claim 1, further comprising, before the step of presenting, manipulating the best writing symbol pattern of the best template according to characteristics of the handwritten pattern.

7. (Original) The method according to claim 6, wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling.

8. (Previously Presented) The method according to claim 1, wherein the handwritten pattern is entered on an input area on the screen and the best writing

symbol pattern of the best template is presented in a presentation area on the screen, wherein said presentation area overlaps the input area.

9. (Previously Presented) The method according to claim 1, wherein the step of recognizing comprises returning at least one alternative template selected from the plurality of templates.

10. (Previously Presented) The method according to claim 9, wherein the step of presenting comprises presenting the at least one of the plurality of writing symbol patterns of the at least one alternative template at a request of a user.

11. (Previously Presented) The method according to claim 1, wherein each of the plurality of templates is associated with a category defining what kind of symbol is represented by each of the plurality templates.

12. (Currently Amended) The method according to claim 11, wherein the step of presenting comprises masking the presentation of the ~~presented~~ best writing symbol pattern according to which category the best template is associated with.

13. (Currently Amended) The method according to claim 12, wherein the category is indicated by a certain color of a background to the ~~presented~~ best writing symbol pattern.

14. (Currently Amended) The method according to claim 12, wherein the category is indicated by a certain color of the ~~presented~~ best writing symbol pattern.

15. (Previously Presented) The method for sequentially presenting a plurality of recognized handwritten symbols, comprising for each handwritten pattern the steps of:

detecting the handwritten pattern that is entered by a user;

recognizing 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 writing symbol patterns of ways of writing symbols and returning a best interpretation of the handwritten pattern, said best interpretation being based on one of the plurality of writing symbol patterns as a best writing 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 one of the plurality of writing symbol patterns which represent different ways of writing a single symbol, and wherein the different ones of the plurality of writing 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 on a screen.

16. (Previously Presented) The 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 writing symbol pattern of the best template.

17. (Previously Presented) The method according to claim 16, wherein the step of presenting comprises presenting the best allograph represented by a bitmap image depicting the way of writing symbols of the best template.

18. (Previously Presented) The method according to claim 16, wherein the step of presenting comprises presenting the best allograph represented by a number of arcs depicting the way of writing symbols of the best template.

19. (Previously Presented) The method according to claim 15, wherein the best interpretation is the writing symbol pattern of the best template, and wherein the step of presenting comprises presenting the best writing symbol pattern of the best template on the screen.

20. (Previously Presented) The method according to claim 19, wherein each of the plurality of writing symbol patterns of a template is represented by geometrical information relating to an appearance of each of said plurality of writing symbol patterns.

21. (Previously Presented) The method according to claim 20, wherein the geometrical information comprises information of positions of a number of dots

representing each of the plurality writing symbol patterns, said each of the plurality of writing symbol patterns being presented by lines drawn between the dots.

22. (Previously Presented) The method according to claim 15, wherein the step of presenting comprises presenting the whole best writing symbol pattern represented by the best interpretation at once.

23. (Original) The method according to claim 21, wherein the step of presenting comprises presenting the lines one at a time.

24. (Previously Presented) The method according to claim 15, further comprising, before the step of presenting, manipulating the best writing symbol pattern represented by the best interpretation according to characteristics of the handwritten pattern.

25. (Original) The method according to claim 24, wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling.

26. (Previously Presented) The method according to claim 15, wherein the handwritten pattern is entered on an input area on the screen and the best interpretation is presented in a presentation area on the screen, whereby said presentation area overlaps the input area.

27. (Previously Presented) The method according to claim 15, wherein the step of recognizing comprises returning at least one alternative interpretation.

28. (Original) The method according to claim 27, wherein the step of presenting comprises presenting the at least one alternative interpretation at the request of a user.

29. (Previously Presented) The method according to claim 15, wherein the best interpretation is associated with a category defining what kind of symbol is represented by the best interpretation.

30. (Currently Amended) The method according to claim 29, wherein the step of presenting comprises masking the presentation of the ~~presented~~ best interpretation according to which category the best interpretation is associated with.

31. (Currently Amended) The method according to claim 30, wherein the category is indicated by a certain color of a background to the at least one of the plurality of writing symbol patterns represented by the ~~presented~~ best interpretation.

32. (Currently Amended) The method according to claim 30, wherein the category is indicated by a certain color of the at least one of the plurality of writing symbol patterns represented by the ~~presented~~ best interpretation.

33. (Previously Presented) A device for recognition of a handwritten symbol, said device comprising

a screen;

means for detecting a handwritten pattern;

a database comprising templates that comprise a plurality of writing symbol patterns representing ways of writing symbols, wherein at least two of the templates comprising different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol; and

means for recognizing the detected handwritten pattern and returning one of the plurality of patterns of a best template of the handwritten pattern, said best template being most similar to the handwritten pattern,

wherein said device is arranged to present the one of the plurality of writing symbol patterns of the best template on the screen.

34. (Previously Presented) A device for recognition of a plurality of handwritten symbols, said device comprising

a screen;

means for detecting a handwritten pattern;

a database comprising templates that comprise a plurality of writing symbol patterns representing ways of writing symbols, wherein at least two of the templates comprising different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol; and

means for recognizing the detected handwritten patterns and individually returning for each handwritten pattern a best interpretation of the handwritten pattern, said best interpretation being based on one of the plurality of writing symbol patterns of a best template selected from the templates that is most similar to the handwritten pattern, wherein the one of the plurality writing symbol patterns of said at least two of the templates return different best interpretations when being most similar to the handwritten pattern,

wherein said device is arranged to present the best interpretation on the screen.

REMARKS

In the outstanding Office Action, the Examiner took the following actions:

(a) objected to the language and format of the Abstract;

(b) rejected claims 12 and 30 under 35 U.S.C. § 112, second paragraph, on the grounds of insufficient antecedent basis;

(c) rejected claims 1-8 and 11 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,303,312 to Comerford et al. ("Comerford");

(d) rejected claims 1-5, 8, and 33 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,666,438 to Beernink et al. ("Beernink '438);

(e) rejected claims 6, 7, 9-16, 18-32, and 34 under 35 U.S.C. § 103(a) as being unpatentable over Beernink '438 in view of U.S. Patent No. 5,682,439 to Beernink et al. ("Beernink '439"); and

(f) rejected claim 17 under 35 U.S.C. § 103(a) as being unpatentable over Beernink '438 in view of Beernink '439 and U.S. Patent No. 5,970,170 to Kadashevich et al. ("Kadashevich").

By this reply, Applicant amends claims 12-14 and 30-32, and provides a Substitute Abstract. Claims 1-34 remain pending in this application. This reply does not introduce any new matter.

I. Objection to the Abstract

Applicant provides a substitute Abstract as an attachment to this reply. Applicant respectfully submits that the substitute Abstract has the proper language and format.

II. Rejection of claims 12 and 30 under 35 U.S.C. § 112, second paragraph

Applicant amends claims 12-14 to replace the phrase "the presented pattern" with the phrase "the best writing symbol pattern," which is recited in independent claim 1, from which claims 12-14 depend. Applicant also amends claims 30-32 to

replace the phrase "the presented interpretation" with the phrase "the best interpretation," which is recited in independent claim 15, from which claims 30-32 depend. Applicant submits that these amendments remedy any antecedent basis deficiencies, and thus, Applicant requests withdrawal of the rejection under 35 U.S.C. § 112, second paragraph.

III. Rejection of claims 1-8 and 11 under 35 U.S.C. § 102(b) as allegedly being anticipated by Comerford

Applicant respectfully traverses the rejection of claims 1-8 and 11 as anticipated by Comerford. Comerford fails to teach each and every limitation recited in those claims.

Independent claim 1 calls for a combination including, for example,

> comparing the handwritten pattern to a plurality of templates . . . wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol.

Comerford fails to teach at least these elements. In Comerford,

> [w]hen the user has completed the character . . . . The recognizer constructs from the completed glyph an ordered sequence of designators 36 corresponding to the template line segments . . . . The recognizer then compares the ordered sequence to entries in a reference table, as shown at 37. If the ordered sequence matches an entry in the table, the corresponding computer code entry is output at 38. Comerford, column 8, lines 16-31.

Comerford does not disclose the content of the entries in reference table 37. Thus, Comerford cannot teach that the entries are "a plurality of templates . . . wherein at least two of the plurality of templates comprise different ones of a plurality of writing symbol patterns, which represent different ways of writing a single symbol," as recited in independent claim 1. Although FIGS. 4 and 8-10 of Comerford show various ways of

writing letters, those letters are not entries in reference table 37, but rather, are user-created characters, the kind that are encoded into ordered sequence of designators 36, and are then compared to entries in reference table 37. See Id. at column 7, lines 50-60; and column 8, lines 16-31. Since the letters in FIGS. 4 and 8-10 of Comerford are not entries in reference table 37, Comerford fails to teach "comparing the handwritten pattern to a plurality of templates . . . wherein at least two of the plurality of templates comprise different ones of a plurality of writing symbol patterns, which represent different ways of writing a single symbol," as recited in independent claim 1. For at least this reason, Comerford fails to anticipate independent claim 1. Applicant respectfully requests reconsideration of this rejection of independent claim 1, and the timely allowance of independent claim 1.

Claims 2-8 and 11 each depend from independent claim 1, and are allowable for at least the reasons stated above with respect to claim 1. In addition, each of the dependent claims recites unique combinations that are neither taught nor suggested by the cited art, and therefore each is also separately patentable.

IV. Rejection of claims 1-5, 8, and 33 under 35 U.S.C. § 102(b) as allegedly being anticipated by Beernink '438

Applicant respectfully traverses the rejection of claims 1-5, 8, and 33 as being anticipated by Beernink '438. Beernink '438 fails to teach each and every limitation recited in those claims.

Independent claim 1 calls for a combination including, for example,

> comparing the handwritten pattern to a plurality of templates . . . wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol.

Beernink '438 fails to teach at least these elements. As stated in Beernink '438, "[t]he present invention makes use of a recognizer implemented by CPU 12 to recognize ink strokes input by a user with a stylus 38. The recognizer analyzes the entered ink and attempts to match the ink to a letter, word, shape, or other symbol present in a database accessible to the recognizer." Beernink '438, column 7, lines 19-23. Beernink '438 does not describe the letter, word, shape, or other symbol, matched to the ink strokes input by the user, and thus, Beernink '438 cannot teach that at least two of the letter, word, shape, or other symbol, "comprise different ones of a plurality of writing symbol patterns, which represent different ways of writing a single symbol," as recited in independent claim 1.

While Beernink '438 discloses different letter styles in a letter style screen 76 shown in FIGS. 6a, 6b, 7, and 8, Beernink '438 does not teach that the ink strokes input by a user are compared to the letter styles. Rather, Beernink '438 discloses,

> [r]eferring now to FIG. 8 . . . . A user selects one of the characters 89 of which he wishes to modify the letter style . . . . CPU 12 then displays style letters 95 for the selected character 89. For each displayed style letter 95, the user can select whether he or she writes that letter style either "sometimes" or "rarely" by actuating one of toggles 97 . . . . Computer system 10 automatically saves adaptive learning data associated with the style letters selected and modified by the user. Beernink '438, column 10, lines 8-22 and 42-44.

Since Beernink '438 does not describe the letter, word, shape or other symbol, matched with the ink strokes input by the user, and Beernink '438 does not teach that the ink strokes input by the user are compared to the letter styles in letter style screen 76, Beernink '438 fails to teach or suggest, "comparing the handwritten pattern to a plurality of templates . . . wherein at least two of the plurality of templates comprise

different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol," as recited in independent claim 1. For at least this reason, Beernink '438 fails to anticipate independent claim 1. Applicant respectfully requests reconsideration of the rejection of claim 1, and the timely allowance of claim 1.

Claims 2-5 and 8 each depend from independent claim 1, and are allowable for at least the reasons stated above with respect to claim 1. In addition, each of the dependent claims recites unique combinations that are neither taught nor suggested by the cited art, and therefore each is also separately patentable.

Independent claim 33, while of different scope, recites elements similar to those recited in independent claim 1. Thus, Beernink '438 fails to teach each and every feature recited in independent claim 33. Accordingly, independent claim 33 is allowable at least for the same reasons discussed above with respect to independent claim 1. Applicant respectfully requests the timely allowance of independent claim 33.

V. Rejection of claims 6, 7, 9-16, 18-32, and 34 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Beernink '438 in view of Beernink '439

Applicant respectfully traverses the rejection of claims 6, 7, 9-16, 18-32, and 34, as being unpatentable over Beernink '438 in view of Beernink '439. A *prima facie* case of obviousness has not been established.

"The key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. . . . [R]ejections on obviousness cannot be sustained with mere conclusory statements." M.P.E.P. § 2142, 8th Ed., Rev. 6 (Sept. 2007) (internal citation and inner quotation omitted). "The mere fact that references can be combined or modified does not render the resultant

combination obvious unless the results would have been predictable to one of ordinary skill in the art." M.P.E.P. § 2143.01(III) (emphasis in original). "All words in a claim must be considered in judging the patentability of that claim against the prior art." M.P.E.P. § 2143.03. "In determining the differences between the prior art and the claims, the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious." M.P.E.P. § 2141.02(I) (emphases in original).

"[T]he framework for objective analysis for determining obviousness under 35 U.S.C. 103 is stated in *Graham v. John Deere Co.*, 383 U.S. 1, 148 U.S.P.Q 459 (1966). . . . The factual inquiries . . . [include determining the scope and content of the prior art and] . . . [a]scertaining the differences between the claimed invention and the prior art." M.P.E.P. § 2141(II). "Office personnel must explain why the difference(s) between the prior art and the claimed invention would have been obvious to one of ordinary skill in the art." M.P.E.P. § 2141(III).

Here, a *prima facie* case of obviousness has not been established because the Examiner has neither properly determined the scope and content of the prior art nor properly ascertained the differences between the claimed invention and the prior art. Accordingly, the Examiner has failed to clearly articulate a reason why the prior art would have rendered the claimed invention obvious to one of ordinary skill in the art.

Independent claim 1, from which claims 6, 7, and 9-14 depend, calls for a combination including, for example,

> comparing the handwritten pattern to a plurality of templates . . . wherein at least two of the plurality of templates comprise different ones of the

> plurality of writing symbol patterns which represent different ways of writing a single symbol.

The Examiner alleges that letter style screen 76 in FIG. 6A of Beernink '438 corresponds to the claimed "plurality of templates," and that letter style screen 76 in FIG. 8 also corresponds to the claimed "plurality of templates." See Office Action, page 7. This is not correct. Beernink '438 discloses,

> "[r]eferring now to FIG. 8 . . . . A user selects one of the characters 89 of which he wishes to modify the letter style . . . . CPU 12 then displays style letters 95 for the selected character 89. For each displayed style letter 95, the user can select whether he or she writes that letter style either "sometimes" or "rarely" by actuating one of toggles 97 . . . . Computer system 10 automatically saves adaptive learning data associated with the style letters selected and modified by the user." Id., column 10, lines 8-22 and 42-44.

However, Beernink '438 does not teach or suggest that the ink strokes input by a user are compared to the letter styles in letter style screen 76. Thus, the letter styles in letter style screen 76 cannot correspond to the claimed "plurality of templates," since independent claim 1 requires the step of "comparing the handwritten pattern to a plurality of templates." In view of the mischaracterization of Beernink '438, above, the Examiner has neither properly determined the scope and content of the prior art nor properly ascertained the differences between the prior art and the invention of independent claim 1. Thus, the Examiner has failed to clearly articulate a reason why claims 6, 7, and 9-14, which depend from independent claim 1, would have been obvious to one of ordinary skill in the art in view of the prior art. Accordingly, a *prima facie* case of obviousness has not been established with respect to claims 6, 7, and 9-14, and the rejection under 35 U.S.C. § 103(a) must be withdrawn.

Independent claims 15 and 34, while of different scope, recite elements similar to those recited in independent claim 1. Thus, independent claims 15 and 34 are allowable over Beernink '438 and Beernink '439, for at least the reasons discussed above with respect to claims 6, 7, and 9-14. Claims 16 and 18-32 depend from independent claim 15, and thus, are allowable for at least the same reasons that independent claim 15 is allowable. In addition, these dependent claims recite unique combinations that are neither taught nor suggested by the cited art, and therefore each is also separately patentable.

VI. Rejection of claim 17 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Beernink '438 in view of Beernink '439 and Kadashevich

Applicant respectfully traverses the rejection of claim 17 as being unpatentable over Beernink '438 in view of Beernink '439 and Kadashevich. A *prima facie* case of obviousness has not been established. Claim 17 depends from claim 15, and thus includes all the elements thereof. As set forth above, Beernink '439 fails to teach or suggest at least "comparing the handwritten pattern to a plurality of templates . . . wherein at least two of the plurality of templates comprise different one of the plurality of writing symbol patterns which represent different ways of writing a single symbol," as recited in claim 15, and required by claim 17. Beernink '439 and Kadashevich fail to cure the deficiencies of Beernink '438. That is, Beernink '439 and Kadashevich also fail to teach or suggest at least "comparing the handwritten pattern to a plurality of templates . . . wherein at least two of the plurality of templates comprise different one of the plurality of writing symbol patterns which represent different ways of writing a single symbol," as recited in claim 15 and required by claim 17.

In view of the mischaracterization of Beernink '438 discussed above, the Examiner has neither properly determined the scope and content of the prior art nor properly ascertained the differences between the prior art and the combination of claim 17. Thus, the Examiner has failed to clearly articulate a reason why claim 17 would have been obvious to one of ordinary skill in the art in view of the prior art. Accordingly, a *prima facie* case of obviousness has not been established with respect to claim 17, and the rejection under 35 U.S.C. § 103(a) must be withdrawn.

In view of the foregoing amendments and remarks, Applicant respectfully requests reconsideration of the pending rejections in this application, and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our Deposit Account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Thomas Ho

Dated: March 21, 2008 By:_____
Thomas Y. Ho
Reg. No. 61,539

Attachments: Attached please find a **Substitute Abstract (1 page).**

SUBSTITUTE ABSTRACT

Please delete the current Abstract and replace it with the following new Abstract:

ABSTRACT

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.

Electronic Patent Application Fee Transmittal

Application Number:	10524430
Filing Date:	09-Aug-2005
Title of Invention:	Presenting recognised handwritten symbols
First Named Inventor/Applicant Name:	Erika Prymus
Filer:	Thomas Y Ho/Janet Weems
Attorney Docket Number:	08806-0174
Filed as Large Entity	

U.S. National Stage under 35 USC 371 Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 1 month with $0 paid	1251	1	120	120

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
			Total in USD ($)	**120**

Electronic Acknowledgement Receipt

EFS ID:	3037706
Application Number:	10524430
International Application Number:	
Confirmation Number:	6160
Title of Invention:	Presenting recognised handwritten symbols
First Named Inventor/Applicant Name:	Erika Prymus
Customer Number:	22852
Filer:	Thomas Y Ho/Janet Weems
Filer Authorized By:	Thomas Y Ho
Attorney Docket Number:	08806-0174
Receipt Date:	21-MAR-2008
Filing Date:	09-AUG-2005
Time Stamp:	18:26:25
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$120
RAM confirmation Number	2235
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)

1	Extension of Time	ExtensionOfTime.pdf	49472 1636e0beab4b6b6735561020c99aeae1e4ad750c	no	1
Warnings:					
Information:					
2		ReplyToOfficeAction.pdf	103880 990086be6e6c35e4d3fd8717fd7b080b12a8a30b	yes	20

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Specification	1	1
Claims	2	10
Applicant Arguments/Remarks Made in an Amendment	11	19
Abstract	20	20

Warnings:					
Information:					
3	Fee Worksheet (PTO-06)	fee-info.pdf	8162 0f29b0e5b0644daf562e4458e1f1e38a502b6d27	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	161514		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
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 displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
10/524,430	08/09/2005	

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☐		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	03/21/2008	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 34	Minus	** 34	= 0	X $ =		OR	X $50=	0
	Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $ =		OR	X $210=	0
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/DEBRA a. SAVOY/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,430	08/09/2005	Erika Prymus	08806-0174	6160

22852 7590 06/23/2008

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
RASHID, DAVID	
ART UNIT	PAPER NUMBER
2624	

MAIL DATE	DELIVERY MODE
06/23/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/524,430	PRYMUS ET AL.	
	Examiner	Art Unit	
	DAVID P. RASHID	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 March 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Amendments

[1] This office action is responsive to the claim and specification amendment received on March 21, 2008. Claims 1-34 remain pending.

Specification

[2] In response to applicant's specification amendments and remarks received on March 21, 2008, the previous specification objections are withdrawn.

Claim Rejections - 35 USC § 102

[3] The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

[4] **Claims 1-6, 8, 11,** and **33** are rejected under 35 U.S.C. 102(n) as being anticipated by U.S. Patent No. 5,666,438 (issued Sep. 9, 1997) [*hereinafter* "Beernink '438"].

Regarding **claim 1**, *Beernink '438* discloses a method for presenting a recognized handwritten symbol (fig. 6a; "handwriting recognition" at 2:13-15), comprising the steps of:

detecting ("recognizer implemented by CPU 12 to recognize ink strokes input by a user with stylus 38" at 7:19-21) a handwritten pattern ("ink strokes input" at 7:19-21; *e.g.*, fig. 8, item 95) that is entered by a user (fig.3);

recognizing ("handwriting recognition" at 2:13-15) the detected handwritten pattern,

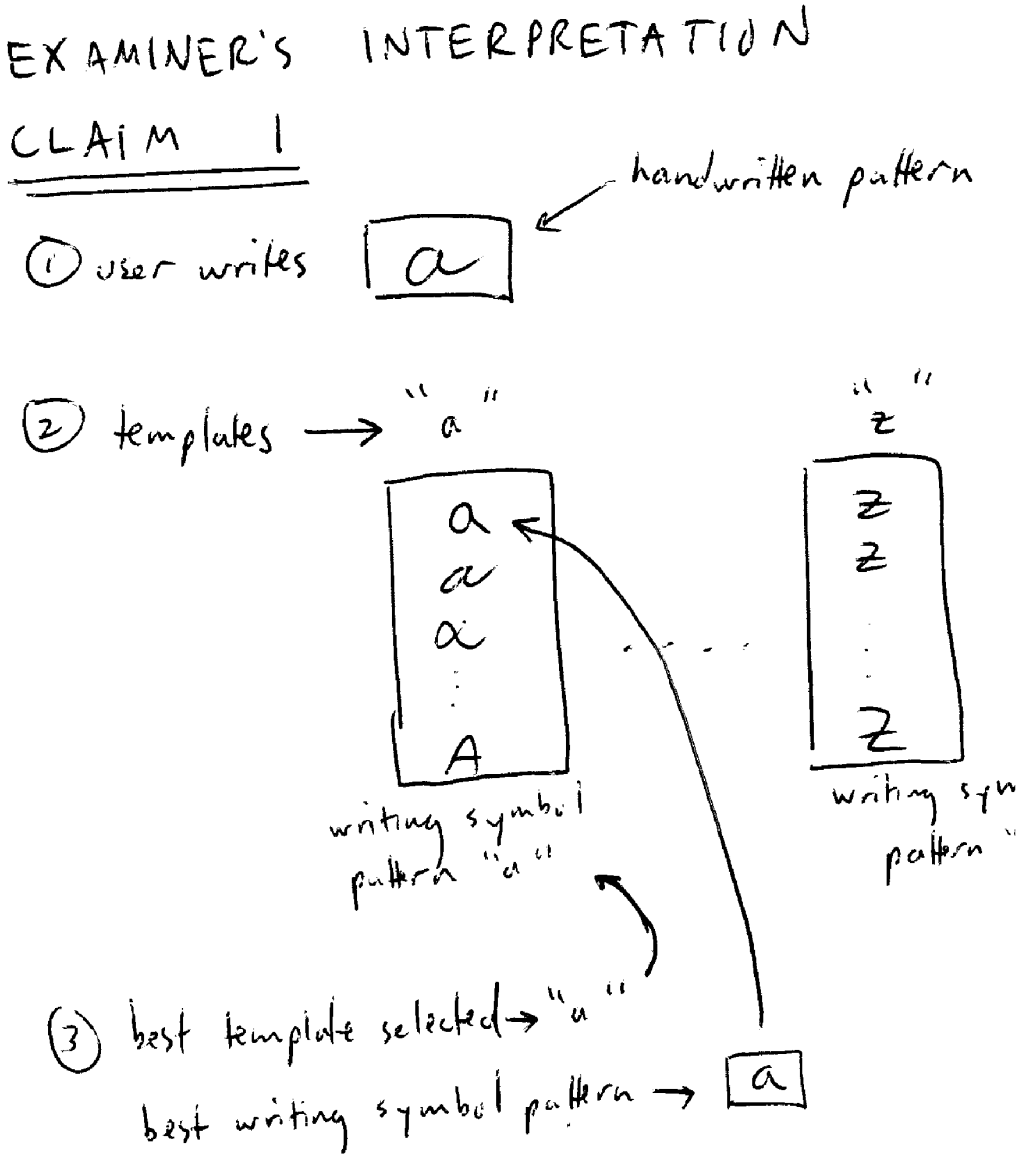
wherein said step of recognizing comprises comparing (the handwriting is compared to each of the templates) the handwritten pattern to a plurality of templates (fig. 8, item 89; *e.g.*, selected character "f" is a template),

wherein each of the plurality of templates (*e.g.*, template "f" in fig. 8) represents at least one of a plurality of writing symbol patterns (*e.g.*, template "f" comprises four writing symbol patterns including items 95, 95b) of ways of writing symbols (the English alphabet), and

returning a best template ("handwriting recognition is optimized" at 2:47-49) selected from the plurality of templates (fig. 8, item 89; *e.g.*, selected character "f" is a template) that represents one of the plurality of writing symbol patterns (*e.g.*, template "f" comprises four writing symbol patterns including items 95, 95b) as a best writing symbol pattern which, according to a predefined rule, is most similar to the handwritten pattern (once "Letter Style" preferences are saved, *Beernink '438* uses those preferences to recognize characters),

wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol (each character in list item 89 has four writing symbol patterns item 95; these four writing symbol patterns are accountable for the plurality of templates of "Letter Styles" for each user); and

presenting the best writing symbol pattern of the best template on a screen (fig 3, item 52; "handwriting recognition" at 2:13-15).



Regarding **claim 2**, *Beernink '438* discloses the method according to claim 1, wherein each of the plurality of writing symbol patterns of a template is represented by geometrical information (it is implicit if not already inherent that each of the plurality of writing symbol

patterns of a template is "represented by geometrical information" as each of the plurality of writing symbol patterns of a template consists of geometrical information such as height, width, etc – *e.g.*, item 79 requires geometric information) relating to an appearance of each of said plurality of writing symbol patterns.

Regarding **claim 3**, *Beernink '438* discloses the method according to claim 2, wherein the geometrical information (it is implicit if not already inherent that each of the plurality of writing symbol patterns of a template is "represented by geometrical information" as each of the plurality of writing symbol patterns of a template consists of geometrical information such as height, width, etc – *e.g.*, item 79 requires geometric information) comprises information of positions of a number of dots (it is again inherent that the tablet-screen 52 of fig 3 will pick up individual pixels from which the user writes, each pixel being a dot that represents additional positional information on the tablet-screen) representing each of the plurality writing symbol patterns (each character of the English alphabet comprises different ways of writing each character (e.g. fig 6a, item 74 gives 4 different ways), each different way being a writing symbol pattern), said each of the plurality of writing symbol patterns being presented by lines (a stroke of a character written on tablet-screen 52 of fig 3 will contain a string of pixels (dots) that are presented by lines drawn between the pixels, take the "Letter Styles" in fig 6a for instance) drawn between the dots.

Regarding **claim 4**, *Beernink '438* discloses the method according to claim 1, wherein the step of presenting comprises presenting the whole best writing symbol pattern (*Beernink '438* discloses only one interpretation thus being the "best interpretation" of the writing symbol

pattern, this occurs "at once" when item 85b on item 81 is turned up to "fast, less accurately" in fig 6a) represented by the best interpretation at once.

Regarding **claim 5**, *Beernink '438* discloses the method according to claim 3, wherein the step of presenting comprises presenting the lines one at a time (each time the user writes a stroke to be recognized, that stroke consists of pixels (dots) and lines between the pixels, and each time the user writes a new stroke another line is constructed and thus lines are being presented one at a time).

Regarding **claim 6**, *Beernink '438* discloses the method according to claim 1, further comprising, before the step of presenting, manipulating ("converted into printed words" at 5:65-67, i.e., the handwriting is converted to electronic text) the best writing symbol pattern of the best template according to characteristics of the handwritten pattern.

Regarding **claim 8**, *Beernink '438* discloses the method according to claim 1, wherein the handwritten pattern is entered on an input area (the area wherever the user writes on) on the screen (fig 3, item 53) and the best interpretation (*Beernink '438* discloses only one interpretation thus being the "best interpretation" of the writing symbol pattern) is presented in a presentation area (the area wherever the user writes on) on the screen (fig 3, item 53), whereby said presentation area overlaps the input area (when the recognition of the handwriting updates, it is performed right over the same spot, thus overlapping).

Regarding **claim 11**, *Beernink '438* discloses the method according to claim 1, wherein each of the plurality of templates is associated with a category (a category is a character from the English alphabet, each category comprised of different user styles writing it, and whether it is

uppercase, lowercase, etc) defining what kind of symbol is represented by each of the plurality of templates.

Regarding **claim 33**, claim 1 recites identical features as in claim 33. Thus, references/arguments equivalent to those presented above for claim 1 are equally applicable to claim 33.

Claim Rejections - 35 USC § 103

[5] The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

[6] **Claim 7** is rejected under 35 U.S.C. 103(a) as being unpatentable over *Beernink '438* in view of U.S. Pub. No. 2001/0026639 (published Oct. 4, 2001) [*hereinafter* "Sparr et al."].

Regarding **claim 7**, while *Beernink '438* discloses the method of claim 6, *Beernink '438* does not teach wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling.

Sparr et al. teaches wherein a step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling (fig. 2, fig. 3).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the step of manipulating of *Beernink '438* to be done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling as taught by *Sparr et al.* so that "to a larger extent accept[ing] individual styles of handwritten characters and unusual

fonts of typewritten characters, and is easy to implement with limited computing power.", para. 0006.

[7] **Claims 9-10, 12-16, 18-24, 26-32,** and **34** are rejected under 35 U.S.C. 103(a) as being unpatentable over *Beernink '438* in view of U.S. Patent No. 5,682,439 (issued Oct. 28, 1997) [*hereinafter* "Beernink '439"].

Regarding **claim 9**, while *Beernink '438* discloses the method of claim 1, *Beernink '438* does not disclose wherein the step of recognizing comprises returning at least one alternative template selected from the plurality of templates.

Beernink '439 teaches wherein a step of recognizing comprises returning at least one alternative template (*e.g.*, handwritten "Correct" item 172 returns list item 170, the letter "o" in "Correct" returns templates "o" and "u") selected from the plurality of templates.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the step of recognizing of *Beernink '438* to include returning at least one alternative template selected from the plurality of templates as taught by *Beernink '439* to "provide[[s]] the user with some character strings which the recognition software believes are close matches for the ink word 172. The ink word 172 represents the original strokes which comprised the word which the user entered. Selecting the keyboard button 174 will display a keyboard window. Once the keyboard window is displayed, the user can select desired characters from the keyboard via the stylus 110.", *Beernink '439,* 10:54-61.

Regarding **claim 10**, while *Beernink '438* discloses the method of claim 1, *Beernink '438* does not disclose wherein the step of presenting comprises presenting the at least one of the plurality of writing symbol patterns of the at least one alternative template at a request of a user.

Beernink '439 teaches presenting the at least one of the plurality of writing symbol patterns (*e.g.*, handwritten "Correct" item 172 returns list item 170, the letter "C" in "Correct" returns templates "C" and "c") of the at least one alternative template at a request of a user (the use requested the list item 170).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the step of recognizing of *Beernink '438* to include presenting the at least one of the plurality of writing symbol patterns of the at least one alternative template at a request of a user as taught by *Beernink '439* to "provide[[s]] the user with some character strings which the recognition software believes are close matches for the ink word 172. The ink word 172 represents the original strokes which comprised the word which the user entered. Selecting the keyboard button 174 will display a keyboard window. Once the keyboard window is displayed, the user can select desired characters from the keyboard via the stylus 110.", *Beernink '439,* 10:54-61.

Regarding **claim 12**, while *Beernink '438* discloses the method of claim 11, *Beernink '438* does not disclose wherein the step of presenting comprises masking the presentation of the presented interpretation according to which category the best interpretation is associated with.

Beernink '439 teaches a boxed input correction system and method for pen based computer systems (fig 1) that teaches wherein the step of presenting comprises masking the presentation of the presented interpretation according to which category the best interpretation is associated with (the masking is performed in step 170 of fig 5 of the best interpretation being presented being the top of the list, among other possibilities of which include "C" and "c" for the character "C").

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the method of *Beernink'438* to include wherein the step of presenting comprises masking the presentation of the presented interpretation according to which category the best interpretation is associated with as taught by *Beernink'439* to provide "a correction method for when the selected word is the string of one or more well defined characters and the correction input is a character editing input overwriting a given box.", *Beernink'439*, 2:51-54.

Regarding **claim 13**, while *Beernink'438* in view of *Beernink'439* disclose the method of claim 12, *Beernink'438* does not disclose wherein the category is indicated by a certain color of a background to the at least one of the plurality of writing symbol patterns represented by the presented interpretation.

Beernink'439 discloses a boxed input correction system and method for pen based computer systems (fig 1) that teaches wherein the category ("C" is "associated" with the capitalized letter category in fig 5, item 170) is indicated by a certain color of a background (the background color is white that indicates "C" is capitalized) to the at least one of the plurality of writing symbol patterns represented by the presented interpretation (presented interpretations being those listed in item 170, fig 5 with the top on the list being the best interpretation).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the method of *Beernink'438* to include wherein the category is indicated by a certain color of a background to the at least one of the plurality of writing symbol patterns represented by the presented interpretation as taught by *Beernink'439* to provide "a correction method for when the selected word is the string of one or more well defined characters and the correction input is a character editing input overwriting a given box.", *Beernink'439*, 2:51-54.

Regarding **claim 14**, while *Beernink'438* in view of *Beernink'439* disclose the method of claim 12, *Beernink'438* does not disclose wherein the category is indicated by a certain color of the at least one of the plurality of writing symbol patterns (represented by the presented interpretation.

Beernink'439 discloses a boxed input correction system and method for pen based computer systems (fig 1) that teaches wherein the category ("C" is "associated" with the capitalized letter category in fig 5, item 170) is indicated by a certain color of the at least one of the plurality of writing symbol patterns (the color is black that indicates "C" is capitalized) represented by the presented interpretation (presented interpretations being those listed in item 170, fig 5 with the top on the list being the best interpretation).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the method of *Beernink'438* to include wherein the category is indicated by a certain color of the at least one of the plurality of writing symbol patterns represented by the presented interpretation as taught by *Beernink'43*9 to provide "a correction method for when the selected word is the string of one or more well defined characters and the correction input is a character editing input overwriting a given box.", *Beernink'439*, 2:51-54.

Regarding **claim 15**, while *Beernink '438* discloses a method for presenting a recognized handwritten symbol (fig. 6a; "handwriting recognition" at 2:13-15), comprising the steps of:

detecting ("recognizer implemented by CPU 12 to recognize ink strokes input by a user with stylus 38" at 7:19-21) a handwritten pattern ("ink strokes input" at 7:19-21; *e.g.*, fig. 8, item 95) that is entered by a user (fig.3);

recognizing ("handwriting recognition" at 2:13-15) the detected handwritten pattern,

wherein said step of recognizing comprises comparing (the handwriting is compared to each of the templates) the handwritten pattern to a plurality of templates (fig. 8, item 89; *e.g.*, selected character “f” is a template),

wherein each of the plurality of templates (*e.g.*, template “f” in fig. 8) represents at least one of a plurality of writing symbol patterns (*e.g.*, template “f” comprises four writing symbol patterns including items 95, 95b) of ways of writing symbols (the English alphabet), and

returning a best interpretation (the best interpretation is a best writing symbol pattern, i.e., when the user writes “F”, it will pick the best of item 95 and that best pick is the best interpretation, the best interpretation displayed will be capital "F" as opposed to lowercase "f") of the handwritten pattern, said best interpretation being based on one of the plurality of writing symbol patterns as a best writing symbol pattern (the best writing symbol pattern is picked from the plurality of templates; e.g., template "f" picked with different writing symbol patterns "f" (item 95) for which the best writing symbol pattern “f” will be picked (either item 95a or 95b) when the user writes “f”) of a best template selected from the plurality of templates (fig. 8, item 89; *e.g.*, selected character “f” is a template) that, according to a predefined rule, is most similar to the handwritten pattern (once “Letter Style” preferences are saved, *Beernink ‘438* uses those preferences to recognize characters), wherein at least two of the plurality of templates comprise different one of the plurality of writing symbol patterns which represent different ways of writing a single symbol (each character in list item 89 has four writing symbol patterns item 95; these four writing symbol patterns are accountable for the plurality of templates of “Letter Styles” for each user), and wherein the different ones of the plurality of writing symbol patterns (*e.g.*, template “f” comprises four writing symbol patterns including items 95, 95b) of said at least two

of the plurality of templates (*e.g.*, template "f" in fig. 8) return different best interpretations (each template is composed of unique and separate writing symbol patterns, so the best interpretations of those separate writing symbol patterns for each template must be different) when being most similar to the handwritten pattern; and

presenting the best interpretation on a screen (fig 3, item 52; "handwriting recognition" at 2:13-15) *Beernink '438* does not disclose returning a best interpretation among multiple interpretations of the handwritten pattern in the sense of Applicant's invention.

Beernink '439 teaches returning a best interpretation (fig. 5, item 168 wherein the top of the list is the best interpretation) among multiple interpretations (fig. 5, item 170) of a handwritten pattern (fig. 5, item 172).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the method of *Beernink'438* to include returning a best interpretation among multiple interpretations of the handwritten pattern in the sense of Applicant's invention as taught by *Beernink '439* to " provide[[s]] the user with some character strings which the recognition software believes are close matches for the ink word 172. The ink word 172 represents the original strokes which comprised the word which the user entered. Selecting the keyboard button 174 will display a keyboard window. Once the keyboard window is displayed, the user can select desired characters from the keyboard via the stylus 110.", *Beernink '439,* 10:54-61.

Regarding **claim 16**, *Beernink '438* discloses further comprising, before the step of presenting, retrieving as the best interpretation, from a database comprising allographs, a best allograph (the best allograph is the digital font letter of "f" that is it converted to (*e.g.*, the text

written in fig. 2 is converted to digital font)) that is associated with the best writing symbol pattern of the best template.

Regarding **claim 18**, *Beernink '438* discloses wherein the step of presenting comprises presenting the best allograph (the best allograph is the digital font letter of "f" that is it converted to (*e.g.*, the text written in fig. 2 is converted to digital font)) represented by a number of arcs (it is inherent that each allograph is "represented by a number of arcs" as each allograph consists of a series of arcs) depicting the way of writing symbols of the best template.

Regarding **claim 19**, *Beernink '438* discloses wherein the best interpretation is the writing symbol pattern of the best template (refer to claim 15), and wherein the step of presenting comprises presenting the best writing symbol pattern (the best writing symbol pattern is picked from the plurality of templates; e.g., template "f" picked with different writing symbol patterns "f" (item 95) for which the best writing symbol pattern "f" will be picked (either item 95a or 95b) when the user writes "f") of the best template on the screen (*e.g.*, user writes "f", the algorithm will find the best "f" writing symbol pattern within template "f").

Regarding **claim 20**, claim 2 recites identical features as in claim 20. Thus, references/arguments equivalent to those presented below for claim 2 are equally applicable to claim 20.

Regarding **claim 21**, claim 3 recites identical features as in claim 21. Thus, references/arguments equivalent to those presented below for claim 3 are equally applicable to claim 21.

Regarding **claim 22**, *Beernink '438* discloses wherein the step of presenting comprises presenting the whole best writing symbol pattern (*Beernink '438* discloses only one

interpretation thus being the "best interpretation" of the writing symbol pattern, this occurs "at once" when item 85b on item 81 is turned up to "fast, less accurately" in fig 6a) represented by the best interpretation at once.

Regarding **claim 23**, claim 5 recites identical features as in claim 23. Thus, references/arguments equivalent to those presented below for claim 5 are equally applicable to claim 23.

Regarding **claim 24**, *Beernink '438* discloses further comprising, before the step of presenting, manipulating ("converted into printed words" at 5:65-67, i.e., the handwriting is converted to electronic text) the best writing symbol pattern represented by the best interpretation (refer to claim 15) according to characteristics of the handwritten pattern.

Regarding **claim 26**, *Beernink '438* discloses wherein the handwritten pattern is entered on an input area (the area wherever the user writes on) on the screen (fig 3, item 53) and the best interpretation (*Beernink '438* discloses only one interpretation thus being the "best interpretation" of the writing symbol pattern) is presented in a presentation area (the area wherever the user writes on) on the screen (fig 3, item 53), whereby said presentation area overlaps the input area (when the recognition of the handwriting updates, it is performed right over the same spot, thus overlapping).

Regarding **claim 27**, while *Beernink '438* discloses the method of claim 1, *Beernink '438* does not disclose wherein the step of recognizing comprises returning at least one alternative interpretation.

Beernink '439 teaches wherein a step of recognizing comprises returning at least one alternative interpretation (*e.g.*, handwritten "Correct" item 172 returns list item 170, the letter "C" in "Correct" returns templates "C" and "c").

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the step of recognizing of *Beernink '438* to include returning at least one alternative interpretation as taught by *Beernink '439* to "provide[[s]] the user with some character strings which the recognition software believes are close matches for the ink word 172. The ink word 172 represents the original strokes which comprised the word which the user entered. Selecting the keyboard button 174 will display a keyboard window. Once the keyboard window is displayed, the user can select desired characters from the keyboard via the stylus 110.", *Beernink '439,* 10:54-61.

Regarding **claim 28**, while *Beernink '438* discloses the method of claim 1, *Beernink '438* does not disclose wherein the step of presenting the at least one alternative interpretation at the request of a user.

Beernink '439 teaches presenting the at least one of the plurality of writing symbol patterns (*e.g.*, handwritten "Correct" item 172 returns list item 170, the letter "C" in "Correct" returns templates "C" and "c") of the at least one alternative interpretation at a request of a user (the use requested the list item 170).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the step of recognizing of *Beernink '438* to include presenting the at least one of the plurality of writing symbol patterns of the at least one alternative interpretation at a request of a user as taught by *Beernink '439* to "provide[[s]] the user with some character strings which the

recognition software believes are close matches for the ink word 172. The ink word 172 represents the original strokes which comprised the word which the user entered. Selecting the keyboard button 174 will display a keyboard window. Once the keyboard window is displayed, the user can select desired characters from the keyboard via the stylus 110.", *Beernink '439,* 10:54-61.

Regarding **claim 29**, *Beernink '438* discloses wherein the best interpretation is associated with a category (a category is a character from the English alphabet, each category comprised of different user styles writing it, and whether it is uppercase, lowercase, etc) defining what kind of symbol is represented by each of the plurality of templates.

Regarding **claim 30**, while *Beernink'438* in view of *Beernink '439* discloses the method of claim 29, *Beernink'438* in view of *Beernink '439* does not disclose wherein the step of presenting comprises masking the presentation of the best interpretation according to which category the best interpretation is associated with.

Beernink'439 discloses a boxed input correction system and method for pen based computer systems (fig 1) that teaches wherein the step of presenting comprises masking the presentation of the best interpretation according to which category the best interpretation is associated with (the masking is performed in step 170 of fig 5 of the best interpretation being presented being the top of the list, among other possibilities of which include "C" and "c" for the character "C").

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the method of *Beernink'438* in view of *Beernink '439* to include wherein the step of presenting comprises masking the presentation of the best interpretation according to which

category the best interpretation is associated with as taught by *Beernink'439* to provide "a correction method for when the selected word is the string of one or more well defined characters and the correction input is a character editing input overwriting a given box.", *Beernink'439*, 2:51-54.

Regarding **claim 31**, while *Beernink'438* in view of *Beernink '439* and *Beernink'439* disclose the method of claim 30, *Beernink'438* in view of *Beernink '439* and *Beernink'439* does not disclose wherein the category is indicated by a certain color of a background to the at least one of the plurality of writing symbol patterns represented by the best interpretation.

Beernink'439 discloses a boxed input correction system and method for pen based computer systems (fig 1) that teaches wherein the category ("C" is "associated" with the capitalized letter category in fig 5, item 170) is indicated by a certain color of a background (the background color is white that indicates "C" is capitalized) to the at least one of the plurality of writing symbol patterns represented by the best interpretation (best interpretations being those listed in item 170, fig 5 with the top on the list being the best interpretation).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the method of *Beernink'438* in view of *Beernink '439* and *Beernink'439* to include wherein the category is indicated by a certain color of a background to the at least one of the plurality of writing symbol patterns represented by the best interpretation as taught by *Beernink'439* to provide "a correction method for when the selected word is the string of one or more well defined characters and the correction input is a character editing input overwriting a given box.", *Beernink'439*, 2:51-54.

Regarding **claim 32**, while *Beernink'438* in view of *Beernink'439* disclose the method of claim 30, *Beernink'438* does not disclose wherein the category is indicated by a certain color of the at least one of the plurality of writing symbol patterns represented by the best interpretation.

Beernink'439 discloses a boxed input correction system and method for pen based computer systems (fig 1) that teaches wherein the category ("C" is "associated" with the capitalized letter category in fig 5, item 170) is indicated by a certain color of the at least one of the plurality of writing symbol patterns (the color is black that indicates "C" is capitalized) represented by the best interpretation (best interpretations being those listed in item 170, fig 5 with the top on the list being the best interpretation).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the method of *Beernink'438* to include wherein the category is indicated by a certain color of the at least one of the plurality of writing symbol patterns represented by the best interpretation as taught by *Beernink'43*9 to provide "a correction method for when the selected word is the string of one or more well defined characters and the correction input is a character editing input overwriting a given box.", *Beernink'439*, 2:51-54.

Regarding **claim 34**, claim 15 recites identical features as in claim 34. Thus, references/arguments equivalent to those presented above for claim 15 are equally applicable to claim 34.

[8] **Claim 17** is rejected under 35 U.S.C. 103(a) as being unpatentable over *Beernink '438* in view of *Beernink '439* and U.S. Patent No. 5,970,170 (issued Oct. 19, 1999) [*hereinafter* "Kadashevich et al."].

Regarding **claim 17**, while *Beernink '438* in view of *Beernink '439* discloses the method according to claim 16, wherein the step of presenting comprises presenting the best allograph represented by an image (fig 7, item 76) depicting the way of writing symbols of the best template, *Beernink '438* in view of *Beernink '439* do not disclose wherein the image is a bitmap image.

Kadashevich et al. discloses a character recognition system identification of scanned and real time handwritten characters that includes teaching a bitmap image (8:60-67; 9:17-22; 13:16-20).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the image of *Beernink '438* in view of *Beernink '439* to be a bitmap image as taught by *Kadashevich et al.* to provide an "array wherein each bit in the array represents a pixel of the…image, with the state of bit (0 or 1) representing whether the corresponding pixel is a background or foreground pixel and the location of the bit in the array representing the coordinates of the corresponding pixel in the image.", *Kadashevich et al.*, 8:60-67.

[9] **Claim 25** is rejected under 35 U.S.C. 103(a) as being unpatentable over *Beernink '438* in view of *Beernink '439* and *Sparr et al.*

Regarding **claim 25**, claim 7 recites identical features as in claim 25. Thus, references/arguments equivalent to those presented above for claim 7 are equally applicable to claim 25.

Response to Arguments

[10] Applicant's arguments with respect to **claims 1-8** and **11** under **35 U.S.C. § 102(b)** *Comerford* have been fully considered and are persuasive. The **35 U.S.C. § 102(b)** rejection of *Comerford* has been withdrawn.

[11] Appicant's arguments with respect to **claims 1-5, 8,** and **33** under **35 U.S.C. § 102(b)** *Beernink '438* (Appicant Resp. at 13-5) have been considered but are moot in view of the new grounds of rejection. An alternative rejection of *Beernink '438* has been used. *See* Examiner's Interpretation.

[12] Appicant's arguments with respect to **claims 6-7, 9-16, 18-32,** and **34** under **35 U.S.C. § 103(a)** *Beernink '438* in view of *Beernink '439* (Appicant Resp. at 15-8) have been considered but are moot in view of the new grounds of rejection. An alternative rejection of *Beernink '438* in view of *Beernink '439* has been used. *See* Examiner's Interpretation.

[13] Applicant's arguments with respect to **claim 17** under **35 U.S.C. § 103(a)** *Beernink '438* in view of *Beernink '439* and *Kadashevich* (Resp. at 18-9) have been considered but are moot in view of the new grounds of rejection. An alternative rejection of *Beernink '438* has been used. *See* Examiner's Interpretation.

Conclusion

[14] The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: US 5105468 A; US 5239592 A; US 5454046 A; US 5559897 A; US 5559942 A; US 5588073 A; US 5610996 A; US 5802205 A; US 6021218 A; US 6101280 A; US 6144764 A; US 6226403 B1; US 6370269 B1; US 6647145 B1.

[15] Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID P. RASHID whose telephone number is (571)270-1578. The examiner can normally be reached Monday - Friday 7:30 - 17:00 ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vikkram Bali can be reached on (571) 272-74155. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David P Rashid/
Examiner, Art Unit 2624

David P Rashid
Examiner
Art Unit 26244

/Vikkram Bali/

Supervisory Patent Examiner, Art Unit 2624

Notice of References Cited	Application/Control No. 10/524,430	Applicant(s)/Patent Under Reexamination PRYMUS ET AL.	
	Examiner DAVID P. RASHID	Art Unit 2624	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,105,468	04-1992	Guyon et al.	382/158
*	B	US-5,239,592	08-1993	Kameyama et al.	382/138
*	C	US-5,454,046	09-1995	Carman, II, Frank C.	382/186
*	D	US-5,559,897	09-1996	Brown et al.	382/186
*	E	US-5,559,942	09-1996	Gough et al.	715/802
*	F	US-5,588,073	12-1996	Lee et al.	382/187
*	G	US-5,610,996	03-1997	Eller, Marlin J.	382/187
*	H	US-6,021,218	02-2000	Capps et al.	382/187
*	I	US-6,101,280	08-2000	Reynolds, David Everett	382/241
*	J	US-6,144,764	11-2000	Yamakawa et al.	382/187
*	K	US-6,226,403	05-2001	Parthasarathy, Kannan	382/187
*	L	US-6,370,269	04-2002	Al-Karmi et al.	382/197
*	M	US-6,647,145	11-2003	Gay, Geoffrey Norman Walter	382/187

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10524430	PRYMUS ET AL.
	Examiner	Art Unit
	Rashid, David P	2624

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	11/15/2007	06/17/2008							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	✓	✓							
	5	✓	✓							
	6	✓	✓							
	7	✓	✓							
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	31	✓	✓							
	32	✓	✓							
	33	✓	✓							
	34	✓	✓							

PATENT
Customer No.: 22,852
Attorney Docket No.: 08806.0174

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
Erika PRYMUS et al.	)	Group Art Unit: 2624
	)	
Application No.: 10/524,430	)	Examiner: Rashid, David
	)	
Filed: February 15, 2005	)	
	)	
For: PRESENTING RECOGNISED HANDWRITTEN SYMBOLS	)	Confirmation No.: 6160
	)	

Mail Stop - Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

REPLY TO OFFICE ACTION

In reply to the Office Action mailed June 23, 2008, the period for response to which extends to September 23, 2008, Applicant requests reconsideration of the pending rejections for the reasons set forth in the Remarks below.

Remarks begin on page 2 of this reply.

REMARKS

In the outstanding Office Action, the Examiner took the following actions:

> (a) rejected claims 1-6, 8, 11, and 33 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,666,438 to Beernink et al. ("Beernink '438");
>
> (b) rejected claim 7 under 35 U.S.C. § 103(a) as being unpatentable over Beernink '438 in view of U.S. Patent Application Publication No. 2001/0026639 to Sparr et al. ("Sparr");
>
> (c) rejected claims 9, 10, 12-16, 18-24, 26-32, and 34 under 35 U.S.C. § 103(a) as being unpatentable over Beernink '438 in view of U.S. Patent No. 5,682,439 to Beernink et al. ("Beernink '439");
>
> (d) rejected claim 17 under 35 U.S.C. § 103(a) as being unpatentable over Beernink '438 in view of Beernink '439 and U.S. Patent No. 5,970,170 to Kadashevich et al. ("Kadashevich"); and
>
> (e) rejected claim 25 under 35 U.S.C. § 103(a) as being unpatentable over Beernink '438 in view of Beernink '439 and Sparr.

By this reply, no amendments have been made. Claims 1-34 remain pending in this application.

I. Rejection of claims 1-6, 8, 11, and 33 under 35 U.S.C. § 102(b) as allegedly being anticipated by Beernink '438

Applicant respectfully traverses the rejection of claims 1-6, 8, 11, and 33 as being anticipated by Beernink '438. Beernink '438 fails to teach, or even suggest, each and every feature recited in those claims.

Independent claim 1 recites, for example,

> comparing the handwritten pattern to a plurality of templates . . . [and] returning a best template . . . that represents one of the plurality of writing symbol patterns as a best writing symbol pattern which . . . is most similar to the handwritten pattern, wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol.

Beernink '438 fails to teach at least these elements. Beernink '438 discloses,

> text, graphical, and other data can then be entered into this second note area 54b. For example, the text object T is a phrase that has been entered into second note area 54b. In the described embodiment, text object T was originally entered as several strokes of handwritten "ink" which were recognized by the CPU and converted into printed words of the object T. Beernink '438, column 5, lines 63-67.
>
> The present invention makes use of a recognizer implemented by CPU 12 to recognize ink strokes input by a user with stylus 38. The recognizer analyzes the entered ink and attempts to match the ink to a letter, word, shape, or other symbol present in a database accessible to the recognizer. Id. at column 7, lines 19-23.

Beernink '438 does not, for example, describe the letter, word, shape, or other symbol, matched to the ink strokes input by the user, and thus, Beernink '438 cannot teach that at least two of the letter, word, shape, or other symbol "comprise different ones of a plurality of writing symbol patterns, which represent different ways of writing a single symbol," as recited in independent claim 1.

Beernink '438 discloses that a user can navigate from note area 54b to preference screens 69, shown in FIGS. 6a, 6b, 7, and 8, which may include a letter styles screen 76. See Beernink '438, column 7, lines 66 and 67; and column 8, lines 1 and 2. Letter styles screen 76 relates to a learning phase of the system in Beernink '438, and is used to capture data that is later used by the recognizer. See Id. at column 2, lines 42-47; and column 10, lines 13-16. While Beernink '438 discloses different letter styles in letter style screen 76, Beernink '438 does not teach that the ink strokes input by a user are compared to the letter styles. Rather, Beernink '438 discloses:

> [r]eferring now to FIG. 8 . . . . A user selects one of the characters 89 of which he wishes to modify the letter style . . . . CPU 12 then displays style

> letters 95 for the selected character 89. For each displayed style letter 95, the user can select whether he or she writes that letter style either "sometimes" or "rarely" by actuating one of toggles 97 . . . . In the described embodiment, the shape of style letters 95 is presented in letter style screen 76, as well as the order of inputting the ink strokes which comprise the style letters . . . . The CPU preferably displays a real-time animation of the selected style letter being drawn . . . . Computer system 10 automatically saves adaptive learning data associated with the style letters selected and modified by the user. Beernink '438, column 10, lines 8-31 and 42-44.

Since Beernink '438 does not describe the letter, word, shape, or other symbol, matched to the ink strokes input by the user, and Beernink '438 does not teach that the ink strokes input by the user are compared to characters 89 or style letters 95 in letter style screen 76, Beernink '438 fails to teach or suggest "comparing the handwritten pattern to a plurality of templates . . . wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol," as recited in independent claim 1. For at least this reason, Beernink '438 fails to anticipate independent claim 1. Applicant respectfully requests reconsideration of the rejection of independent claim 1, and the timely allowance of independent claim 1.

Also, Beernink '438 does not teach returning one of characters 89 or style letters 95 that is most similar to the ink strokes input by the user. Rather, Beernink '438 discloses that "[a] user selects one of the characters 89 . . . . CPU 12 then displays style letters 95 for the selected character 89." Beernink '438, column 10, lines 13-19. Since Beernink '438 does not teach returning one of characters 89 or style letters 95 that is most similar to the ink strokes input by the user, Beernink '438 fails to teach or suggest "returning a best template selected from the plurality of templates that

represents one of the plurality of writing symbol patterns as a best writing symbol pattern which . . . is most similar to the handwritten pattern," as recited in independent claim 1. For at least this reason, Beernink '438 fails to anticipate independent claim 1. Applicant respectfully requests reconsideration of the rejection of independent claim 1, and the timely allowance of independent claim 1.

Applicant also respectfully requests clarification as to the Examiner's interpretation of style letters 95 of Beernink '438. On page 2 of the Office Action, the Examiner states, "a handwritten pattern ("ink strokes input" at 7:19-21; *e.g.*, fig. 8, item 95)," indicating that style letters 95 of Beernink '438 correspond to a handwritten pattern. Yet on page 3 of the Office Action, the Examiner states, "wherein each of the plurality of templates (*e.g.*, template "f" in fig. 8) represents at least one of a plurality of writing symbol patterns (*e.g.*, template "f" comprises four writing symbol patterns including items 95, 95b)," indicating that style letters 95 of Beernink '438 correspond to a plurality of writing symbol patterns. However, the claimed "handwritten pattern" and "plurality of writing symbol patterns" are separate elements of independent claim 1, and thus, it is improper for the Examiner to apply a single element, style letters 95, against those separate elements. For at least this additional reason, Applicant respectfully requests reconsideration of the rejection of independent claim 1, and the timely allowance of independent claim 1.

Claims 2-6, 8, and 11 each depend from independent claim 1, and are allowable for at least the reasons stated above with respect to claim 1. In addition, each of the dependent claims recites unique combinations that are neither taught nor suggested by the cited art, and therefore each is also separately patentable.

Independent claim 33, while of different scope, recites elements similar to those recited in independent claim 1. For example, independent claim 33 calls for a combination including, for example, "means for recognizing the detected handwritten pattern and returning one of the plurality of patterns of a best template of the handwritten pattern, said best template being most similar to the handwritten pattern." Thus, Beernink '438 fails to teach each and every feature recited in independent claim 33. Accordingly, independent claim 33 is allowable at least for reasons similar to those discussed above with respect to independent claim 1. Applicant respectfully requests the timely allowance of independent claim 33.

II. Rejection of claim 7 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Beernink '438 in view of Sparr

Applicant respectfully traverses the rejection of claim 7 as being unpatentable over Beernink '438 in view of Sparr. A *prima facie* case of obviousness has not been established.

"The key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. . . . [R]ejections on obviousness cannot be sustained with mere conclusory statements." M.P.E.P. § 2142, 8th Ed., Rev. 6 (Sept. 2007) (internal citation and inner quotation omitted). "The mere fact that references can be combined or modified does not render the resultant combination obvious unless the results would have been predictable to one of ordinary skill in the art." M.P.E.P. § 2143.01(III) (emphasis in original). "All words in a claim must be considered in judging the patentability of that claim against the prior art." M.P.E.P. § 2143.03. "In determining the differences between the prior art and the

claims, the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious." M.P.E.P. § 2141.02(I) (emphases in original).

"[T]he framework for objective analysis for determining obviousness under 35 U.S.C. 103 is stated in *Graham v. John Deere Co.*, 383 U.S. 1, 148 U.S.P.Q 459 (1966). . . . The factual inquiries . . . [include determining the scope and content of the prior art and] . . . [a]scertaining the differences between the claimed invention and the prior art." M.P.E.P. § 2141(II). "Office personnel must explain why the difference(s) between the prior art and the claimed invention would have been obvious to one of ordinary skill in the art." M.P.E.P. § 2141(III).

Here, a *prima facie* case of obviousness has not been established because the Examiner has neither properly determined the scope and content of the prior art nor properly ascertained the differences between the claimed invention and the prior art. Accordingly, the Examiner has failed to clearly articulate a reason why the prior art would have rendered the claimed invention obvious to one of ordinary skill in the art.

Claim 7 depends from independent claim 1, and thus includes all the elements thereof. As set forth above, Beernink '438 fails to teach or suggest at least "comparing the handwritten pattern to a plurality of templates . . . returning a best template . . . that represents one of the plurality of writing symbol patterns as a best writing symbol pattern which . . . is most similar to the handwritten pattern, wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol," as recited in independent claim 1, and required by claim 7. Sparr fails to cure the deficiencies of Beernink '438.

That is, Sparr also fails to teach or suggest at least "comparing the handwritten pattern to a plurality of templates . . . returning a best template . . . that represents one of the plurality of writing symbol patterns as a best writing symbol pattern which . . . is most similar to the handwritten pattern, wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol."

In view of the mischaracterization of Beernink '438 discussed above, the Examiner has neither properly determined the scope and content of the prior art nor properly ascertained the differences between the prior art and the combination of claim 7. Thus, the Examiner has failed to clearly articulate a reason why claim 7 would have been obvious to one of ordinary skill in the art in view of the prior art. Accordingly, a *prima facie* case of obviousness has not been established with respect to claim 7, and the rejection under 35 U.S.C. § 103(a) must be withdrawn.

III. Rejection of claims 9, 10, 12-16, 18-24, 26-32, and 34 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Beernink '438 in view of Beernink '439

Applicant respectfully traverses the rejection of claims 9, 10, 12-16, 18-24, 26-32, and 34 as being unpatentable over Beernink '438 in view of Beernink '439. A *prima facie* case of obviousness has not been established.

Here, a *prima facie* case of obviousness has not been established because the Examiner has neither properly determined the scope and content of the prior art nor properly ascertained the differences between the claimed invention and the prior art. Accordingly, the Examiner has failed to clearly articulate a reason why the prior art would have rendered the claimed invention obvious to one of ordinary skill in the art.

Independent claim 1, from which claims 9, 10, and 12-14 depend, calls for a combination including, for example,

> comparing the handwritten pattern to a plurality of templates . . . returning a best template . . . that represents one of the plurality of writing symbol patterns as a best writing symbol pattern which . . . is most similar to the handwritten pattern, wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol.

The Examiner alleges that characters 89 of Beernink '438 correspond to the claimed "plurality of templates," and that style letters 95 correspond to the claimed "plurality of writing symbol patterns." See Office Action, page 3. This is not correct. Beernink '438 discloses,

> [r]eferring now to FIG. 8 . . . . A user selects one of the characters 89 of which he wishes to modify the letter style . . . . CPU 12 then displays style letters 95 for the selected character 89. For each displayed style letter 95, the user can select whether he or she writes that letter style either "sometimes" or "rarely" by actuating one of toggles 97 . . . . In the described embodiment, the shape of style letters 95 is presented in letter style screen 76, as well as the order of inputting the ink strokes which comprise the style letters. Beernink '438, column 10, lines 8-28.

However, Beernink '438 does not teach or suggest that the ink strokes input by a user are compared to characters 89. Thus, characters 89 in letter style screen 76 cannot correspond to the claimed "plurality of templates," since independent claim 1 recites the step of "comparing the handwritten pattern to a plurality of templates." In view of the mischaracterization of Beernink '438, above, the Examiner has neither properly determined the scope and content of the prior art nor properly ascertained the differences between the prior art and the invention of independent claim 1. Thus, the Examiner has failed to clearly articulate a reason why claims 9, 10, and 12-14, which depend from independent claim 1, would have been obvious to one of ordinary skill in

the art in view of the prior art. Accordingly, a *prima facie* case of obviousness has not been established with respect to claims 9, 10, and 12-14, and the rejection under 35 U.S.C. § 103(a) must be withdrawn.

Independent claims 15 and 34, while of different scope, recite elements similar to those recited in independent claim 1, and Beernink '439 fails to cure the deficiencies of Beernink '438. Thus, independent claims 15 and 34 are allowable over Beernink '438 and Beernink '439, at least for reasons similar to those discussed above with respect to independent claim 1. Claims 16, 18-24, and 26-32 depend from independent claim 15, and thus, are allowable for at least the same reasons that independent claim 15 is allowable. In addition, these dependent claims recite unique combinations that are neither taught nor suggested by the cited art, and therefore each is also separately patentable.

IV. Rejection of claim 17 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Beernink '438 in view of Beernink '439 and Kadashevich

Applicant respectfully traverses the rejection of claim 17 as being unpatentable over Beernink '438 in view of Beernink '439 and Kadashevich. A *prima facie* case of obviousness has not been established. Claim 17 depends from claim 15, and thus includes all the elements thereof. As set forth above, Beernink '438 fails to teach or suggest at least "comparing the handwritten pattern to a plurality of templates . . . returning a best interpretation of the handwritten pattern, said best interpretation being based on one of the plurality of writing symbol patterns as a best writing symbol pattern . . . that . . . is most similar to the handwritten pattern, wherein at least two of the plurality of templates comprise different one of the plurality of writing symbol patterns

which represent different ways of writing a single symbol." Beernink '439 and Kadashevich fail to cure the deficiencies of Beernink '438. That is, Beernink '439 and Kadashevich also fail to teach or suggest at least "comparing the handwritten pattern to a plurality of templates . . . returning a best interpretation of the handwritten pattern, said best interpretation being based on one of the plurality of writing symbol patterns as a best writing symbol pattern . . . that . . . is most similar to the handwritten pattern, wherein at least two of the plurality of templates comprise different one of the plurality of writing symbol patterns which represent different ways of writing a single symbol," as recited in independent claim 15 from which claim 17 depends.

In view of the mischaracterization of Beernink '438 discussed above, the Examiner has neither properly determined the scope and content of the prior art nor properly ascertained the differences between the prior art and the combination of claim 17. Thus, the Examiner has failed to clearly articulate a reason why claim 17 would have been obvious to one of ordinary skill in the art in view of the prior art. Accordingly, a *prima facie* case of obviousness has not been established with respect to claim 17, and the rejection under 35 U.S.C. § 103(a) must be withdrawn.

V. Rejection of claim 25 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Beernink '438 in view of Beernink 439 and Sparr

Applicant respectfully traverses the rejection of claim 25 as being unpatentable over Beernink '438 in view of Beernink '439 and Sparr. A *prima facie* case of obviousness has not been established. Claim 25 depends from independent claim 15, and thus includes all the elements thereof. As set forth above, Beernink '438 fails to teach or suggest at least "comparing the handwritten pattern to a plurality of templates .

. . returning a best interpretation of the handwritten pattern, said best interpretation being based on one of the plurality of writing symbol patterns as a best writing symbol pattern . . . that . . . is most similar to the handwritten pattern, wherein at least two of the plurality of templates comprise different one of the plurality of writing symbol patterns which represent different ways of writing a single symbol." Beernink '439 and Sparr fail to cure the deficiencies of Beernink '438. That is, Beernink '439 and Sparr also fail to teach or suggest at least "comparing the handwritten pattern to a plurality of templates . . . returning a best interpretation of the handwritten pattern, said best interpretation being based on one of the plurality of writing symbol patterns as a best writing symbol pattern . . . that . . . is most similar to the handwritten pattern, wherein at least two of the plurality of templates comprise different one of the plurality of writing symbol patterns which represent different ways of writing a single symbol," as recited in independent claim 15 from which claim 25 depends.

In view of the mischaracterization of Beernink '438 discussed above, the Examiner has neither properly determined the scope and content of the prior art nor properly ascertained the differences between the prior art and the combination of claim 25. Thus, the Examiner has failed to clearly articulate a reason why claim 25 would have been obvious to one of ordinary skill in the art in view of the prior art. Accordingly, a *prima facie* case of obviousness has not been established with respect to claim 25, and the rejection under 35 U.S.C. § 103(a) must be withdrawn.

In view of the foregoing remarks, Applicant respectfully requests reconsideration of the pending rejections in this application, and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our Deposit Account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: September 23, 2008

By: _____
Thomas Y. Ho
Reg. No. 61,539

Electronic Acknowledgement Receipt

EFS ID:	3986868
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International Application Number:	
Confirmation Number:	6160
Title of Invention:	Presenting recognised handwritten symbols
First Named Inventor/Applicant Name:	Erika Prymus
Customer Number:	22852
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant Arguments/Remarks Made in an Amendment	Reply_To_Office_Action_Mailed_June_23_2008.pdf	770876 d6b2e60e52af4080e559c31db6d6ffd10117e7de	no	13

Warnings:	
Information:	

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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EXAMINER	
RASHID, DAVID	
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2624	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/524,430	PRYMUS ET AL.	
	Examiner	Art Unit	
	DAVID P. RASHID	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 September 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

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Amendments

[1] This office action is responsive to Reply to Office Action received on Sept. 23, 2008. Claims 1-34 remain pending.

Response to Arguments

[2] Remarks filed Sept. 23, 2008 with respect to claims 1-34 have been respectfully and fully considered, but are not found persuasive.

Summary of Remarks regarding Rejections of claims 1-34 under 35. U.S.C. § 102(b)

> Since Beernink '438 does not describe the letter, word, shape, or other symbol, matched to the ink strokes input by the user, and Beernink '438 does not teach that the ink strokes input by the user are compared to characters 89 or style letters 95 in letter style screen 76, Beernink '438 fails to teach or suggest "comparing the handwritten pattern to a plurality of templates.., wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol," as recited in independent claim 1.

Applicant's Remarks at 4, Sept. 23, 2008.

However, the purpose of *Beernink '438* is to perform handwriting recognition in accordance with handwriting styles of various users (an extension of handwriting recognition in

that the user writing is matched with various stored styles). The purpose of citing to fig. 6-8 (e.g., fig. 8, item 95) is to show an example of a handwriting style being stored in the tablet to be compared with the user's handwriting using a stylus (e.g., fig. 3). Fig. 6-8 is also an indicator that the user physically wrote that handwriting style that is now stored to later be compared at another time.

Beernink '438 does describe a letter or symbol (e.g., fig. 8, item 95a) being compared with the user's handwriting inputted in fig. 3. The ink strokes input in fig. 3 are being compared to stored characters 89 or 95 because that is the primary use of the invention (to recognize handwriting of different users of a pen-based computer system).

In addition, an example of a template is the symbol "f" (just as another template would be symbol "g", etc. given in fig. 8, item 89). Each "alphabet" template (e.g., "f") contains at least two writing symbol patterns (i.e., a lowercase "f" and uppercase "F"), which are different ways of writing the letter "f" (also regarded as template "f" for having two writing symbol patterns immediately above).

> Also, Beernink '438 does not teach returning one of characters 89 or style letters 95 that is most similar to the ink strokes input by the user. Rather, Beernink '438 discloses that "[a] user selects one of the characters 89 .... CPU 12 then displays style letters 95 for the selected character 89." Beernink '438, column 10, lines 13-19. Since Beernink '438 does not teach returning one of characters 89 or style letters 95 that is most similar to the ink strokes input by the user, Beernink '438 fails to teach or suggest "returning a best template selected from the plurality of templates that represents one of the plurality of writing symbol patterns as a best writing symbol pattern which.., is most similar to the handwritten pattern," as recited in independent claim 1.

Remarks at 4-5.

However, the purpose of *Beernink '438* is to perform handwriting recognition in accordance with handwriting styles of various users. For example, guest letter styles are given at fig. 8, item 95 such that the user's writing is compared to the guest letter styles using various templates (e.g., letters "f", "g", etc). The actual intended purpose of *Beernink '438* to disclose fig. 8 is to show a preference screen to change/view the guest handwriting style. The Examiner refers to fig. 8 in the rejection to show the various types of templates, writing symbol patterns, etc in the claim language being used in an underlying manner. If a user writes "F" on fig. 3, item 52, that letter "F" will be matched against guest templates as shown in fig. 8, item 95, and will

return the best writing symbol pattern (i.e., capital "F") from template (letter "f"). That best writing symbol pattern, once recognized according to the proper "style" by the user, will then be recognized and converted to digital font (e.g., fig. 2, item T).

> Applicant also respectfully requests clarification as to the Examiner's interpretation of style letters 95 of Beernink '438. On page 2 of the Office Action, the Examiner states, "a handwritten pattern ("ink strokes input" at 7:19-21; *e.g.,* fig. 8, item 95)," indicating that style letters 95 of Beernink '438 correspond to a handwritten pattern. Yet on page 3 of the Office Action, the Examiner states, "wherein each of the plurality of templates *(e.g.,* template "f" in fig. 8) represents at least one of a plurality of writing symbol patterns *(e.g.,* template "f" comprises four writing symbol patterns including items 95, 95b)," indicating that style letters 95 of Beernink '438 correspond to a plurality of writing symbol patterns. However, the claimed "handwritten pattern" and "plurality of writing symbol patterns" are separate elements of independent claim 1, and thus, it is improper for the Examiner to apply a single element, style letters 95, against those separate elements.

Remarks at 5.

See above for clarification. The handwritten pattern is what is written on fig. 3, item 52 by the user. The purpose of fig. 6-8 is to indicate examples of what the handwritten pattern in being matched against (e.g., fig. 6a shows a preferences box to see what custom template and writing symbol pattern styles look like). The Examiner emphasizes that the claims are broad enough to read that if a template were to be interpreted as a English alphabet character, and a writing symbol pattern were to be its lowercase of uppercase format, then *Beernink '438* reads on the claims (matching these custom styles against the user's own handwriting on fig. 3, item 52). The Examiner also emphasizes that the claims are broad enough to allow an separate interpretation using *Beernink '439* (see below rejection using *Beernink '439* wherein a template is regarded not as a single English alphabet character such as "f", but a whole word such as "Current").

The same argument applies to claims 33 and 34.

Summary of Remarks regarding Rejections of claims 1-34 under 35. U.S.C. § 103(a)

Applicant's arguments with respect to *Beernink'438* in view of *Sparr* (Remarks at 6-7); *Beernink'438* in view of *Beernink'439* and *Kadashevich* (Remarks at 10-11); and *Beernink'438* in view of *Beernink'439* and *Sparr* (Remarks at 11-12) have been withdrawn in light of the primary reference *Beernink'439* rejections below.

> However, Beernink ~438 does not teach or suggest that the ink strokes input by a user are compared to characters 89. Thus, characters 89 in letter style screen 76 cannot correspond to the claimed "plurality of templates," since independent claim 1 recites the step of "comparing the handwritten pattern to a plurality of templates." In view of the mischaracterization of Beernink '438, above, the Examiner has neither properly determined the scope and content of the prior art nor properly ascertained the differences between the prior art and the invention of independent claim 1. Thus, the Examiner has failed to clearly articulate a reason why claims 9, 10, and 12-14, which depend from independent claim 1, would have been obvious to one of ordinary skill in the art in view of the prior art.

Remarks at 9-10.

However, see above argument over the interpretation in the rejection of "handwritten pattern", "plurality of templates", and "writing symbol pattern" used in the *Beernink'438* prior art reference. *Beernink'438* does disclose that the ink strokes input by a user are compared to characters 89 (with e.g. guest style item 95 for character "f" listed in character list 89). *See Beernink'438* at 2:30-50 (citing overall summary of identifying the user as either a guest or primary user, and thus recognizing the user's handwriting on the tablet accordingly according to that specific user style, with the addition of learning recognition).

Claim Rejections - 35 USC § 101

[3] 35 U.S.C. § 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

In Re Bilski – "Tied To" Criteria

[4] **Claims 1-32** are rejected under 35 U.S.C. § 101 as not falling within one of the four statutory categories of invention. Supreme Court precedent[1] and recent Federal Circuit

[1] *Diamond v. Diehr*, 450 U.S. 175, 184 (1981); *Parker v. Flook*, 437 U.S. 584, 588 n.9 (1978); *Gottschalk v. Benson*, 409 U.S. 63, 70 (1972); *Cochrane v. Deener*, 94 U.S. 780, 787-88 (1876).

decisions[2] indicate that a statutory "process" under 35 U.S.C. § 101 must (1) be tied to another statutory category (such as a particular apparatus), or (2) transform underlying subject matter (such as an article or material) to a different state or thing. While the instant claim(s) recite a series of steps or acts to be performed, the claim(s) neither transform underlying subject matter nor positively tie to another statutory category that accomplishes the claimed method steps, and therefore do not qualify as a statutory process.

A process must have a meaningful tie to an "apparatus", or "machine". Insignificant pre- or post-solution activity involving an "apparatus", or "machine" is not a meaningful tie. "Detecting a handwritten pattern that is entered by a user" and then "presenting the best writing symbol pattern of the best template on a screen" (claim 1 at ll. 3, 13; emphasis added) is not a meaningful tie significant to the basic inventive concept, but rather insignificant pre- or post-activity. Claim 15 is rejected by similar reasoning. Claims 2-14 and 16-32 are rejected for failing to alleviate the deficiency of their respective dependent claims.

Claim Rejections - 35 U.S.C. § 102

[5] The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

[2] *In re Bilski*, 88 USPQ2d 1385 (Fed. Cir. 2008).

Beernink '438

[6] **Claims 1-6, 8, 11,** and **33** are rejected under 35 U.S.C. § 102(n) as being anticipated by U.S. Patent No. 5,666,438 (issued Sep. 9, 1997, hereinafter "Beernink '438).

Regarding **claim 1**, *Beernink '438* discloses a method for presenting a recognized handwritten symbol (fig. 6a; "handwriting recognition" at 2:13-15), comprising the steps of:

detecting ("recognizer implemented by CPU 12 to recognize ink strokes input by a user with stylus 38" at 7:19-21) a handwritten pattern ("ink strokes input" at 7:19-21; *e.g.*, fig. 8, item 95) that is entered by a user (fig.3);

recognizing ("handwriting recognition" at 2:13-15) the detected handwritten pattern,

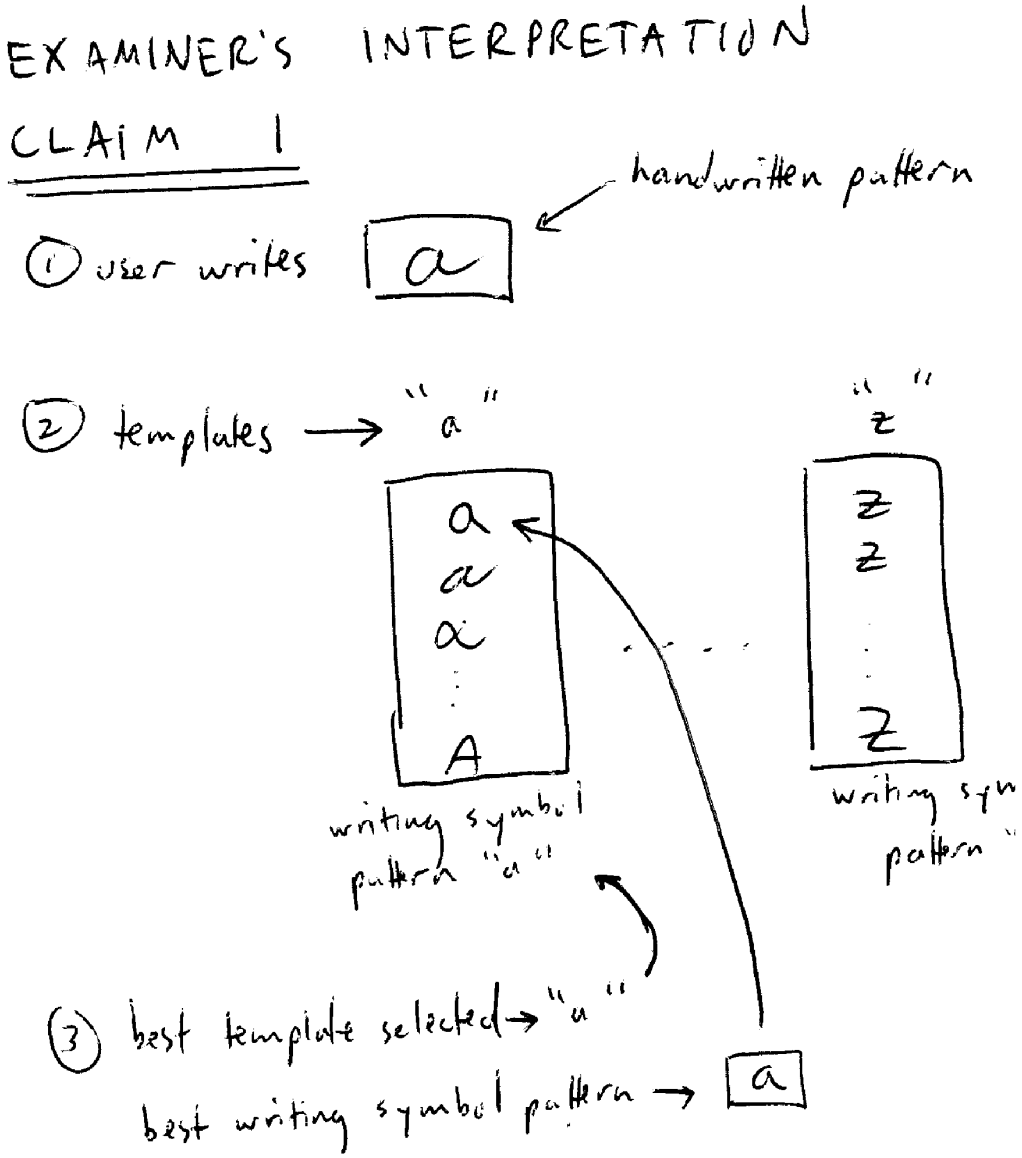
wherein said step of recognizing comprises comparing (the handwriting is compared to each of the templates) the handwritten pattern to a plurality of templates (fig. 8, item 89; *e.g.*, selected character "f" is a template),

wherein each of the plurality of templates (*e.g.*, template "f" in fig. 8) represents at least one of a plurality of writing symbol patterns (*e.g.*, template "f" comprises four writing symbol patterns including items 95, 95b) of ways of writing symbols (the English alphabet), and

returning a best template ("handwriting recognition is optimized" at 2:47-49) selected from the plurality of templates (fig. 8, item 89; *e.g.*, selected character "f" is a template) that represents one of the plurality of writing symbol patterns (*e.g.*, template "f" comprises four writing symbol patterns including items 95, 95b) as a best writing symbol pattern which, according to a predefined rule, is most similar to the handwritten pattern (once "Letter Style" preferences are saved, *Beernink '438* uses those preferences to recognize characters),

wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol (each character in list item 89 has four writing symbol patterns item 95; these four writing symbol patterns are accountable for the plurality of templates of "Letter Styles" for each user); and

presenting the best writing symbol pattern of the best template on a screen (fig 3, item 52; "handwriting recognition" at 2:13-15).


EXAMINER'S INTERPRETATION
CLAIM 1
handwritten pattern
(1) user writes
(2) templates → "a"
"z"
writing symbol pattern "a"
writing sym pattern "
(3) best template selected → "a"
best writing symbol pattern →

Beernink '439

[7] **Claims 1-6, 8, 11,** and **33** are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,682,439 (issued Oct. 28, 1997, hereinafter "Beernink '439").

Regarding **claim 1**, *Beernink '439* discloses a method for presenting a recognized handwritten symbol (e.g., handwritten symbols being the English alphabet symbols using item 110 at fig. 2), comprising the steps of:

detecting a handwritten pattern (e.g., fig. 6, item 172; "Correct") that is entered by a user (user uses fig. 2, item 106);

recognizing (fig. 6, list items 170; item 172 as a result of recognizing the actual handwritten pattern on fig. 2, item 106) the detected handwritten pattern (e.g., fig. 6, item 172; "Correct"),

wherein said step of recognizing comprises comparing the handwritten pattern to a plurality of templates (fig. 6, item 170; e.g., template1 being "Correct", template2 being "correct", template3 being "Currect", template4 being "Cwrect", template5 being "currect"),

wherein each of the plurality of templates represents at least one of a plurality of writing symbol patterns (e.g., fig. 6, item 170 is composed of "C", "c", "o", r", "u", "w", "t", etc. in each of the templates; e.g., template4 comprised of "C", "w", "r", "e", "c", "t") of ways of writing symbols (symbols being the English alphabet symbols; e.g., symbol "c" being writing symbol patterns "C" and "c"), and

returning a best template (top template "Correct" at item 170, fig. 6) selected from the plurality of templates (fig. 6, item 170; e.g., template1 being "Correct", template2 being "correct", template3 being "Currect", template4 being "Cwrect", template5 being "currect") that represents one of the plurality of writing symbol patterns (e.g., writing symbol pattern "C" in best template "Correct" selected, not writing symbol pattern "c", thus "C" being the best writing symbol pattern when template1 is selected as the best template) as a best writing symbol pattern which, according to a predefined rule, is most similar to the handwritten pattern (inherent rules must exist such that writing symbol pattern C" in best template "Correct" on list 170 was selected),

wherein at least two of the plurality of templates (e.g., item 170 contains template1 "Correct" and template2 "correct") comprise different ones of the plurality of writing symbol

patterns which represent different ways of writing a single symbol (symbols being the English alphabet symbols; e.g., symbol “c” being writing symbol patterns “C” and “c”); and

presenting the best writing symbol pattern (e.g., writing symbol pattern “C” in best template “Correct” selected, not writing symbol pattern “c”, thus “C” being the best writing symbol pattern) of the best template (top template “Correct” at item 170, fig. 6) on a screen (fig. 6, item 151; fig. 2, item 44).

Regarding **claim 2**, *Beernink ‘439* discloses the method according to claim 1, wherein each of the plurality of writing symbol patterns (e.g., fig. 6, item 170 is composed of "C", “c”, "o", r", "u", "w", "t", etc. in each of the templates) of a template (fig. 6, item 170; e.g., template1 being “Correct”, template2 being “correct”, template3 being “Currect”, template4 being “Cwrect”, template5 being “currect”) is represented by geometrical information (it is implicit if not already inherent that each of the plurality of writing symbol patterns of a template is “represented by geometrical information” as each of the plurality of writing symbol patterns of a template consists of geometrical information such as height, width, etc – i.e., item 170 requires geometric information) relating to an appearance of each of said plurality of writing symbol patterns.

Regarding **claim 3**, *Beernink ‘439* discloses the method according to claim 2, wherein the geometrical information (it is implicit if not already inherent that each of the plurality of writing symbol patterns of a template is “represented by geometrical information” as each of the plurality of writing symbol patterns of a template consists of geometrical information such as height, width, etc – e.g., item 170 requires geometric information) comprises information of positions of a number of dots (it is again inherent that the tablet-screen 44 of fig. 2 will pick up individual pixels from which the user writes, each pixel being a dot that represents additional positional information on the tablet-screen) representing each of the plurality writing symbol patterns (e.g., fig. 6, item 170 is composed of "C", “c”, "o", r", "u", "w", "t", etc. in each of the templates), said each of the plurality of writing symbol patterns being presented by lines (a stroke of a character written on tablet-screen 44 of fig. 2 will contain a string of pixels (dots) that are presented by lines drawn between the pixels, fig. 6, item 172for instance) drawn between the dots.

Regarding **claim 4**, *Beernink '439* discloses wherein the step of presenting comprises presenting the whole best writing symbol pattern (e.g., writing symbol pattern "C" in best template "Correct" selected, not writing symbol pattern "c", thus "C" being the best writing symbol pattern) represented by the best template (top template "Correct" at item 170, fig. 6) at once.

Regarding **claim 5**, *Beernink '439* discloses the method according to claim 3, wherein the step of presenting comprises presenting the lines one at a time (each time the user writes a stroke to be recognized, that stroke consists of pixels (dots) and lines between the pixels, and each time the user writes a new stroke another line is constructed and thus lines are being presented one at a time).

Regarding **claim 6**, *Beernink '439* discloses the method according to claim 1, further comprising, before the step of presenting, manipulating (manipulation occurs when transforming "C" at item 172 to the "C" at fig. 170) the best writing symbol pattern (e.g., writing symbol pattern "C" in best template "Correct" selected, not writing symbol pattern "c", thus "C" being the best writing symbol pattern) of the best template (top template "Correct" at item 170, fig. 6) according to characteristics of the handwritten pattern (e.g., fig. 6, item 172; "Correct").

Regarding **claim 8**, *Beernink '439* discloses the method according to claim 1, wherein the handwritten pattern (e.g., writing symbol pattern "C" in best template "Correct" selected, not writing symbol pattern "c", thus "C" being the best writing symbol pattern) is entered on an input area (e.g., fig. 3, item 151) on the screen (fig. 2, item 44; fig. 6, item 151) and the best writing symbol pattern (e.g., writing symbol pattern "C" in best template "Correct" selected, not writing symbol pattern "c", thus "C" being the best writing symbol pattern) of the best template (top template "Correct" at item 170, fig. 6) is presented in a presentation area (fig. 6, item 168) on the screen (fig. 2, item 44; fig. 6, item 151), whereby said presentation area (fig. 6, item 168) overlaps the input area (when the recognition of the handwriting updates, it is performed right over the same spot, thus overlapping).

Regarding **claim 9**, *Beernink '439* discloses the method according to claim 1, wherein the step of recognizing comprises returning at least one alternative template (e.g., template5 being "currect" alternative from template1 being "Correct" as listed on item 170) selected from the

plurality of templates (fig. 6, item 170; e.g., template1 being “Correct”, template2 being “correct”, template3 being “Currect”, template4 being “Cwrect”, template5 being “currect”).

Regarding **claim 10**, *Beernink ‘439* discloses the method according to claim 9, wherein the step of presenting the at least one of the plurality of writing symbol patterns (e.g., fig. 6, item 170 is composed of "C", “c”, "o", r", "u", "w", "t", etc. in each of the templates) of the at least one alternative template (e.g., template5 being “currect” alternative from template1 being “Correct” as listed on item 170) at a request of a user (“word 164 being selected to invoke a pop-up corrector 168” at 10:17-30).

Regarding **claim 11**, *Beernink ‘439* discloses the method according to claim 1, wherein each of the plurality of templates is associated with a category (a category is a character from the English alphabet, each category comprised of different user styles writing it, and whether it is uppercase, lowercase, etc) defining what kind of symbol is represented by each of the plurality of templates.

Regarding **claim 12**, *Beernink ‘439* discloses the method of claim 11, wherein the step of presenting comprises masking the presentation of the presented interpretation according to which category the best interpretation is associated with (the masking is performed in step 170 of fig. 6 of the best interpretation being presented being the top of the list, among other possibilities of which include "C" and "c" for the character "C").

Regarding **claim 13**, *Beernink ‘439* discloses the method of claim 12, wherein the category (“C” is “associated” with the capitalized letter category in fig. 6, item 170) is indicated by a certain color of a background (the background color is white that indicates “C” is capitalized) to the at least one of the plurality of writing symbol patterns represented by the presented interpretation (presented interpretations being those listed in item 170, fig. 6 with the top on the list being the best interpretation).

Regarding **claim 14**, *Beernink ‘439* discloses the method of claim 13, wherein the category (“C” is “associated” with the capitalized letter category in fig. 6, item 170) is indicated by a certain color of the at least one of the plurality of writing symbol patterns (the color is black that indicates “C” is capitalized) represented by the presented interpretation (presented interpretations being those listed in item 170, fig. 6 with the top on the list being the best interpretation).

Regarding **claim 15**, *Beernink '439* discloses a method for presenting a recognized handwritten symbol (e.g., handwritten symbols being the English alphabet symbols using item 110 at fig. 2), comprising the steps of:

detecting a handwritten pattern (e.g., fig. 6, item 172; "Correct") that is entered by a user (user uses fig. 2, item 106);

recognizing (fig. 6, list items 170; item 172 as a result of recognizing the actual handwritten pattern on fig. 2, item 106) the detected handwritten pattern (e.g., fig. 6, item 172; "Correct"),

wherein said step of recognizing comprises comparing the handwritten pattern to a plurality of templates (fig. 6, item 170; e.g., template1 being "Correct", template2 being "correct", template3 being "Currect", template4 being "Cwrect", template5 being "currect"),

wherein each of the plurality of templates represents at least one of a plurality of writing symbol patterns (e.g., fig. 6, item 170 is composed of "C", "c", "o", r", "u", "w", "t", etc. in each of the templates; e.g., template4 comprised of "C", "w", "r", "e", "c", "t") of ways of writing symbols (symbols being the English alphabet symbols; e.g., symbol "c" being writing symbol patterns "C" and "c"), and

returning a best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation) of the handwritten pattern (e.g., fig. 6, item 172; "Correct"), said best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation) being based on one of the plurality of writing symbol patterns (e.g., fig. 6, item 170 is composed of "C", "c", "o", r", "u", "w", "t", etc. in each of the templates; e.g., template4 comprised of "C", "w", "r", "e", "c", "t") as a best writing symbol pattern (e.g., writing symbol pattern "C" in best template "Correct" selected, not writing symbol pattern "c", thus "C" being the best writing symbol pattern) of a best template (top template "Correct" at item 170, fig. 6) selected from the plurality of templates (fig. 6, item 170; e.g., template1 being "Correct", template2 being "correct", template3 being "Currect", template4 being "Cwrect", template5 being "currect") that, according to a predefined rule, is most similar to the handwritten pattern (inherent rules must exist such that writing symbol pattern C" in best template "Correct" on list 170 was selected),

wherein at least two of the plurality of templates (e.g., item 170 contains templates "Correct" and "correct") comprise different ones of the plurality of writing symbol patterns

which represent different ways of writing a single symbol (symbols being the English alphabet symbols; e.g., symbol “c” being writing symbol patterns “C” and “c”),

and wherein the different ones of the plurality of writing symbol patterns (e.g., fig. 6, item 170 is composed of "C", “c”, "o", r", "u", "w", "t", etc. in each of the templates; e.g., template4 comprised of “C”, “w”, “r”, “e”, “c”, “t”) of said at least two of the plurality of templates (fig. 6, item 170; e.g., template1 being “Correct”, template2 being “correct”, template3 being “Currect”, template4 being “Cwrect”, template5 being “currect”) return different best interpretations (the second interpretation “correct”, 2nd from the top of the list contains alternate writing symbol patterns "C" and "c") when being most similar to the handwritten pattern (e.g., fig. 6, item 172; “Correct”); and

presenting the best interpretation (fig. 6, item 168 wherein the top of the list “Correct” is the best interpretation) on a screen (fig. 6, item 151; fig. 2, item 44).

Regarding **claim 16**, *Beernink ‘439* discloses further comprising, before the step of presenting, retrieving as the best interpretation (fig. 6, item 168 wherein the top of the list “Correct” is the best interpretation), from a database comprising allographs, a best allograph (the best allograph is the digital font letter of “C” that is it converted to (*e.g.*, the text written in fig. 6, item 172 is converted to digital font)) that is associated with the best writing symbol pattern (e.g., writing symbol pattern “C” in best template “Correct” selected, not writing symbol pattern “c”, thus “C” being the best writing symbol pattern) of the best template (top template “Correct” at item 170, fig. 6).

Regarding **claim 18**, *Beernink ‘439* discloses wherein the step of presenting comprises presenting the best allograph (the best allograph is the digital font letter of “C” that is it converted to (*e.g.*, the text written in fig. 6, item 172 is converted to digital font)) represented by a number of arcs (it is inherent that each allograph is “represented by a number of arcs” as each allograph consists of a series of arcs) depicting the way of writing symbols of the best template.

Regarding **claim 19**, *Beernink ‘439* discloses wherein the best interpretation (fig. 6, item 168 wherein the top of the list “Correct” is the best interpretation) is the writing symbol pattern of the best template (top template “Correct” at item 170, fig. 6), and wherein the step of presenting comprises presenting the best writing symbol pattern (e.g., writing symbol pattern “C” in best template “Correct” selected, not writing symbol pattern “c”, thus “C” being the best

writing symbol pattern) of a best template (top template "Correct" at item 170, fig. 6) of the best template on the screen (fig. 6 screen).

Regarding **claim 20**, claim 2 recites identical features as in claim 20. Thus, references/arguments equivalent to those presented below for claim 2 are equally applicable to claim 20.

Regarding **claim 21**, claim 3 recites identical features as in claim 21. Thus, references/arguments equivalent to those presented below for claim 3 are equally applicable to claim 21.

Regarding **claim 22**, *Beernink '439* discloses wherein the step of presenting comprises presenting the whole best writing symbol pattern (e.g., writing symbol pattern "C" in best template "Correct" selected, not writing symbol pattern "c", thus "C" being the best writing symbol pattern) represented by the best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation) at once.

Regarding **claim 23**, claim 5 recites identical features as in claim 23. Thus, references/arguments equivalent to those presented below for claim 5 are equally applicable to claim 23.

Regarding **claim 24**, *Beernink '439* discloses further comprising, before the step of presenting, manipulating (manipulation occurs when transforming "C" at item 172 to the "C" at fig. 170) the best writing symbol pattern (e.g., writing symbol pattern "C" in best template "Correct" selected, not writing symbol pattern "c", thus "C" being the best writing symbol pattern) represented by the best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation) according to characteristics of the handwritten pattern (e.g., fig. 6, item 172; "Correct").

Regarding **claim 26**, *Beernink '439* discloses wherein the handwritten pattern is entered on an input area (e.g., fig. 3, item 151) on the screen (fig. 2, item 44; fig. 6, item 151) and the best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation) is presented in a presentation area (fig. 6, item 168) on the screen (fig. 2, item 44; fig. 6, item 151), whereby said presentation area overlaps the input area (when the recognition of the handwriting updates, it is performed right over the same spot, thus overlapping).

Regarding **claim 27**, *Beernink '439* discloses wherein a step of recognizing comprises returning at least one alternative interpretation (*e.g.*, handwritten "Correct" item 172 returns list item 170, the letter "C" in "Correct" returns templates "Correct" and "correct").

Regarding **claim 28**, *Beernink '439* discloses presenting the at least one of the plurality of writing symbol patterns (e.g., fig. 6, item 170 is composed of "C", "c", "o", r", "u", "w", "t", etc. in each of the templates) of the at least one alternative interpretation (*e.g.*, handwritten "Correct" item 172 returns list item 170, the letter "C" in "Correct" returns templates "Correct" and "correct") at a request of a user (the use requested the list item 170).

Regarding **claim 29**, *Beernink '439* discloses wherein the best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation) is associated with a category (a category is a character from the English alphabet, each category comprised of different user styles writing it, and whether it is uppercase, lowercase, etc) defining what kind of symbol is represented by each of the plurality of templates (fig. 6, item 170; e.g., template1 being "Correct", template2 being "correct", template3 being "Currect", template4 being "Cwrect", template5 being "currect").

Regarding **claim 30**, *Beernink '439* discloses wherein the step of presenting comprises masking the presentation of the best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation)) according to which category (a category is a character from the English alphabet, each category comprised of different user styles writing it, and whether it is uppercase, lowercase, etc) the best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation) is associated with (the masking is performed in step 170 of fig. 6 of the best interpretation being presented being the top of the list, among other possibilities of which include "C" and "c" for the character "C").

Regarding **claim 31**, *Beernink '439* discloses wherein the category ("C" is "associated" with the capitalized letter category in fig. 6, item 170) is indicated by a certain color of a background (the background color is white that indicates "C" is capitalized) to the at least one of the plurality of writing symbol patterns represented by the best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation).

Regarding **claim 32**, *Beernink '439* discloses wherein the category ("C" is "associated" with the capitalized letter category in fig. 6, item 170) is indicated by a certain color of the at

least one of the plurality of writing symbol patterns (the color is black that indicates "C" is capitalized) represented by the best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation).

Regarding **claim 33**, claim 1 recites identical features as in claim 33. Thus, references/arguments equivalent to those presented above for claim 1 are equally applicable to claim 33.

Regarding **claim 34**, claim 15 recites identical features as in claim 34. Thus, references/arguments equivalent to those presented above for claim 15 are equally applicable to claim 34.

Claim Rejections - 35 U.S.C. § 103

[8] The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Beernink '438 in view of Beernink '439.

[9] **Claim 15** is rejected under 35 U.S.C. § 103(a) as being unpatentable over *Beernink '438* in view of *Beernink '439.*

Regarding **claim 15**, while *Beernink '438* discloses a method for presenting a recognized handwritten symbol (fig. 6a; "handwriting recognition" at 2:13-15), comprising the steps of:

detecting ("recognizer implemented by CPU 12 to recognize ink strokes input by a user with stylus 38" at 7:19-21) a handwritten pattern ("ink strokes input" at 7:19-21; *e.g.*, fig. 8, item 95) that is entered by a user (fig.3);

recognizing ("handwriting recognition" at 2:13-15) the detected handwritten pattern,

wherein said step of recognizing comprises comparing (the handwriting is compared to each of the templates) the handwritten pattern to a plurality of templates (fig. 8, item 89; *e.g.*, selected character "f" is a template),

wherein each of the plurality of templates (*e.g.*, template “f” in fig. 8) represents at least one of a plurality of writing symbol patterns (*e.g.*, template “f” comprises four writing symbol patterns including items 95, 95b) of ways of writing symbols (the English alphabet), and

returning a best interpretation (the best interpretation is a best writing symbol pattern, i.e., when the user writes “F”, it will pick the best of item 95 and that best pick is the best interpretation, the best interpretation displayed will be capital "F" as opposed to lowercase "f") of the handwritten pattern, said best interpretation being based on one of the plurality of writing symbol patterns as a best writing symbol pattern (the best writing symbol pattern is picked from the plurality of templates; e.g., template "f" picked with different writing symbol patterns "f" (item 95) for which the best writing symbol pattern “f” will be picked (either item 95a or 95b) when the user writes “f”) of a best template selected from the plurality of templates (fig. 8, item 89; *e.g.*, selected character “f” is a template) that, according to a predefined rule, is most similar to the handwritten pattern (once “Letter Style” preferences are saved, *Beernink ‘438* uses those preferences to recognize characters), wherein at least two of the plurality of templates comprise different one of the plurality of writing symbol patterns which represent different ways of writing a single symbol (each character in list item 89 has four writing symbol patterns item 95; these four writing symbol patterns are accountable for the plurality of templates of “Letter Styles” for each user), and wherein the different ones of the plurality of writing symbol patterns (*e.g.*, template “f” comprises four writing symbol patterns including items 95, 95b) of said at least two of the plurality of templates (*e.g.*, template “f” in fig. 8) return different best interpretations (each template is composed of unique and separate writing symbol patterns, so the best interpretations of those separate writing symbol patterns for each template must be different) when being most similar to the handwritten pattern; and

presenting the best interpretation on a screen (fig 3, item 52; “handwriting recognition” at 2:13-15) *Beernink ‘438* does not disclose returning a best interpretation among multiple interpretations of the handwritten pattern in the sense of Applicant’s invention.

Beernink ‘439 teaches returning a best interpretation (fig. 5, item 168 wherein the top of the list is the best interpretation) among multiple interpretations (fig. 5, item 170) of a handwritten pattern (fig. 5, item 172).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the method of *Beernink'438* to include returning a best interpretation among multiple interpretations of the handwritten pattern in the sense of Applicant's invention as taught by *Beernink '439* to " provide[[s]] the user with some character strings which the recognition software believes are close matches for the ink word 172. The ink word 172 represents the original strokes which comprised the word which the user entered. Selecting the keyboard button 174 will display a keyboard window. Once the keyboard window is displayed, the user can select desired characters from the keyboard via the stylus 110.", *Beernink '439,* 10:54-61.

Beernink '439 in view of Sparr et al.

[10] **Claim 7** is rejected under 35 U.S.C. § 103(a) as being unpatentable over *Beernink '439* in view of U.S. Pub. No. 2001/0026639 (published Oct. 4, 2001, hereinafter "Sparr et al."].

Regarding **claim 7**, while *Beernink '439* discloses the method of claim 6, *Beernink '439* does not teach wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling.

Sparr et al. teaches wherein a step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling (fig. 2, fig. 3).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the step of manipulating of *Beernink '439* to be done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling as taught by *Sparr et al.* so that "to a larger extent accept[ing] individual styles of handwritten characters and unusual fonts of typewritten characters, and is easy to implement with limited computing power.", para. 0006.

Regarding **claim 25**, claim 7 recites identical features as in claim 25. Thus, references/arguments equivalent to those presented above for claim 7 are equally applicable to claim 25.

Beernink '439 in view of Kadashevich et al.

[11] **Claim 17** is rejected under 35 U.S.C. § 103(a) as being unpatentable over *Beernink '439* in view of U.S. Patent No. 5,970,170 (issued Oct. 19, 1999, hereinafter "Kadashevich et al.").

Regarding **claim 17**, while *Beernink '439* discloses the method according to claim 16, wherein the step of presenting comprises presenting the best allograph represented by an image (fig 7, item 76) depicting the way of writing symbols of the best template, *Beernink '439* do not disclose wherein the image is a bitmap image.

Kadashevich et al. discloses a character recognition system identification of scanned and real time handwritten characters that includes teaching a bitmap image (8:60-67; 9:17-22; 13:16-20).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the image of *Beernink '439* to be a bitmap image as taught by *Kadashevich et al.* to provide an "array wherein each bit in the array represents a pixel of the…image, with the state of bit (0 or 1) representing whether the corresponding pixel is a background or foreground pixel and the location of the bit in the array representing the coordinates of the corresponding pixel in the image.", *Kadashevich et al.*, 8:60-67.

Conclusion

[12] Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID P. RASHID whose telephone number is (571)270-1578. The examiner can normally be reached Monday - Friday 7:30 - 17:00 ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vikkram Bali can be reached on (571) 272-74155. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David P Rashid/

Examiner, Art Unit 2624

/Bhavesh M Mehta/
Supervisory Patent Examiner, Art Unit 2624

David P Rashid
Examiner
Art Unit 26244

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10524430	PRYMUS ET AL.
	Examiner	Art Unit
	Rashid, David P	2624

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	11/15/2007	06/17/2008	01/16/2009						
	1	✓	✓	✓						
	2	✓	✓	✓						
	3	✓	✓	✓						
	4	✓	✓	✓						
	5	✓	✓	✓						
	6	✓	✓	✓						
	7	✓	✓	✓						
	8	✓	✓	✓						
	9	✓	✓	✓						
	10	✓	✓	✓						
	11	✓	✓	✓						
	12	✓	✓	✓						
	13	✓	✓	✓						
	14	✓	✓	✓						
	15	✓	✓	✓						
	16	✓	✓	✓						
	17	✓	✓	✓						
	18	✓	✓	✓						
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	24	✓	✓	✓						
	25	✓	✓	✓						
	26	✓	✓	✓						
	27	✓	✓	✓						
	28	✓	✓	✓						
	29	✓	✓	✓						
	30	✓	✓	✓						
	31	✓	✓	✓						
	32	✓	✓	✓						
	33	✓	✓	✓						
	34	✓	✓	✓						

PATENT
Customer No.: 22,852
Attorney Docket No.: 08806.0174

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
Erika PRYMUS et al.	)	Group Art Unit: 2624
	)	
Application No.: 10/524,430	)	Examiner: Rashid, David
	)	
Filed: August 9, 2005	)	
	)	
For: PRESENTING RECOGNISED HANDWRITTEN SYMBOLS	)	Confirmation No.: 6160
	)	

Mail Stop - Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

REPLY TO OFFICE ACTION

In reply to the Office Action mailed January 23, 2009, the period for response to which extends to April 23, 2009, please amend the above-identified application as follows:

Amendments to the Claims are reflected in the listing of claims beginning on page 2 of this reply.

Remarks follow the claim amendments section of this reply.

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently Amended) A method performed by a 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 writing symbol patterns of ways of writing symbols, and returning a best template selected from the plurality of templates that represents one of the plurality of writing symbol patterns as a best writing 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 writing symbol patterns which represent different ways of writing a single symbol; and

presenting the best writing symbol pattern of the best template ~~on a screen~~.

2. (Previously Presented) The method according to claim 1, wherein the at least one of the plurality of writing symbol patterns of each of the plurality of templates is

represented by geometrical information relating to an appearance of said writing symbol pattern.

3. (Previously Presented) 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 writing symbol patterns being presented by lines drawn between the dots.

4. (Previously Presented) The method according to claim 1, wherein the step of presenting comprises presenting the whole best writing symbol pattern of the best template at once.

5. (Original) The method according to claim 3, wherein the step of presenting comprises presenting lines one at a time.

6. (Previously Presented) The method according to claim 1, further comprising, before the step of presenting, manipulating the best writing symbol pattern of the best template according to characteristics of the handwritten pattern.

7. (Original) The method according to claim 6, wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling.

8. (Currently Amended) The method according to claim 1, wherein the handwritten pattern is entered on an input area on ~~the~~ a screen and the best writing symbol pattern of the best template is presented in a presentation area on the screen, wherein said presentation area overlaps the input area.

9. (Previously Presented) The method according to claim 1, wherein the step of recognizing comprises returning at least one alternative template selected from the plurality of templates.

10. (Previously Presented) The method according to claim 9, wherein the step of presenting comprises presenting the at least one of the plurality of writing symbol patterns of the at least one alternative template at a request of a user.

11. (Previously Presented) The method according to claim 1, wherein each of the plurality of templates is associated with a category defining what kind of symbol is represented by each of the plurality templates.

12. (Previously Presented) The method according to claim 11, wherein the step of presenting comprises masking the presentation of the best writing symbol pattern according to which category the best template is associated with.

13. (Previously Presented) The method according to claim 12, wherein the category is indicated by a certain color of a background to the best writing symbol pattern.

14. (Previously Presented) The method according to claim 12, wherein the category is indicated by a certain color of the best writing symbol pattern.

15. (Currently Amended) ~~The~~ A method performed by a 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 ~~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 writing symbol patterns of ways of writing symbols and returning a best interpretation of the handwritten pattern, said best interpretation being based on one of the plurality of writing symbol patterns as a best writing 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 ~~one~~ ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol, and wherein the different ones of the plurality

of writing 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 ~~on a screen~~.

16. (Previously Presented) The 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 writing symbol pattern of the best template.

17. (Previously Presented) The method according to claim 16, wherein the step of presenting comprises presenting the best allograph represented by a bitmap image depicting the way of writing symbols of the best template.

18. (Previously Presented) The method according to claim 16, wherein the step of presenting comprises presenting the best allograph represented by a number of arcs depicting the way of writing symbols of the best template.

19. (Currently Amended) The method according to claim 15, wherein the best interpretation is the writing symbol pattern of the best template, and wherein the step of presenting comprises presenting the best writing symbol pattern of the best template on ~~the~~ a screen.

20. (Previously Presented) The method according to claim 19, wherein each of the plurality of writing symbol patterns of a template is represented by geometrical information relating to an appearance of each of said plurality of writing symbol patterns.

21. (Previously Presented) The method according to claim 20, wherein the geometrical information comprises information of positions of a number of dots representing each of the plurality writing symbol patterns, said each of the plurality of writing symbol patterns being presented by lines drawn between the dots.

22. (Previously Presented) The method according to claim 15, wherein the step of presenting comprises presenting the whole best writing symbol pattern represented by the best interpretation at once.

23. (Original) The method according to claim 21, wherein the step of presenting comprises presenting the lines one at a time.

24. (Previously Presented) The method according to claim 15, further comprising, before the step of presenting, manipulating the best writing symbol pattern represented by the best interpretation according to characteristics of the handwritten pattern.

25. (Original) The method according to claim 24, wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling.

26. (Currently Amended) The method according to claim 15, wherein the handwritten pattern is entered on an input area on ~~the~~ a screen and the best interpretation is presented in a presentation area on the screen, whereby said presentation area overlaps the input area.

27. (Previously Presented) The method according to claim 15, wherein the step of recognizing comprises returning at least one alternative interpretation.

28. (Original) The method according to claim 27, wherein the step of presenting comprises presenting the at least one alternative interpretation at the request of a user.

29. (Previously Presented) The method according to claim 15, wherein the best interpretation is associated with a category defining what kind of symbol is represented by the best interpretation.

30. (Previously Presented) The method according to claim 29, wherein the step of presenting comprises masking the presentation of the best interpretation according to which category the best interpretation is associated with.

31. (Previously Presented) The method according to claim 30, wherein the category is indicated by a certain color of a background to the at least one of the plurality of writing symbol patterns represented by the best interpretation.

32. (Previously Presented) The method according to claim 30, wherein the category is indicated by a certain color of the at least one of the plurality of writing symbol patterns represented by the best interpretation.

33. (Previously Presented) A device for recognition of a handwritten symbol, said device comprising

a screen;

means for detecting a handwritten pattern;

a database comprising templates that comprise a plurality of writing symbol patterns representing ways of writing symbols, wherein at least two of the templates comprising different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol; and

means for recognizing the detected handwritten pattern and returning one of the plurality of patterns of a best template of the handwritten pattern, said best template being most similar to the handwritten pattern,

wherein said device is arranged to present the one of the plurality of writing symbol patterns of the best template on the screen.

34. (Previously Presented) A device for recognition of a plurality of handwritten symbols, said device comprising

a screen;

means for detecting a handwritten pattern;

a database comprising templates that comprise a plurality of writing symbol patterns representing ways of writing symbols, wherein at least two of the templates comprising different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol; and

means for recognizing the detected handwritten patterns and individually returning for each handwritten pattern a best interpretation of the handwritten pattern, said best interpretation being based on one of the plurality of writing symbol patterns of a best template selected from the templates that is most similar to the handwritten pattern, wherein the one of the plurality writing symbol patterns of said at least two of the templates return different best interpretations when being most similar to the handwritten pattern,

wherein said device is arranged to present the best interpretation on the screen.

REMARKS

In the outstanding Office Action, the Examiner took the following actions:

(a) rejected claims 1-32 under 35 U.S.C. § 101 as not falling within one of the four statutory categories of invention;

(b) rejected claims 1-6, 8, 11, and 33 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,666,438 to Beernink et al. ("Beernink '438);

(c) rejected claims 1-6, 8-16, 18-24, and 26-34 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,666,439 to Beernink et al. ("Beernink '439);

(d) rejected claim 15 under 35 U.S.C. § 103(a) as being unpatentable over Beernink '438 in view of Beernink '439;

(e) rejected claims 7 and 25 under 35 U.S.C. § 103(a) as being unpatentable over Beernink '439 in view of U.S. Patent Application Publication No. 2001/0026639 to Sparr et al. ("Sparr"); and

(f) rejected claim 17 under 35 U.S.C. § 103(a) as being unpatentable over Beernink '439 in view of U.S. Patent No. 5,970,170 to Kadashevich et al. ("Kadashevich").

By this reply, claims 1, 8, 15, 19, and 26 have been amended. Claims 1-34 remain pending in this application. No new matter has been entered by this reply.

I. Rejection of claims 1-32 under 35 U.S.C. § 101 as not falling within one of the four statutory categories of invention

Applicant respectfully traverses the rejection of claims 1-32 as not falling within one of the four statutory categories of invention. However, in an effort to expedite prosecution, Applicant has amended the claims. For example, independent claim 1 has been amended to recite, *inter alia*, "[a] method performed by a 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; [and] recognizing, by the processor, the detected handwritten pattern." As set forth in In re Bilski, "a claimed process is surely patent-eligible under § 101 if: (1) it is tied to a particular machine or apparatus, or (2) it transforms a particular article into a different state or thing." In re Bilski, 545 F.3d 943, 954 (Fed. Cir. 2008)(en banc). Because independent claim 1 is tied to a particular machine or apparatus (i.e., a recognition device, including a processor and a detection means), Applicant submits that independent claim 1 recites statutory subject matter.

Independent claim 15 has been amended in a manner similar to claim 1. Because independent claim 15 is tied to a particular machine or apparatus (i.e., a recognition device, including a processor and a detection means), Applicant submits that independent claim 15 recites statutory subject matter. See id.

Claims 2-14 and 16-32, which depend directly or indirectly from one of independent claims 1 and 15, recite statutory subject matter at least due to their dependence from independent claims 1 and 15.

For at least the above reasons, claims 1-32 meet the requirements of 35 U.S.C. § 101. Therefore, Applicant requests reconsideration and withdrawal of the rejection.

II. Rejection of claims 1-6, 8, 11, and 33 under 35 U.S.C. § 102(b) as being anticipated by Beernink '438

Applicant respectfully traverses the rejection of claims 1-6, 8, 11, and 33 as being anticipated by Beernink '438. Beernink '438 fails to teach, or even suggest, each and every element recited in those claims.

Amended independent claim 1 recites, *inter alia*,

> comparing the handwritten pattern to a plurality of templates . . . [and] returning a best template . . . that represents one of the plurality of writing symbol patterns . . . wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol; and presenting the best writing symbol pattern of the best template. (Emphasis added).

Page 8 of the Office Action provides a drawing describing the Examiner's characterization of independent claim 1. The drawing, however, is incorrect. The drawing depicts two templates, one represented by "a" and the other represented by "z" in section 2. The drawing indicates that a plurality of writing symbol patterns correspond to the "a" template and a plurality of writing symbol patterns correspond to the "z" template. The plurality of writing symbol patterns corresponding to the "a" template and the plurality of writing symbol patterns corresponding to the "z" template in the drawing represent different ways of writing different symbols (for the letter "a" and the letter "z"). Independent claim 1, however, requires that "at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol" (emphasis added). Thus, the drawing on page 8 of the Office Action mischaracterizes the features recited in independent claim 1.

In response to the Office Action's mischaracterization, Applicant submits the diagram below ("Diagram") for illustrative purposes.

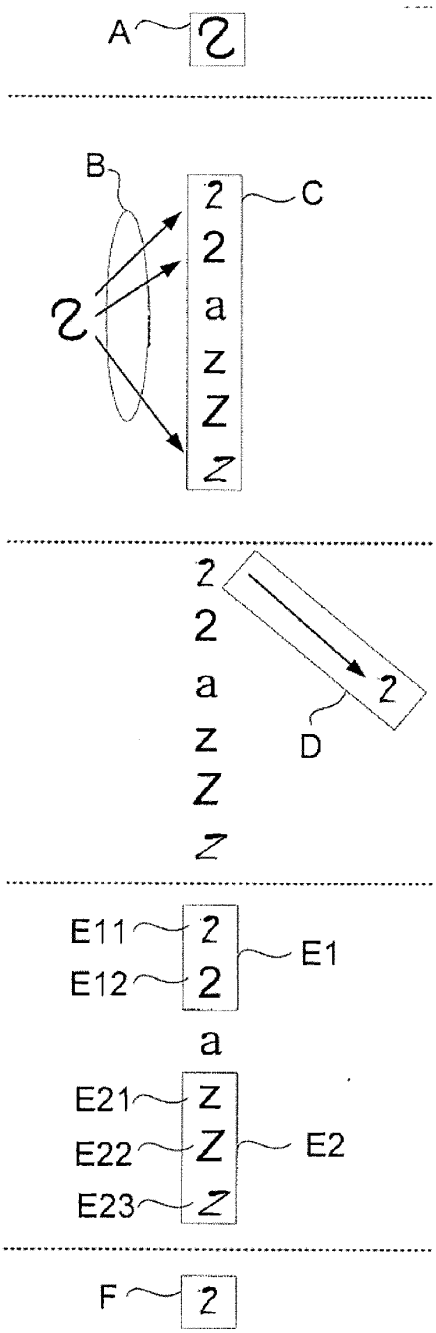


DIAGRAM A

The Diagram is not a portion of the specification, but is provided merely to help facilitate the Examiner's understanding of Applicant's disclosure. The top of the Diagram, above the first horizontal dotted line, depicts parts of a detecting step, with a handwritten pattern (i.e., a "backwards" S) contained in Box A. Between the top horizontal dotted line and the bottom-most horizontal dotted line, the Diagram depicts a recognizing step. In the section below the first horizontal dotted line, the handwritten pattern is compared to a plurality of templates. Arrow B is indicative of comparing, and the items in Box C are indicative of the plurality of templates. The templates in Box C represent the writing symbols "2", "a", and "z". In the section below the second horizontal dotted line, a best template is selected from the plurality of templates. The best template is shown in Box D. In the section below the third horizontal dotted line, the Diagram shows that there are two different patterns for writing the symbol "2" (E11 and E12 in Box E1), one pattern for writing the symbol "a", and three different patterns for writing the symbol "z" (E21, E22, and E23 in Box E2). In the section below the bottom-most horizontal dotted line, a best writing symbol pattern of the best template is presented, as shown in Box F. Thus, not only is the best writing symbol "2" returned, but also the most similar way of writing the best writing symbol is returned, disclosing the font, the style, or other calligraphic attributes of the symbol. This gives a user information of how a handwritten pattern is being interpreted, giving the user an opportunity to adapt his or her writing so less false interpretations are made.

Beernink '438 is quite different. Beernink '438 discloses,

> [T]ext, graphical, and other data can then be entered into this second note area 54b. For example, the text object T is a phrase that has been entered into second note area 54b. In the described embodiment, text

> object T was originally entered as several strokes of handwritten "ink" which were recognized by the CPU and converted into printed words of the object T. Beernink '438, column 5, lines 63-67.
>
> The present invention makes use of a recognizer implemented by CPU 12 to recognize ink strokes input by a user with stylus 38. The recognizer analyzes the entered ink and attempts to match the ink to a letter, word, shape, or other symbol present in a database accessible to the recognizer. Id. at column 7, lines 19-23.

Beernink '438 does not, for example, describe the letter, word, shape, or other symbol, matched to the ink strokes input by the user, and thus, Beernink '438 cannot teach that at least two of the letter, word, shape, or other symbol "comprise different ones of a plurality of writing symbol patterns, which represent different ways of writing a single symbol," as recited in independent claim 1.

Beernink '438 discloses that a user can navigate from note area 54b to preference screens 69, shown in FIGS. 6a, 6b, 7, and 8, which may include a letter styles screen 76. See Beernink '438, column 7, lines 66 and 67; and column 8, lines 1 and 2. Letter styles screen 76 relates to a learning phase of the system in Beernink '438, and is used to capture data that is later used by the recognizer. See Id. at column 2, lines 42-47; and column 10, lines 13-16. While Beernink '438 discloses different letter styles in letter style screen 76, Beernink '438 does not teach that the ink strokes input by a user are compared to the letter styles. Rather, Beernink '438 discloses:

> [r]eferring now to FIG. 8 . . . . A user selects one of the characters 89 of which he wishes to modify the letter style . . . . CPU 12 then displays style letters 95 for the selected character 89. For each displayed style letter 95, the user can select whether he or she writes that letter style either "sometimes" or "rarely" by actuating one of toggles 97 . . . . In the described embodiment, the shape of style letters 95 is presented in letter style screen 76, as well as the order of inputting the ink strokes which

> comprise the style letters . . . . The CPU preferably displays a real-time animation of the selected style letter being drawn . . . . Computer system 10 automatically saves adaptive learning data associated with the style letters selected and modified by the user. Id. at column 10, lines 8-31 and 42-44.

Since Beernink '438 does not teach that the letter, word, shape, or other symbol, are matched to the ink strokes input by the user, and Beernink '438 does not teach that the ink strokes input by the user are compared to characters 89 or style letters 95 in letter style screen 76, Beernink '438 fails to teach or suggest "comparing the handwritten pattern to a plurality of templates . . . wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol," as recited in independent claim 1. For at least this reason, Beernink '438 fails to anticipate independent claim 1. Applicant respectfully requests reconsideration of the rejection of independent claim 1, and the timely allowance of independent claim 1.

Applicant respectfully disagrees with the assertions of the Office Action, that FIGS. 6-8 of Beernink '438, and in particular, style letters 95 of FIG. 8, shows

> an example of a handwriting style being stored in the tablet to be compared with the user's handwriting using a stylus (e.g., fig. 3). Fig. 6-8 is also an indicator that that user physically wrote that handwriting style that is now stored to later be compared at another time.
>
> *Beernink '438* does describe a letter or symbol (e.g., fig. 8, item 95a) being compared with the user's handwriting inputted in fig. 3. The ink strokes input in fig. 3 are being compared to stored characters 89 or 95 because that is the primary use of the invention (to recognize handwriting of different users of a pen-based computer system). Office Action, page 3.

Applicant submits that the Office Action's assertions with respect to Beernink '438 are not supported by the reference. For example, the assertion that style letters 95 are

compared with a user's handwriting is unsupported. Beernink '438 discloses that a recognizer analyzes "ink" entered by a user and attempts to match it to a letter, word, shape, or other symbol in a database, not to style letters 95 as alleged in the Office Action.

Furthermore, page 7 of the Office Action characterizes characters 89 from FIG. 8 of Beernink '438 as corresponding to the "plurality of templates" recited in independent claim 1, and style letters 95 of Beernink '438 as corresponding to the "plurality of writing symbol patterns" recited in independent claim 1. However, independent claim 1 recites that "at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol." No two characters 89 of Beernink '438 comprise different ones of style letters 95 which represent different ways of writing a single symbol. For example, while character "F" of characters 89 has style letters 95a and 95b for writing a symbol "f", none of the other characters 89 has style letters for writing that same symbol "f". Since no two of characters 89 comprise different ones of style letters 95 which represent different ways of writing a single symbol, Beernink '438 fails to teach "at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol," as recited in independent claim 1. For at least this additional reason, Beernink '438 cannot anticipate claim 1.

Also, Beernink '438 does not teach, or even suggest, that style letters 95 are presented. Rather, the computer system in Beernink '438 presents printed words/letters (shown in text object "T" of FIG. 2). See Beernink '438, column 5, lines 63-67. Since style letters 95 are not presented, Beernink '438 fails to teach "presenting the best

writing symbol pattern of the best template," as recited in claim 1. For at least this additional reason, Beernink '438 cannot anticipate claim 1. Applicant requests reconsideration and withdrawal of the rejection of claim 1 under 35 U.S.C. § 102(b) as being anticipated by Beernink '438.

Claims 2-6, 8, and 11 each depend from independent claim 1, and are allowable for at least the reasons stated above with respect to claim 1. In addition, each of the dependent claims recites unique combinations that are neither taught nor suggested by the cited art, and therefore each is also separately patentable. Moreover, the Office Action provides no explanation of how, if at all, Beernink '438 anticipates claims 2-6, 8, and 11.

Independent claim 33, while of different scope, recites elements similar to those recited in independent claim 1. For example, independent claim 33 recites, *inter alia*, "a database comprising templates that comprise a plurality of writing symbol patterns . . . wherein at least two of the templates comprising different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol; and means for recognizing the detected handwritten pattern and returning one of the plurality of patterns of a best template of the handwritten pattern, said best template being most similar to the handwritten pattern, wherein said device is arranged to present the one of the plurality of writing symbol patterns of the best template on the screen," emphasis added. Moreover, the Office Action fails to provide any explanation of how, if at all, Beernink '438 anticipates independent claim 33. Thus, Beernink '438 fails to teach each and every feature recited in independent claim 33. Accordingly, independent claim 33 is allowable at least for reasons similar to those discussed above with respect

to independent claim 1. Applicant respectfully requests the timely allowance of independent claim 33.

III. Rejection of claims 1-6, 8-16, 18-24, and 26-34 under 35 U.S.C. § 102(b) as being anticipated by Beernink '439

Applicant respectfully traverses the rejection of claims 1-6, 8-16, 18-24, and 26-34 as being anticipated by Beernink '439. Beernink '439 fails to teach, or even suggest, each and every feature recited in those claims.

Independent claim 1 recites, for example,

> comparing the handwritten pattern to a plurality of templates . . . [and] returning a best template . . . that represents one of the plurality of writing symbol patterns as a best writing symbol pattern which . . . is most similar to the handwritten pattern, wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol; and presenting the best writing symbol pattern of the best template. Emphasis added.

Beernink '439 fails to teach at least these elements. Beernink '439 discloses,

> [A]ssume that a user of a pen-based computer system 10 utilized a stylus 110 to enter an ink word representation corresponding to the selected word 164. In turn, recognition software implemented on the computer system 10 processed the ink word and produced a "best guess" being the selected word 164. In this case, the character string "correct" is displayed as the best guess of the selected word 164.
>
> FIG. 5 illustrates a response of the boxed input correction system to the selected word 164 being selected to invoke a pop-up corrector 168 in accordance with one embodiment of the present invention. The pop-up corrector provides an alternates list 170, an ink word 172 . . . . The alternates list 170 provides the user with some character strings which the recognition software believes are close matches for the ink word 172. The ink word 172 represents the original strokes which comprised the word which the user entered. Beernink '439, column 10, lines 9-27.

Page 9 of the Office Action characterizes character strings from alternates list 170 of Beernink '439 as corresponding to the "plurality of templates" recited in

independent claim 1, and the letters forming the character strings as corresponding to the "plurality of writing symbol patterns" recited in claims. However, this is not correct.

Independent claim 1 recites that "at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol." None of the letters forming the character strings in Beernink '439 represent different ways of writing a single symbol. For example, the first, third, and fourth character strings of Beernink '439 each include a letter "C", but that letter "C" is identical in all three instances. Therefore, the letters "C" in the first, third, and fourth character strings of Beernink '439 do not represent different ways of writing a single symbol, but rather, represent identical ways of writing a single symbol.

In contrast, the attached Diagram shows different ways of writing a single symbol. For example, the Diagram shows different ways E11 and E12 of writing a single symbol, that symbol being the number "2". The Diagram also shows different ways E21, E22, and E23 of writing a single symbol, that symbol being a capital letter "Z". The capital letter "C" and the lower-case letter "c" in the character strings of Beernink '439, however, represent ways of writing different symbols. Accordingly, Beernink '439 fails to teach or suggest "at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol," as recited in claim 1. For at least this reason, Beernink '439 cannot anticipate claim 1.

Independent claim 15, while of different scope, recites elements similar to those recited in independent claim 1. For example, independent claim 15 recites, *inter alia*,

"wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol" emphasis added. Contrary to the allegations of the Office Action, Beernink '439 fails to teach the elements recited in independent claim 15. Accordingly, independent claim 15 is not anticipated by the prior art at least for reasons similar to those discussed above with respect to independent claim 1. Applicant respectfully requests withdrawal of the rejection of claim 15 under 35 U.S.C. § 102(b) and the timely allowance of independent claim 15.

Claims 2-6, 8-14, 16, 18-24, and 26-32 each depend from one of independent claims 1 and 15, and are allowable for at least the reasons stated above with respect to independent claims 1 and 15. In addition, each of the dependent claims recites unique combinations that are neither taught nor suggested by the cited art, and therefore each is also separately patentable.

Independent claims 33 and 34, while of different scope, each recite elements similar to those recited in independent claim 1. For example, independent claims 33 and 34 each recite, *inter alia*, "a database comprising templates that comprise a plurality of writing symbol patterns representing ways of writing symbols, wherein at least two of the templates comprising different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol." For at least this reason, Beernink '439 fails to teach each and every feature recited in independent claims 33 and 34. Accordingly, independent claims 33 and 34 are each allowable at least for reasons similar to those discussed above with respect to independent claim 1. Applicant respectfully requests the timely allowance of independent claims 33 and 34.

IV. Rejection of claim 15 under 35 U.S.C. § 103(a) as being unpatentable over Beernink '438 in view of Beernink '439

Applicant respectfully traverses the rejection of independent claim 15 as being unpatentable over Beernink '438 in view of Beernink '439. A *prima facie* case of obviousness has not been established.

"The key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. . . . [R]ejections on obviousness cannot be sustained with mere conclusory statements." M.P.E.P. § 2142, 8th Ed., Rev. 6 (Sept. 2007) (internal citation and inner quotation omitted). "[T]he framework for the objective analysis for determining obviousness under 35 U.S.C. 103 is stated in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966). . . . The factual inquiries . . . [include determining the scope and content of the prior art and] . . . [a]scertaining the differences between the claimed invention and the prior art." M.P.E.P. § 2141(II). In rejecting a claim, "Office personnel must explain why the difference(s) between the prior art and the claimed invention would have been obvious to one of ordinary skill in the art." M.P.E.P. § 2141(III).

Independent claim 15 calls for a combination including, for example, "wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol." As discussed above with respect to claim 1, Beernink '438 fails to teach or suggest "wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol," as recited in independent claim 15.

The Examiner cited Beernink '439 as a teaching of returning a best interpretation among multiple interpretations. Office Action, page 18. Even assuming the Examiner's characterization of Beernink '439 is correct, which Applicant does not concede, Beernink '439 fails to cure the deficiencies of Beernink '438, discussed above. That is, Beernink '439 also, fails to teach or suggest "wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol," as recited in claim 15.

In view of the mischaracterization of the prior art set forth above, the Examiner has neither properly determined the scope and content of the prior art nor ascertained the differences between the prior art and the combination of claim 15. Moreover, the Examiner has provided no motivation for one of ordinary skill in the art to modify the teachings of the prior art to achieve the claimed combinations. Accordingly, no reason has been articulated as to why one of ordinary skill in the art would find the claimed combination obvious in view of the prior art. For at least this reason, a *prima facie* case of obviousness has not been established. The rejection of claim 15 under 35 U.S.C. § 103(a) is thus improper and should be withdrawn.

V. Rejection of claims 7 and 25 under 35 U.S.C. § 103(a) as being unpatentable over Beernink '439 in view of Sparr

Applicant respectfully traverses the rejection of claims 7 and 25 as being unpatentable over Beernink '439 in view of Sparr. A *prima facie* case of obviousness has not been established.

Claim 7 depends from independent claim 1, and thus includes all the elements thereof. As set forth above, Beernink '439 fails to teach or suggest at least "wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol," as recited in claim 1 and required by claim 7. Sparr fails to cure the deficiencies of Beernink '439. That is, Sparr also fails to teach or suggest at least "wherein at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol," as recited in independent claim 1 and required by claim 7.

Claim 25 depends from independent claim 15, and thus includes all the elements thereof. As set forth above, Beernink '439 fails to teach or suggest at least "wherein at least two of the plurality of templates comprise different one of the plurality of writing symbol patterns which represent different ways of writing a single symbol." Sparr fails to cure the deficiencies of Beernink '439. That is, Sparr also fails to teach or suggest at least "wherein at least two of the plurality of templates comprise different one of the plurality of writing symbol patterns which represent different ways of writing a single symbol," as recited in independent claim 15 from which claim 25 depends.

In view of the mischaracterization of Beernink '439 discussed above, the Examiner has neither properly determined the scope and content of the prior art nor properly ascertained the differences between the prior art and either of claims 7 or 25. Moreover, the Examiner has provided no motivation for one of ordinary skill in the art to modify the teachings of the prior art to achieve the claimed combinations. Thus, the Examiner has failed to clearly articulate a reason why either of claims 7 or 25 would

have been obvious to one of ordinary skill in the art in view of the prior art. Accordingly, a *prima facie* case of obviousness has not been established with respect to either of claims 7 or 25, and the rejection under 35 U.S.C. § 103(a) must be withdrawn.

VI. Rejection of claim 17 under 35 U.S.C. § 103(a) as being unpatentable over Beernink '439 in view of Kadashevich

Applicant respectfully traverses the rejection of claim 17 as being unpatentable over Beernink '439 in view of Kadashevich. A *prima facie* case of obviousness has not been established. Claim 17 depends from independent claim 15, and thus includes all the elements thereof. As set forth above, Beernink '439 fails to teach or suggest at least "wherein at least two of the plurality of templates comprise different one of the plurality of writing symbol patterns which represent different ways of writing a single symbol," as recited in claim 15 and required by claim 17. Kadashevich fails to cure the deficiencies of Beernink '439. That is, Kadashevich also fails to teach or suggest at least "wherein at least two of the plurality of templates comprise different one of the plurality of writing symbol patterns which represent different ways of writing a single symbol," as recited in independent claim 15 and required by claim 17.

In view of the mischaracterization of Beernink '439 discussed above, the Examiner has neither properly determined the scope and content of the prior art nor properly ascertained the differences between the prior art and the combination of claim 17. Moreover, the Examiner has provided no motivation for one of ordinary skill in the art to modify the teachings of the prior art to achieve the claimed combinations. Thus, the Examiner has failed to clearly articulate a reason why claim 17 would have

been obvious to one of ordinary skill in the art in view of the prior art. Accordingly, a *prima facie* case of obviousness has not been established with respect to claim 17, and the rejection under 35 U.S.C. § 103(a) must be withdrawn.

CONCLUSION

In view of the foregoing amendments and remarks, Applicant respectfully requests reconsideration of the pending rejections in this application, and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our Deposit Account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: April 22, 2009

By: _____

Thomas Y. Ho
Reg. No. 61,539
(202) 408-4000

Electronic Acknowledgement Receipt

EFS ID:	5197090
Application Number:	10524430
International Application Number:	
Confirmation Number:	6160
Title of Invention:	Presenting recognised handwritten symbols
First Named Inventor/Applicant Name:	Erika Prymus
Customer Number:	22852
Filer:	Thomas Y Ho/Janet Weems
Filer Authorized By:	Thomas Y Ho
Attorney Docket Number:	08806-0174
Receipt Date:	22-APR-2009
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Time Stamp:	13:26:57
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Amendment.pdf	1468818 c9cb8dfc21e6add240a000d9378ff5d0f8848227	yes	27

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	10
	Applicant Arguments/Remarks Made in an Amendment	11	27
Warnings:			
Information:			
	Total Files Size (in bytes):	1468818	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (07-06)
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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
10/524,430	08/09/2005	

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☐		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	04/22/2009	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 34	Minus	** 34	= 0	X $ =		OR	X $52=	0
	Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $ =		OR	X $220=	0
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/LAWANDA MILTON/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,430	08/09/2005	Erika Prymus	08806-0174	6160

22852 7590 07/14/2009

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EXAMINER	
RASHID, DAVID	
ART UNIT	PAPER NUMBER
2624	

MAIL DATE	DELIVERY MODE
07/14/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/524,430	PRYMUS ET AL.	
	Examiner	Art Unit	
	DAVID P. RASHID	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 April 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

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Prior Art

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U.S. Patent No. 5,970,170 (issued Oct. 19, 1999, hereinafter "Kadashevich et al.") 15
U.S. Pub. No. 2001/0026639 (published Oct. 4, 2001, hereinafter "Sparr et al.") 14

Amendments

[1] This office action is responsive to Reply to Office Action (hereinafter "Amendment") received Apr. 22, 2009. Claims 1-34 remain pending.

Claim Rejections - 35 U.S.C. § 101

[2] In response to Amendment at 11-12, the previous § 101 rejections are withdrawn.

Response to Arguments

Remarks Persuasive regarding Rejections Under 35 U.S.C. § 102

[3] Amendment at 12-20 regarding 35 U.S.C. § 102 rejections with respect to claim 1 of Beernink '438 have been respectfully and fully considered, and found persuasive.

Remarks Unpersuasive regarding Rejections Under 35 U.S.C. § 102

[4] Amendment at 20-22 regarding 35 U.S.C. § 102 rejections with respect to claims 1-6, 8-16, 18-24, and 26-34 have been respectfully and fully considered, but are not found persuasive.

> Independent claim 1 recites that "at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol." None of the letters forming the character strings in Beernink '439 represent different ways of writing a single symbol. For example, the first, third, and fourth character strings of Beernink '439 each include a letter "C", but that letter "C" is identical in all three instances. Therefore, the letters "C" in the first, third, and fourth character strings of Beernink '439 do not represent different ways of writing a single symbol, but rather, represent identical ways of writing a single symbol.

Amendment at 21.

Applicant argues that the first, third, and fourth character strings of Beernink '439 each include letter "C", but that letter "C" is identical in all three instances in the first, third, and fourth character strings. See Amendment at 21.

However, the full disclosure of fig. 5, item 170 of Beernink '439 discloses both "C" and "c". Applicant choosing the specific elements in listing item 170 for which is only "C" is unpersuasive because the same listing includes both "C" and "c", which has been interpreted as different writing symbol patterns (as further argued below why this is a reasonable interpretation in light of the specification by the Examiner).

> In contrast, the attached Diagram shows different ways of writing a symbol. For example, the Diagram shows different ways E11 and E12 of writing a single symbol, that symbol being the number "2". The Diagram also shows different ways E21, E22, and E23 of writing a single symbol, that symbol being a capital letter "Z". The capital letter "C" and the lower-case letter "c" in the character strings of Beernink '439, however, represent ways of writing different symbols. Accordingly, Beernink '439 fails to teach or suggest "at least two of the plurality of templates comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol," as recited in claim 1. For at least this reason, Beernink '439 cannot anticipate claim 1.

Amendment at 21.

However, in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., that the

(i) handwritten patterns are composed of individual letters/numbers – e.g., see Amendment at 14, item C of Diagram A,

(ii) templates are also composed of handwritten and stored individual letters/numbers – e.g., see Amendment at 14, item C of Diagram A, and

specifically (iii) single symbols are composed of different "handwritten" ways of writing a specific letter/number (e.g., "A", "𝔄", and "$\mathcal{A}$"), that does not include capital and lower-case letters (e.g., "C" and "c") of that specific letter/number – e.g., see Amendment at 14 (items E1, E2) and 21

are not recited in the rejected claims.

> Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). (Claims to a superconducting magnet which generates a "uniform magnetic field" were not limited to the degree of magnetic field uniformity required for Nuclear Magnetic Resonance (NMR) imaging. Although the specification disclosed that the claimed magnet may be used in an NMR apparatus, the claims were not so limited.); Constant v. Advanced Micro-Devices, Inc., 848 F.2d 1560, 1571-72, 7 USPQ2d 1057, 1064-1065 (Fed. Cir.), cert. denied, 488 U.S. 892 (1988) (Various limitations on which appellant relied were not stated in the claims; the specification did not provide evidence indicating these limitations must be read into the claims to give meaning to the disputed terms.); Ex parte McCullough, 7 USPQ2d 1889, 1891 (Bd. Pat. App. & Inter. 1987) (Claimed electrode was rejected as obvious despite assertions that electrode functions differently than would be expected when used in nonaqueous battery since "although the demonstrated results may be germane to the patentability of a battery containing appellant's electrode, they are not germane to the patentability of the invention claimed on appeal."). See MPEP § 2111 - § 2116.01, for additional case law relevant to claim interpretation.

M.P.E.P. § 2145(VI).

With respect to **(iii)** above, the claim does not positively recite that single symbols are composed of different "handwritten" ways of writing a specific letter/number (e.g., "A", "𝔄", and "$\mathcal{A}$"), and not the difference between "handwritten" ways of writing capital and lower-case letters (e.g., "$\mathcal{A}$", and "a"). The Examiner has reasonably interpreted in light of the specification a single symbol to be a specific English alphabet character, including different variations of it, whether capital/lower-case or one handwritten style or another. It is suggested for Applicant to further limit claim 1 by restricting single symbols to be composed of different "handwritten" ways of writing a specific letter/number (e.g., "A", "𝔄", and "$\mathcal{A}$"), and excluding capital and lower-case letters (e.g., "C" and "c") of that specific letter/number.

Contrary to the allegations of the Applicant (Amendment at 22), Beernink '439 teaches the elements recited in independent claims 15 and 33-34 for analogous reasoning as given above by the Examiner.

Remarks Persuasive regarding Rejections Under 35 U.S.C. § 103

[5] Amendment at 23-24 regarding 35 U.S.C. § 103 rejections with respect to claim 15 of Beernink '438 in view of Beernink '439 have been respectfully and fully considered, and found persuasive.

Remarks Unpersuasive regarding Rejections Under 35 U.S.C. § 103

[6] Amendment at 24-26 regarding 35 U.S.C. § 103 rejections with respect to claims 7 and 25 of Beernink '438 in view of Sparr have been respectfully and fully considered, but are not found persuasive.

As argued above, Beernink '438 does not contain any deficiencies from which Sparr is expected to cure. The differences and motivation are property given in the § 103 rejection below.

[7] Amendment at 26-27 regarding 35 U.S.C. § 103 rejections with respect to claim 17 of Beernink '438 in view of Kadashevich have been respectfully and fully considered, but are not found persuasive.

As argued above, Beernink '438 does not contain any deficiencies from which Kadashevich is expected to cure. The differences and motivation are property given in the § 103 rejection below.

Claim Rejections - 35 U.S.C. § 102

[8] The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall

> have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Beernink '439

[9] **Claims 1-6, 8, 11,** and **33** are rejected under 35 U.S.C. § 102(b) as being anticipated by *Beernink '439.*

Regarding **claim 1**, *Beernink '439* discloses a method performed by a recognition device (fig. 1) for presenting a recognized handwritten symbol (e.g., handwritten symbols being the English alphabet symbols using item 110 at fig. 2), the recognition device having a processor (fig. 12, item 12) and detection means (fig. 1, item 40 storing programs) for detecting entry of a handwritten symbol, the method comprising the steps of:

detecting, by the detection means, a handwritten pattern (e.g., fig. 6, item 172; "Correct") that is entered by a user (user uses fig. 2, item 106);

recognizing (fig. 6, list items 170; item 172 as a result of recognizing the actual handwritten pattern on fig. 2, item 106), by the processor, the detected handwritten pattern (e.g., fig. 6, item 172; "Correct"),

wherein said step of recognizing comprises comparing the handwritten pattern to a plurality of templates (fig. 6, item 170; e.g., template1 being "Correct", template2 being "correct", template3 being "Currect", template4 being "Cwrect", template5 being "currect"),

wherein each of the plurality of templates represents at least one of a plurality of writing symbol patterns (e.g., fig. 6, item 170 is composed of "C", "c", "o", r", "u", "w", "t", etc. in each of the templates; e.g., template4 comprised of "C", "w", "r", "e", "c", "t") of ways of writing symbols (symbols being the English alphabet symbols; e.g., symbol "c" being writing symbol patterns "C" and "c"), and

returning a best template (top template "Correct" at item 170, fig. 6) selected from the plurality of templates (fig. 6, item 170; e.g., template1 being "Correct", template2 being "correct", template3 being "Currect", template4 being "Cwrect", template5 being "currect") that represents one of the plurality of writing symbol patterns (e.g., writing symbol pattern "C" in best template "Correct" selected, not writing symbol pattern "c", thus "C" being the best writing symbol pattern when template1 is selected as the best template) as a best writing symbol pattern

which, according to a predefined rule, is most similar to the handwritten pattern (inherent rules must exist such that writing symbol pattern C" in best template "Correct" on list 170 was selected),

wherein at least two of the plurality of templates (e.g., item 170 contains template1 “Correct” and template2 “correct”) comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol (symbols being the English alphabet symbols; e.g., symbol “c” being writing symbol patterns “C” and “c”); and

presenting (fig. 6, item 151; fig. 2, item 44) the best writing symbol pattern (e.g., writing symbol pattern “C” in best template “Correct” selected, not writing symbol pattern “c”, thus “C” being the best writing symbol pattern) of the best template (top template “Correct” at item 170, fig. 6).

Regarding **claim 2**, *Beernink ‘439* discloses the method according to claim 1, wherein each of the plurality of writing symbol patterns (e.g., fig. 6, item 170 is composed of "C", “c”, "o", r", "u", "w", "t", etc. in each of the templates) of a template (fig. 6, item 170; e.g., template1 being “Correct”, template2 being “correct”, template3 being “Currect”, template4 being “Cwrect”, template5 being “currect”) is represented by geometrical information (it is implicit if not already inherent that each of the plurality of writing symbol patterns of a template is “represented by geometrical information” as each of the plurality of writing symbol patterns of a template consists of geometrical information such as height, width, etc – i.e., item 170 requires geometric information) relating to an appearance of each of said plurality of writing symbol patterns.

Regarding **claim 3**, *Beernink ‘439* discloses the method according to claim 2, wherein the geometrical information (it is implicit if not already inherent that each of the plurality of writing symbol patterns of a template is “represented by geometrical information” as each of the plurality of writing symbol patterns of a template consists of geometrical information such as height, width, etc – e.g., item 170 requires geometric information) comprises information of positions of a number of dots (it is again inherent that the tablet-screen 44 of fig. 2 will pick up individual pixels from which the user writes, each pixel being a dot that represents additional positional information on the tablet-screen) representing each of the plurality writing symbol patterns (e.g., fig. 6, item 170 is composed of "C", “c”, "o", r", "u", "w", "t", etc. in each of the

templates), said each of the plurality of writing symbol patterns being presented by lines (a stroke of a character written on tablet-screen 44 of fig. 2 will contain a string of pixels (dots) that are presented by lines drawn between the pixels, fig. 6, item 172for instance) drawn between the dots.

Regarding **claim 4**, *Beernink '439* discloses wherein the step of presenting comprises presenting the whole best writing symbol pattern (e.g., writing symbol pattern "C" in best template "Correct" selected, not writing symbol pattern "c", thus "C" being the best writing symbol pattern) represented by the best template (top template "Correct" at item 170, fig. 6) at once.

Regarding **claim 5**, *Beernink '439* discloses the method according to claim 3, wherein the step of presenting comprises presenting the lines one at a time (each time the user writes a stroke to be recognized, that stroke consists of pixels (dots) and lines between the pixels, and each time the user writes a new stroke another line is constructed and thus lines are being presented one at a time).

Regarding **claim 6**, *Beernink '439* discloses the method according to claim 1, further comprising, before the step of presenting, manipulating (manipulation occurs when transforming "C" at item 172 to the "C" at fig. 170) the best writing symbol pattern (e.g., writing symbol pattern "C" in best template "Correct" selected, not writing symbol pattern "c", thus "C" being the best writing symbol pattern) of the best template (top template "Correct" at item 170, fig. 6) according to characteristics of the handwritten pattern (e.g., fig. 6, item 172; "Correct").

Regarding **claim 8**, *Beernink '439* discloses the method according to claim 1, wherein the handwritten pattern (e.g., writing symbol pattern "C" in best template "Correct" selected, not writing symbol pattern "c", thus "C" being the best writing symbol pattern) is entered on an input area (e.g., fig. 3, item 151) on the screen (fig. 2, item 44; fig. 6, item 151) and the best writing symbol pattern (e.g., writing symbol pattern "C" in best template "Correct" selected, not writing symbol pattern "c", thus "C" being the best writing symbol pattern) of the best template (top template "Correct" at item 170, fig. 6) is presented in a presentation area (fig. 6, item 168) on the screen (fig. 2, item 44; fig. 6, item 151), whereby said presentation area (fig. 6, item 168) overlaps the input area (when the recognition of the handwriting updates, it is performed right over the same spot, thus overlapping).

Regarding **claim 9**, *Beernink '439* discloses the method according to claim 1, wherein the step of recognizing comprises returning at least one alternative template (e.g., template5 being "currect" alternative from template1 being "Correct" as listed on item 170) selected from the plurality of templates (fig. 6, item 170; e.g., template1 being "Correct", template2 being "correct", template3 being "Currect", template4 being "Cwrect", template5 being "currect").

Regarding **claim 10**, *Beernink '439* discloses the method according to claim 9, wherein the step of presenting the at least one of the plurality of writing symbol patterns (e.g., fig. 6, item 170 is composed of "C", "c", "o", r", "u", "w", "t", etc. in each of the templates) of the at least one alternative template (e.g., template5 being "currect" alternative from template1 being "Correct" as listed on item 170) at a request of a user ("word 164 being selected to invoke a pop-up corrector 168" at 10:17-30).

Regarding **claim 11**, *Beernink '439* discloses the method according to claim 1, wherein each of the plurality of templates is associated with a category (a category is a character from the English alphabet, each category comprised of different user styles writing it, and whether it is uppercase, lowercase, etc) defining what kind of symbol is represented by each of the plurality of templates.

Regarding **claim 12**, *Beernink '439* discloses the method of claim 11, wherein the step of presenting comprises masking the presentation of the presented interpretation according to which category the best interpretation is associated with (the masking is performed in step 170 of fig. 6 of the best interpretation being presented being the top of the list, among other possibilities of which include "C" and "c" for the character "C").

Regarding **claim 13**, *Beernink '439* discloses the method of claim 12, wherein the category ("C" is "associated" with the capitalized letter category in fig. 6, item 170) is indicated by a certain color of a background (the background color is white that indicates "C" is capitalized) to the at least one of the plurality of writing symbol patterns represented by the presented interpretation (presented interpretations being those listed in item 170, fig. 6 with the top on the list being the best interpretation).

Regarding **claim 14**, *Beernink '439* discloses the method of claim 13, wherein the category ("C" is "associated" with the capitalized letter category in fig. 6, item 170) is indicated by a certain color of the at least one of the plurality of writing symbol patterns (the color is black

that indicates “C” is capitalized) represented by the presented interpretation (presented interpretations being those listed in item 170, fig. 6 with the top on the list being the best interpretation).

Regarding **claim 15**, *Beernink ‘439* discloses a method performed by a recognition device (fig. 1) for presenting a recognized handwritten symbols (e.g., handwritten symbols being the English alphabet symbols using item 110 at fig. 2), the recognition device having a processor (fig. 1, item 12) and detection means (fig. 1, item 40 storing programs) for detecting entry of a handwritten symbol, the method comprising the steps of:

Detecting, by the detection means, a handwritten pattern (e.g., fig. 6, item 172; “Correct”) that is entered by a user (user uses fig. 2, item 106);

recognizing (fig. 6, list items 170; item 172 as a result of recognizing the actual handwritten pattern on fig. 2, item 106), by the processor, the detected handwritten pattern (e.g., fig. 6, item 172; “Correct”),

wherein said step of recognizing comprises comparing the handwritten pattern to a plurality of templates (fig. 6, item 170; e.g., template1 being “Correct”, template2 being “correct”, template3 being “Currect”, template4 being “Cwrect”, template5 being “currect”),

wherein each of the plurality of templates represents at least one of a plurality of writing symbol patterns (e.g., fig. 6, item 170 is composed of "C", “c”, "o", r", "u", "w", "t", etc. in each of the templates; e.g., template4 comprised of “C”, “w”, “r”, “e”, “c”, “t”) of ways of writing symbols (symbols being the English alphabet symbols; e.g., symbol “c” being writing symbol patterns “C” and “c”), and

returning a best interpretation (fig. 6, item 168 wherein the top of the list “Correct” is the best interpretation) of the handwritten pattern (e.g., fig. 6, item 172; “Correct”), said best interpretation (fig. 6, item 168 wherein the top of the list “Correct” is the best interpretation) being based on one of the plurality of writing symbol patterns (e.g., fig. 6, item 170 is composed of "C", “c”, "o", r", "u", "w", "t", etc. in each of the templates; e.g., template4 comprised of “C”, “w”, “r”, “e”, “c”, “t”) as a best writing symbol pattern (e.g., writing symbol pattern “C” in best template “Correct” selected, not writing symbol pattern “c”, thus “C” being the best writing symbol pattern) of a best template (top template “Correct” at item 170, fig. 6) selected from the plurality of templates (fig. 6, item 170; e.g., template1 being “Correct”, template2 being

"correct", template3 being "Currect", template4 being "Cwrect", template5 being "currect") that, according to a predefined rule, is most similar to the handwritten pattern (inherent rules must exist such that writing symbol pattern C" in best template "Correct" on list 170 was selected),

wherein at least two of the plurality of templates (e.g., item 170 contains templates "Correct" and "correct") comprise different ones of the plurality of writing symbol patterns which represent different ways of writing a single symbol (symbols being the English alphabet symbols; e.g., symbol "c" being writing symbol patterns "C" and "c"),

and wherein the different ones of the plurality of writing symbol patterns (e.g., fig. 6, item 170 is composed of "C", "c", "o", r", "u", "w", "t", etc. in each of the templates; e.g., template4 comprised of "C", "w", "r", "e", "c", "t") of said at least two of the plurality of templates (fig. 6, item 170; e.g., template1 being "Correct", template2 being "correct", template3 being "Currect", template4 being "Cwrect", template5 being "currect") return different best interpretations (the second interpretation "correct", 2nd from the top of the list contains alternate writing symbol patterns "C" and "c") when being most similar to the handwritten pattern (e.g., fig. 6, item 172; "Correct"); and

presenting (fig. 6, item 151; fig. 2, item 44) the best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation).

Regarding **claim 16**, *Beernink '439* discloses further comprising, before the step of presenting, retrieving as the best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation), from a database comprising allographs, a best allograph (the best allograph is the digital font letter of "C" that is it converted to (*e.g.*, the text written in fig. 6, item 172 is converted to digital font)) that is associated with the best writing symbol pattern (e.g., writing symbol pattern "C" in best template "Correct" selected, not writing symbol pattern "c", thus "C" being the best writing symbol pattern) of the best template (top template "Correct" at item 170, fig. 6).

Regarding **claim 18**, *Beernink '439* discloses wherein the step of presenting comprises presenting the best allograph (the best allograph is the digital font letter of "C" that is it converted to (*e.g.*, the text written in fig. 6, item 172 is converted to digital font)) represented by a number of arcs (it is inherent that each allograph is "represented by a number of arcs" as each allograph consists of a series of arcs) depicting the way of writing symbols of the best template.

Regarding **claim 19**, *Beernink '439* discloses wherein the best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation) is the writing symbol pattern of the best template (top template "Correct" at item 170, fig. 6), and wherein the step of presenting comprises presenting the best writing symbol pattern (e.g., writing symbol pattern "C" in best template "Correct" selected, not writing symbol pattern "c", thus "C" being the best writing symbol pattern) of a best template (top template "Correct" at item 170, fig. 6) of the best template on the screen (fig. 6 screen).

Regarding **claim 20**, claim 2 recites identical features as in claim 20. Thus, references/arguments equivalent to those presented below for claim 2 are equally applicable to claim 20.

Regarding **claim 21**, claim 3 recites identical features as in claim 21. Thus, references/arguments equivalent to those presented below for claim 3 are equally applicable to claim 21.

Regarding **claim 22**, *Beernink '439* discloses wherein the step of presenting comprises presenting the whole best writing symbol pattern (e.g., writing symbol pattern "C" in best template "Correct" selected, not writing symbol pattern "c", thus "C" being the best writing symbol pattern) represented by the best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation) at once.

Regarding **claim 23**, claim 5 recites identical features as in claim 23. Thus, references/arguments equivalent to those presented below for claim 5 are equally applicable to claim 23.

Regarding **claim 24**, *Beernink '439* discloses further comprising, before the step of presenting, manipulating (manipulation occurs when transforming "C" at item 172 to the "C" at fig. 170) the best writing symbol pattern (e.g., writing symbol pattern "C" in best template "Correct" selected, not writing symbol pattern "c", thus "C" being the best writing symbol pattern) represented by the best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation) according to characteristics of the handwritten pattern (e.g., fig. 6, item 172; "Correct").

Regarding **claim 26**, *Beernink '439* discloses wherein the handwritten pattern is entered on an input area (e.g., fig. 3, item 151) on the screen (fig. 2, item 44; fig. 6, item 151) and the

best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation) is presented in a presentation area (fig. 6, item 168) on the screen (fig. 2, item 44; fig. 6, item 151), whereby said presentation area overlaps the input area (when the recognition of the handwriting updates, it is performed right over the same spot, thus overlapping).

Regarding **claim 27**, *Beernink '439* discloses wherein a step of recognizing comprises returning at least one alternative interpretation (*e.g.*, handwritten "Correct" item 172 returns list item 170, the letter "C" in "Correct" returns templates "Correct" and "correct").

Regarding **claim 28**, *Beernink '439* discloses presenting the at least one of the plurality of writing symbol patterns (e.g., fig. 6, item 170 is composed of "C", "c", "o", r", "u", "w", "t", etc. in each of the templates) of the at least one alternative interpretation (*e.g.*, handwritten "Correct" item 172 returns list item 170, the letter "C" in "Correct" returns templates "Correct" and "correct") at a request of a user (the use requested the list item 170).

Regarding **claim 29**, *Beernink '439* discloses wherein the best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation) is associated with a category (a category is a character from the English alphabet, each category comprised of different user styles writing it, and whether it is uppercase, lowercase, etc) defining what kind of symbol is represented by each of the plurality of templates (fig. 6, item 170; e.g., template1 being "Correct", template2 being "correct", template3 being "Currect", template4 being "Cwrect", template5 being "currect").

Regarding **claim 30**, *Beernink '439* discloses wherein the step of presenting comprises masking the presentation of the best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation)) according to which category (a category is a character from the English alphabet, each category comprised of different user styles writing it, and whether it is uppercase, lowercase, etc) the best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation) is associated with (the masking is performed in step 170 of fig. 6 of the best interpretation being presented being the top of the list, among other possibilities of which include "C" and "c" for the character "C").

Regarding **claim 31**, *Beernink '439* discloses wherein the category ("C" is "associated" with the capitalized letter category in fig. 6, item 170) is indicated by a certain color of a background (the background color is white that indicates "C" is capitalized) to the at least one of

the plurality of writing symbol patterns represented by the best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation).

Regarding **claim 32**, *Beernink '439* discloses wherein the category ("C" is "associated" with the capitalized letter category in fig. 6, item 170) is indicated by a certain color of the at least one of the plurality of writing symbol patterns (the color is black that indicates "C" is capitalized) represented by the best interpretation (fig. 6, item 168 wherein the top of the list "Correct" is the best interpretation).

Regarding **claim 33**, claim 1 recites identical features as in claim 33. Thus, references/arguments equivalent to those presented above for claim 1 are equally applicable to claim 33.

Regarding **claim 34**, claim 15 recites identical features as in claim 34. Thus, references/arguments equivalent to those presented above for claim 15 are equally applicable to claim 34.

Claim Rejections - 35 U.S.C. § 103

[10] The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Beernink '439 in view of Sparr et al.

[11] **Claim 7** is rejected under 35 U.S.C. § 103(a) as being unpatentable over *Beernink '439* in view of *Sparr et al.*.

Regarding **claim 7**, while *Beernink '439* discloses the method of claim 6, *Beernink '439* does not teach wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling.

Sparr et al. teaches wherein a step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling (fig. 2, fig. 3).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the step of manipulating of *Beernink '439* to be done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling as taught by *Sparr et al.* so that "to a larger extent accept[ing] individual styles of handwritten characters and unusual fonts of typewritten characters, and is easy to implement with limited computing power.", para. 0006.

Regarding **claim 25**, claim 7 recites identical features as in claim 25. Thus, references/arguments equivalent to those presented above for claim 7 are equally applicable to claim 25.

Beernink '439 in view of Kadashevich et al.

[12] **Claim 17** is rejected under 35 U.S.C. § 103(a) as being unpatentable over *Beernink '439* in view of *Kadashevich et al.*

Regarding **claim 17**, while *Beernink '439* discloses the method according to claim 16, wherein the step of presenting comprises presenting the best allograph represented by an image (fig 7, item 76) depicting the way of writing symbols of the best template, *Beernink '439* do not disclose wherein the image is a bitmap image.

Kadashevich et al. discloses a character recognition system identification of scanned and real time handwritten characters that includes teaching a bitmap image (8:60-67; 9:17-22; 13:16-20).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the image of *Beernink '439* to be a bitmap image as taught by *Kadashevich et al.* to provide an "array wherein each bit in the array represents a pixel of the…image, with the state of bit (0 or 1) representing whether the corresponding pixel is a background or foreground pixel and the location of the bit in the array representing the coordinates of the corresponding pixel in the image.", *Kadashevich et al.*, 8:60-67.

Conclusion

[13] Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

[14] Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID P. RASHID whose telephone number is (571)270-1578 and fax number (571)270-2578. The examiner can normally be reached Monday - Friday 7:30 - 17:00 ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (571) 272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David P. Rashid/
Examiner, Art Unit 2624

/Bhavesh M Mehta/
Supervisory Patent Examiner, Art Unit 2624

David P Rashid
Examiner
Art Unit 26244

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10524430	PRYMUS ET AL.
	Examiner	Art Unit
	Rashid, David P	2624

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	11/15/2007	06/17/2008	01/16/2009	07/06/2009					
	1	✓	✓	✓	✓					
	2	✓	✓	✓	✓					
	3	✓	✓	✓	✓					
	4	✓	✓	✓	✓					
	5	✓	✓	✓	✓					
	6	✓	✓	✓	✓					
	7	✓	✓	✓	✓					
	8	✓	✓	✓	✓					
	9	✓	✓	✓	✓					
	10	✓	✓	✓	✓					
	11	✓	✓	✓	✓					
	12	✓	✓	✓	✓					
	13	✓	✓	✓	✓					
	14	✓	✓	✓	✓					
	15	✓	✓	✓	✓					
	16	✓	✓	✓	✓					
	17	✓	✓	✓	✓					
	18	✓	✓	✓	✓					
	19	✓	✓	✓	✓					
	20	✓	✓	✓	✓					
	21	✓	✓	✓	✓					
	22	✓	✓	✓	✓					
	23	✓	✓	✓	✓					
	24	✓	✓	✓	✓					
	25	✓	✓	✓	✓					
	26	✓	✓	✓	✓					
	27	✓	✓	✓	✓					
	28	✓	✓	✓	✓					
	29	✓	✓	✓	✓					
	30	✓	✓	✓	✓					
	31	✓	✓	✓	✓					
	32	✓	✓	✓	✓					
	33	✓	✓	✓	✓					
	34	✓	✓	✓	✓					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	Erika Prymus
Serial No.:	10/524,430
Filed:	August 9, 2005
Art Unit:	2624
Confirmation Number:	6160
Examiner:	David Rashid
Title:	Presenting Recognized Handwritten Symbols
Attorney Docket No.:	ZICO0006

September 9, 2009

Mail Stop: Amendments
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO OFFICE ACTION

Applicant submits this Response to the Office Action dated July 14, 2009 in connection with the above-identified patent application. A **Listing of Claims** begins on Page 2 of this paper, and **Remarks** begin on Page 9 of this paper.

Applicant does not believe that the filing of this amendment will incur additional fees. However, the Commissioner is authorized to charge any fees that may be due and to credit any overpayments to Deposit Account 07-1445 (Order No. ZICO0006). Applicant considers this document to be filed in a timely manner.

LISTING OF CLAIMS

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.

2. (Currently Amended) 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.

3. (Currently Amended) 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.

4. (Currently Amended) 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.

5. (Original) The method according to claim 3, wherein the step of presenting comprises presenting lines one at a time.

6. (Currently Amended) The method according to claim 1, further comprising, before the step of presenting, manipulating the best handwriting symbol pattern of the best template according to characteristics of the handwritten pattern.

7. (Original) The method according to claim 6, wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling.

8. (Currently Amended) 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.

9. (Previously Presented) The method according to claim 1, wherein the step of recognizing comprises returning at least one alternative template selected from the plurality of templates.

10. (Currently Amended) 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.

11. (Currently Amended) The method according to claim 1, wherein each of the plurality of templates is associated with a category defining what kind of symbol is represented by each of the plurality of templates.

12. (Currently Amended) The method according to claim 11, wherein the step of presenting comprises masking the presentation of the best handwriting symbol pattern according to which category the best template is associated with.

13. (Currently Amended) The method according to claim 12, wherein the category is indicated by a certain color of a background to the best handwriting symbol pattern.

14. (Currently Amended) The method according to claim 12, wherein the category is indicated by a certain color of the best handwriting symbol pattern.

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.

16. (Currently Amended) The 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.

17. (Currently Amended) The method according to claim 16, wherein the step of presenting comprises presenting the best allograph represented by a bitmap image depicting the way of hand writing symbols of the best template.

18. (Currently Amended) The method according to claim 16, wherein the step of presenting comprises presenting the best allograph represented by a number of arcs depicting the way of hand writing symbols of the best template.

19. (Currently Amended) 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.

20. (Currently Amended) 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.

21. (Currently Amended) 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.

22. (Currently Amended) 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.

23. (Original) The method according to claim 21, wherein the step of presenting comprises presenting the lines one at a time.

24. (Currently Amended) The method according to claim 15, further comprising, before the step of presenting, manipulating the best handwriting symbol pattern represented by the best interpretation according to characteristics of the handwritten pattern.

25. (Original) The method according to claim 24, wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling.

26. (Previously Presented) 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.

27. (Previously Presented) The method according to claim 15, wherein the step of recognizing comprises returning at least one alternative interpretation.

28. (Original) The method according to claim 27, wherein the step of presenting comprises presenting the at least one alternative interpretation at the request of a user.

29. (Previously Presented) The method according to claim 15, wherein the best interpretation is associated with a category defining what kind of symbol is represented by the best interpretation.

30. (Previously Presented) The method according to claim 29, wherein the step of presenting comprises masking the presentation of the best interpretation according to which category the best interpretation is associated with.

31. (Currently Amended) The method according to claim 30, wherein the category is indicated by a certain color of a background to the at least one of the plurality of handwriting symbol patterns represented by the best interpretation.

32. (Currently Amended) The method according to claim 30, wherein the category is indicated by a certain color of the at least one of the plurality of handwriting symbol patterns represented by the best interpretation.

33. (Currently Amended) A device for recognition of a handwritten symbol, said device comprising

a screen;

means for detecting a handwritten pattern;

a database comprising templates that comprise a plurality of handwriting symbol patterns representing handwritten ways of hand writing symbols, wherein at least two of the templates comprising different ones of the plurality of handwriting symbol patterns which represent different handwritten ways of hand writing a single symbol; and

means for recognizing the detected handwritten pattern and returning one of the plurality of patterns of a best template of the handwritten pattern, said best template being most similar to the handwritten pattern,

wherein said device is arranged to present the one of the plurality of handwriting symbol patterns of the best template on the screen.

34. (Currently Amended) A device for recognition of a plurality of handwritten symbols, said device comprising

a screen;

means for detecting a handwritten pattern;

a database comprising templates that comprise a plurality of handwriting symbol patterns representing handwritten ways of hand writing symbols, wherein at least two of the templates comprising different ones of the plurality of handwriting symbol patterns which represent different handwritten ways of hand writing a single symbol; and

means for recognizing the detected handwritten patterns and individually returning for each handwritten pattern a best interpretation of the handwritten pattern, said best interpretation being based on one of the plurality of handwriting symbol patterns of a best template selected from the templates that is most similar to the handwritten pattern, wherein the one of the plurality handwriting symbol patterns of said at least two of the templates return different best interpretations when being most similar to the handwritten pattern,

wherein said device is arranged to present the best interpretation on the screen.

REMARKS

Applicants respectfully request further examination and reconsideration in view of the above amendments and arguments set forth fully below. Claims 1-34 were previously pending in the present application. Within the Office Action, Claims 1-34 have been rejected.

Claim Rejections under 35 U.S.C. § 102

Within the Office Action, Claims 1-6, 8, 11, and 33 were rejected under 35 U.S.C. § 102(b) as being anticipated by United States Patent Publication No. 5,682,439 to Beernink *et al.* (hereinafter referred to as "Beernink").

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987).

The Applicants respectfully traverse this rejection because each and every element set forth in Claims 1-6, 8, 11, and 33 is not found in Beernink, either expressly nor inherently described. Specifically, Beernink does not describe systems or methods performed by a handwriting recognition devices for "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."

Beernink involves methods of correcting words entered into a pointer-based computer user interface. Beernink describes that:

> "[o]ne aspect teaches a correction method for when the selected word is the string of one or more well defined characters and the correction input is a character editing input overwriting a given box. This correction method includes the steps of receiving a ranked character list of one or more well defined characters corresponding to possible characters which the character editing input may represent, reordering the ranked character list based on a format of the boxed input corrector and a guess list of characters which the box input corrector has previously suggested for the given box, removing any characters from the ranked character list which are not suitable for the given box, and replacing a current character associated with the given box with a highest ranked character found in the ranked character list."

However, Beernink does not involve single symbols within the "list of characters" that are composed of "different *handwritten* ways of *hand*writing a single symbol (emphasis added)," as recited by Claims 1 and 33.

Within the Office Action, the Examiner suggests further limiting Claim 1 to explicitly require that the "single symbols" be composed of different "handwritten ways of writing a specific symbol. The Applicants thank the Examiner graciously for his suggestion and agree that said limitation distinguishes Beernink.

Claims 1 and 33, as currently amended, recite this limitation explicitly and Claims 2-6, 8, and 11 contain the limitation by reference to Claim 1. For at least this reason, Claims 1-6, 8, 11, and 33 are not anticipated by Beernink.

Claim Rejections under 35 U.S.C. § 103 – Beernink in view of Sparr

Also within the Office Action, Claim 7 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Beernink in view of United States Patent publication no. 2001/0026639 to Sparr *et al.* (hereinafter referred to as "Sparr").

To establish a *prima facie* case of obviousness of a claimed invention, all the claimed features must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). The Applicants respectfully traverse this rejection, because neither Beernink nor Sparr, either alone or in combination, disclose all of the limitations of Claim 7.

Specifically neither Beernink nor Sparr teach or suggest systems or methods performed by a handwriting recognition devices for "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."

As explained above, Beernink does not involve single symbols composed of different handwritten ways of writing a specific symbol. Likewise, Sparr does not teach this limitation.

Sparr involves a method of character recognition comprising detecting inputted characters entered in a pressure sensitive display wherein the coordinates for a series of points of the input are recorded, preprocessing the characters using the coordinates and a series of transformations, comparing the processed characters to a database of known characters, and deciding whether the processed characters are included in the database. However, Sparr does not involve detecting different ways of handwriting one particular character, nor does the Examiner suggest that it does.

On the contrary, Claim 7 recites this limitation by reference to Claim 1. For at least this reason, Claim 7 is not rendered obvious in light of a hypothetical combination of Beernink and Sparr.

Claim Rejections under 35 U.S.C. § 103 – Beernink in view of Kadashevich

Finally, within the Office Action, Claim 17 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Beernink in view of United States Patent No. 5,970,170 to Kadashevich *et al.* (hereinafter referred to as "Kadashevich"). The Applicants respectfully traverse this rejection, because neither Beernink nor Kadashevich, either alone or in combination, disclose all of the limitations of Claim 7.

Specifically neither Beernink nor Kadashevich teach or suggest systems or methods performed by a handwriting recognition devices for "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."

As explained above, Beernink does not involve single symbols composed of different handwritten ways of writing a specific symbol. Likewise, Kadashevich does not teach this limitation.

Kadashevich involves a character recognition system involving identification of scanned and real time handwritten characters represented by a bitmap. However, Kadashevich does not involve detecting different ways of handwriting one particular character, nor does the Examiner suggest that it does.

On the contrary, Claim 17 recites this limitation by reference to Claim 15. For at least this reason, Claim 17 is not rendered obvious in light of a hypothetical combination of Beernink and Kadashevich.

CONCLUSION

Applicant respectfully posits that the pending claims have been distinguished from the art of record, and that all objections to and rejections of the claims have been overcome. Accordingly, Applicant respectfully requests allowance. Should the Examiner deem it helpful he is encouraged to contact Applicant's attorney, at (650) 474-8400.

Respectfully submitted,



Michael A. Glenn
Reg. No. 30,176

Customer No. 22862

PTO/SB/122 (11-08)
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Application Number	10/524,430
Filing Date	August 9, 2005
First Named Inventor	Erika Prymus
Art Unit	2624
Examiner Name	Davide Rashid
Attorney Docket Number	ZICO0006

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☐ Registered practitioner named in the application transmittal letter in an application without an executed oath or declaration. See 37 CFR 1.33(a)(1). Registration Number_____.

Signature

Typed or Printed Name Michael A. Glenn

Date September 9, 2009	Telephone (650) 474-8400

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Application No. 10/524,430 Attorney Docket No. ZICO0006

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- Change of Correspondence Address, Application - 1 page

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Electronic Acknowledgement Receipt

EFS ID:	6042061
Application Number:	10524430
International Application Number:	
Confirmation Number:	6160
Title of Invention:	Presenting recognised handwritten symbols
First Named Inventor/Applicant Name:	Erika Prymus
Customer Number:	22852
Filer:	Michael Glenn/Sheena Hicks
Filer Authorized By:	Michael Glenn
Attorney Docket Number:	08806-0174
Receipt Date:	09-SEP-2009
Filing Date:	09-AUG-2005
Time Stamp:	19:15:45
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		ZICO0006_ResponseFOA_efiled_09092009.pdf	641876 6c4fb14a08b188aa7c2a64ff696ffb64cb84d0efa	yes	17

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment After Final	1	1
	Claims	2	8
	Applicant Arguments/Remarks Made in an Amendment	9	15
	Change of Address	16	16
	Miscellaneous Incoming Letter	17	17
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 10/524,430	Filing Date 08/09/2005	☒ To be Mailed

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☐		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	09/09/2009	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 34	Minus	** 34	= 0	X $ =		OR	X $52=	0
	Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $ =		OR	X $220=	0
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
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Legal Instrument Examiner:
/KATRINA HARLING/

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,430	08/09/2005	Erika Prymus	ZICO0006	6160

22862 7590 09/17/2009

GLENN PATENT GROUP
3475 EDISON WAY, SUITE L
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EXAMINER	
RASHID, DAVID	

ART UNIT	PAPER NUMBER
2624	

NOTIFICATION DATE	DELIVERY MODE
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eptomatters@glenn-law.com

Advisory Action Before the Filing of an Appeal Brief	**Application No.** 10/524,430	**Applicant(s)** PRYMUS ET AL.	
	Examiner DAVID P. RASHID	**Art Unit** 2624	

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 09 September 2009 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

1. ☒ The reply was filed after a final rejection, but prior to or on the same day as filing a Notice of Appeal. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. The reply must be filed within one of the following time periods:
   a) ☐ The period for reply expires _____months from the mailing date of the final rejection.
   b) ☒ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

   Examiner Note: If box 1 is checked, check either box (a) or (b). ONLY CHECK BOX (b) WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☒ The proposed amendment(s) filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   (a) ☒ They raise new issues that would require further consideration and/or search (see NOTE below);
   (b) ☐ They raise the issue of new matter (see NOTE below);
   (c) ☒ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   (d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.
   NOTE: *See Continuation Sheet*. (See 37 CFR 1.116 and 41.33(a)).
4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicant's reply has overcome the following rejection(s): _____.
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☒ For purposes of appeal, the proposed amendment(s): a) ☒ will not be entered, or b) ☐ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.
   The status of the claim(s) is (or will be) as follows:
   Claim(s) allowed: _____.
   Claim(s) objected to: _____.
   Claim(s) rejected: *1-34*.
   Claim(s) withdrawn from consideration: _____.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ The affidavit or other evidence filed after a final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
9. ☐ The affidavit or other evidence filed after the date of filing a Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing a good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
10. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

11. ☐ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____.
12. ☐ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). _____
13. ☐ Other: _____.

/Bhavesh M Mehta/
Supervisory Patent Examiner, Art Unit 2624

/David P Rashid/
Examiner, Art Unit 2624

Continuation of 3. NOTE: The amended claims raise new issues that would require further consideration and search, and requires reconsideration of the prior art of record. .

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	Erika Prymus
Serial No.:	10/524,430
Filed:	August 9, 2005
Art Unit:	2624
Confirmation Number:	6160
Examiner:	David Rashid
Title:	Presenting Recognized Handwritten Symbols
Attorney Docket No.:	ZICO0006

September 9, 2009

Mail Stop: Amendments
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DO NOT ENTER: /D.R./
09/11/2009

RESPONSE TO OFFICE ACTION

Applicant submits this Response to the Office Action dated July 14, 2009 in connection with the above-identified patent application. A **Listing of Claims** begins on Page 2 of this paper, and **Remarks** begin on Page 9 of this paper.

Applicant does not believe that the filing of this amendment will incur additional fees. However, the Commissioner is authorized to charge any fees that may be due and to credit any overpayments to Deposit Account 07-1445 (Order No. ZICO0006). Applicant considers this document to be filed in a timely manner.

Doc code: RCEX
Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
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

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☒ Amendment/Reply
- ☐ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

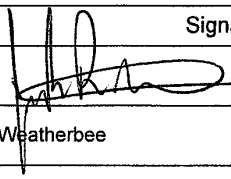
☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 071445

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature
☐ Applicant Signature

PTO/SB/30EFS (07-09)
Approved for use through 07/31/2012, OMB 0651-0031
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.

Signature of Registered U.S. Patent Practitioner			
Signature		Date (YYYY-MM-DD)	2009-10-09
Name	Joseph Weatherbee	Registration Number	64810

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	Erika Prymus
Serial No.:	10/524,430
Filed:	August 9, 2005
Art Unit:	2624
Confirmation Number:	6160
Examiner:	David Rashid
Title:	Presenting Recognized Handwritten Symbols
Attorney Docket No.:	ZICO0006

October 9, 2009

Mail Stop: Amendments
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

PRELIMINARY AMENDMENT

Applicant submits this Response to the Office Action dated July 14, 2009 in connection with the above-identified patent application. A **Listing of Claims** begins on Page 2 of this paper, and **Remarks** begin on Page 9 of this paper.

Applicant does not believe that the filing of this amendment will incur additional fees. However, the Commissioner is authorized to charge any fees that may be due and to credit any overpayments to Deposit Account 07-1445 (Order No. ZICO0006). Applicant considers this document to be filed in a timely manner.

LISTING OF CLAIMS

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.

2. (Currently Amended) 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.

3. (Currently Amended) 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.

4. (Currently Amended) 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.

5. (Original) The method according to claim 3, wherein the step of presenting comprises presenting lines one at a time.

6. (Currently Amended) The method according to claim 1, further comprising, before the step of presenting, manipulating the best handwriting symbol pattern of the best template according to characteristics of the handwritten pattern.

7. (Original) The method according to claim 6, wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling.

8. (Currently Amended) 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.

9. (Previously Presented) The method according to claim 1, wherein the step of recognizing comprises returning at least one alternative template selected from the plurality of templates.

10. (Currently Amended) 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.

11. (Currently Amended) The method according to claim 1, wherein each of the plurality of templates is associated with a category defining what kind of symbol is represented by each of the plurality of templates.

12. (Currently Amended) The method according to claim 11, wherein the step of presenting comprises masking the presentation of the best handwriting symbol pattern according to which category the best template is associated with.

13. (Currently Amended) The method according to claim 12, wherein the category is indicated by a certain color of a background to the best handwriting symbol pattern.

14. (Currently Amended) The method according to claim 12, wherein the category is indicated by a certain color of the best handwriting symbol pattern.

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.

16. (Currently Amended) The 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.

17. (Currently Amended) The method according to claim 16, wherein the step of presenting comprises presenting the best allograph represented by a bitmap image depicting the way of hand writing symbols of the best template.

18. (Currently Amended) The method according to claim 16, wherein the step of presenting comprises presenting the best allograph represented by a number of arcs depicting the way of hand writing symbols of the best template.

19. (Currently Amended) 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.

20. (Currently Amended) 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.

21. (Currently Amended) 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.

22. (Currently Amended) 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.

23. (Original) The method according to claim 21, wherein the step of presenting comprises presenting the lines one at a time.

24. (Currently Amended) The method according to claim 15, further comprising, before the step of presenting, manipulating the best handwriting symbol pattern represented by the best interpretation according to characteristics of the handwritten pattern.

25. (Original) The method according to claim 24, wherein the step of manipulating is done in consideration of at least one characteristic in the group of translation, rotation, slant and scaling.

26. (Previously Presented) 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.

27. (Previously Presented) The method according to claim 15, wherein the step of recognizing comprises returning at least one alternative interpretation.

28. (Original) The method according to claim 27, wherein the step of presenting comprises presenting the at least one alternative interpretation at the request of a user.

29. (Previously Presented) The method according to claim 15, wherein the best interpretation is associated with a category defining what kind of symbol is represented by the best interpretation.

30. (Previously Presented) The method according to claim 29, wherein the step of presenting comprises masking the presentation of the best interpretation according to which category the best interpretation is associated with.

31. (Currently Amended) The method according to claim 30, wherein the category is indicated by a certain color of a background to the at least one of the plurality of handwriting symbol patterns represented by the best interpretation.

32. (Currently Amended) The method according to claim 30, wherein the category is indicated by a certain color of the at least one of the plurality of handwriting symbol patterns represented by the best interpretation.

33. (Currently Amended) A device for recognition of a handwritten symbol, said device comprising

a screen;

means for detecting a handwritten pattern;

a database comprising templates that comprise a plurality of handwriting symbol patterns representing handwritten ways of hand writing symbols, wherein at least two of the templates comprising different ones of the plurality of handwriting symbol patterns which represent different handwritten ways of hand writing a single symbol; and

means for recognizing the detected handwritten pattern and returning one of the plurality of patterns of a best template of the handwritten pattern, said best template being most similar to the handwritten pattern,

wherein said device is arranged to present the one of the plurality of handwriting symbol patterns of the best template on the screen.

34. (Currently Amended) A device for recognition of a plurality of handwritten symbols, said device comprising

a screen;

means for detecting a handwritten pattern;

a database comprising templates that comprise a plurality of handwriting symbol patterns representing handwritten ways of hand writing symbols, wherein at least two of the templates comprising different ones of the plurality of handwriting symbol patterns which represent different handwritten ways of hand writing a single symbol; and

means for recognizing the detected handwritten patterns and individually returning for each handwritten pattern a best interpretation of the handwritten pattern, said best interpretation being based on one of the plurality of handwriting symbol patterns of a best template selected from the templates that is most similar to the handwritten pattern, wherein the one of the plurality handwriting symbol patterns of said at least two of the templates return different best interpretations when being most similar to the handwritten pattern,

wherein said device is arranged to present the best interpretation on the screen.

REMARKS

Applicants respectfully request further examination and reconsideration in view of the above amendments and arguments set forth fully below. Claims 1-34 were previously pending in the present application. Within the Office Action, Claims 1-34 have been rejected.

Claim Rejections under 35 U.S.C. § 102

Within the Office Action, Claims 1-6, 8, 11, and 33 were rejected under 35 U.S.C. § 102(b) as being anticipated by United States Patent Publication No. 5,682,439 to Beernink *et al.* (hereinafter referred to as "Beernink").

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987).

The Applicants respectfully traverse this rejection because each and every element set forth in Claims 1-6, 8, 11, and 33 is not found in Beernink, either expressly nor inherently described. Specifically, Beernink does not describe systems or methods performed by a handwriting recognition devices for "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."

Beernink involves methods of correcting words entered into a pointer-based computer user interface. Beernink describes that:

> "[o]ne aspect teaches a correction method for when the selected word is the string of one or more well defined characters and the correction input is a character editing input overwriting a given box. This correction method includes the steps of receiving a ranked character list of one or more well defined characters corresponding to possible characters which the character editing input may represent, reordering the ranked character list based on a format of the boxed input corrector and a guess list of characters which the box input corrector has previously suggested for the given box, removing any characters from the ranked character list which are not suitable for the given box, and replacing a current character associated with the given box with a highest ranked character found in the ranked character list."

However, Beernink does not involve single symbols within the "list of characters" that are composed of "different *handwritten* ways of *hand*writing a single symbol (emphasis added)," as recited by Claims 1 and 33.

Within the Office Action, the Examiner suggests further limiting Claim 1 to explicitly require that the "single symbols" be composed of different "handwritten ways of writing a specific symbol. The Applicants thank the Examiner graciously for his suggestion and agree that said limitation distinguishes Beernink.

Claims 1 and 33, as currently amended, recite this limitation explicitly and Claims 2-6, 8, and 11 contain the limitation by reference to Claim 1. For at least this reason, Claims 1-6, 8, 11, and 33 are not anticipated by Beernink.

Claim Rejections under 35 U.S.C. § 103 – Beernink in view of Sparr

Also within the Office Action, Claim 7 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Beernink in view of United States Patent publication no. 2001/0026639 to Sparr *et al.* (hereinafter referred to as "Sparr").

To establish a *prima facie* case of obviousness of a claimed invention, all the claimed features must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). The Applicants respectfully traverse this rejection, because neither Beernink nor Sparr, either alone or in combination, disclose all of the limitations of Claim 7.

Specifically neither Beernink nor Sparr teach or suggest systems or methods performed by a handwriting recognition devices for "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."

As explained above, Beernink does not involve single symbols composed of different handwritten ways of writing a specific symbol. Likewise, Sparr does not teach this limitation.

Sparr involves a method of character recognition comprising detecting inputted characters entered in a pressure sensitive display wherein the coordinates for a series of points of the input are recorded, preprocessing the characters using the coordinates and a series of transformations, comparing the processed characters to a database of known characters, and deciding whether the processed characters are included in the dat abase. However, Sparr does not involve detecting different ways of handwriting one particular character, nor does the Examiner suggest that it does.

On the contrary, Claim 7 recites this limitation by reference to Claim 1. For at least this reason, Claim 7 is not rendered obvious in light of a hypothetical combination of Beernink and Sparr.

Claim Rejections under 35 U.S.C. § 103 – Beernink in view of Kadashevich

Finally, within the Office Action, Claim 17 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Beernink in view of United States Patent No. 5,970,170 to Kadashevich *et al.* (hereinafter referred to as "Kadashevich"). The Applicants respectfully traverse this rejection, because neither Beernink nor Kadashevich, either alone or in combination, disclose all of the limitations of Claim 7.

Specifically neither Beernink nor Kadashevich teach or suggest systems or methods performed by a handwriting recognition devices for "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."

As explained above, Beernink does not involve single symbols composed of different handwritten ways of writing a specific symbol. Likewise, Kadashevich does not teach this limitation.

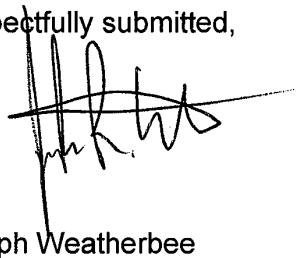
Kadashevich involves a character recognition system involving identification of scanned and real time handwritten characters represented by a bitmap. However, Kadashevich does not involve detecting different ways of handwriting one particular character, nor does the Examiner suggest that it does.

On the contrary, Claim 17 recites this limitation by reference to Claim 15. For at least this reason, Claim 17 is not rendered obvious in light of a hypothetical combination of Beernink and Kadashevich.

CONCLUSION

Applicant respectfully posits that the pending claims have been distinguished from the art of record, and that all objections to and rejections of the claims have been overcome. Accordingly, Applicant respectfully requests allowance. Should the Examiner deem it helpful he is encouraged to contact Applicant's attorney, at (650) 474-8400.

Respectfully submitted,



Joseph Weatherbee
Reg. No. 64,810

Customer No. 22862

ELECTRONIC TRANSMITTAL COVERSHEET

Application No.10/524,430 Attorney Docket No. ZICO0006

I hereby certify that this correspondence is being ELECTRONICALLY FILED to the United States Patent and Trademark Office

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on October 9, 2009.
Date



Signature

Sheena Hicks

Typed or printed name of person signing Certificate

Note: Each paper must have its own certificate of transmission, or this certificate must identify each submitted paper.

Attached to this cover sheet please find the following documents:

- Request for Continued Examination (RCE) (2 pages)
- Preliminary Amendment (15 pages)

This collection of information is required by 37 CFR 1.8. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.8 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Patent Application Fee Transmittal

Application Number:	10524430
Filing Date:	09-Aug-2005
Title of Invention:	Presenting recognised handwritten symbols
First Named Inventor/Applicant Name:	Erika Prymus
Filer:	Michael Glenn/Sheena Hicks
Attorney Docket Number:	ZICO0006

Filed as Large Entity

U.S. National Stage under 35 USC 371 Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Request for continued examination	1801	1	810	810
		Total in USD ($)		**810**

Electronic Acknowledgement Receipt	
EFS ID:	6239950
Application Number:	10524430
International Application Number:	
Confirmation Number:	6160
Title of Invention:	Presenting recognised handwritten symbols
First Named Inventor/Applicant Name:	Erika Prymus
Customer Number:	22862
Filer:	Michael Glenn/Sheena Hicks
Filer Authorized By:	Michael Glenn
Attorney Docket Number:	ZICO0006
Receipt Date:	09-OCT-2009
Filing Date:	09-AUG-2005
Time Stamp:	18:20:06
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$810
RAM confirmation Number	4775
Deposit Account	071445
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		ZICO0006_RCE_efiled_10092009.pdf	680895 1220c9bc4833d3c5ab913090098bc1f621953261	yes	18

Multipart Description/PDF files in .zip description

Document Description	Start	End
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Warnings:

Information:

2	Fee Worksheet (PTO-875)	fee-info.pdf	30391 a803e20768e5ddb2d12149d4e258a7a97f81ea22	no	2

Warnings:

Information:

Total Files Size (in bytes):	711286

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
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 displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
10/524,430	08/09/2005	

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☐		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	10/09/2009	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 34	Minus	** 34	= 0	X $ =		OR	X $52=	0
	Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $ =		OR	X $220=	0
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/KIMBERLY PANNELL/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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NOTICE OF ALLOWANCE AND FEE(S) DUE

22862 7590 10/28/2009

GLENN PATENT GROUP
3475 EDISON WAY, SUITE L
MENLO PARK, CA 94025

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

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$300	$0	$1810	01/28/2010

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

22862 7590 10/28/2009

GLENN PATENT GROUP
3475 EDISON WAY, SUITE L
MENLO PARK, CA 94025

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

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

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$300	$0	$1810	01/28/2010

EXAMINER	ART UNIT	CLASS-SUBCLASS
RASHID, DAVID	2624	382-189000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:

❑ Issue Fee

❑ Publication Fee (No small entity discount permitted)

❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

❑ A check is enclosed.

❑ Payment by credit card. Form PTO-2038 is attached.

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

❑ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

❑ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,430	08/09/2005	Erika Prymus	ZICO0006	6160

22862 7590 10/28/2009

GLENN PATENT GROUP
3475 EDISON WAY, SUITE L
MENLO PARK, CA 94025

EXAMINER	
RASHID, DAVID	
ART UNIT	PAPER NUMBER
2624	

DATE MAILED: 10/28/2009

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 383 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 383 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

Notice of Allowability	Application No.	Applicant(s)	
	10/524,430	PRYMUS ET AL.	
	Examiner	Art Unit	
	DAVID P. RASHID	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *10/9/2009*.

2. ☒ The allowed claim(s) is/are *1-34*.

3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☒ All b) ☐ Some* c) ☐ None of the:
      1. ☒ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

EXAMINER'S STATEMENT OF REASONS FOR ALLOWANCE

Table of Contents

Amendments & Claim Status 2
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Claim Rejections - 35 U.S.C. § 102, 103 2
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Reasons for Allowance 3
Conclusion 3
Citation of Pertinent Prior Art 3

Amendments & Claim Status

[1] This "Examiner's Statement of Reasons for Allowance" is responsive to "Preliminary Amendment" (Amendment) received Oct. 10, 2009. Claims 1-34 remain pending.

Response to Arguments

Remarks Persuasive regarding Rejections Under 35 U.S.C. § 102, 103

[2] Amendment at 9-14 regarding rejected Claims 1-6, 8, 11, and 33 under 35 U.S.C. § 102(b) as being anticipated by Beernink (U.S. Patent No. 5,682,439), rejected Claim 7 under 35 U.S.C. § 103(a) as being unpatentable over Beernink in view of Sparr (U.S. Pub. No. 2001/0026638); rejected Claim 17 under 35 U.S.C. § 103(a) as being unpatentable over Beernink in view of Kadashevich (U.S. Patent No. 5,970,170) have been respectfully and fully considered, and are found persuasive.

Claim Rejections - 35 U.S.C. § 102, 103

[3] In response to Amendment at 9-14, the previous 35 U.S.C. § 102-103 rejections are withdrawn.

Allowable Subject Matter

[4] **Claims 1-34** allowed.

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.

[6] Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Citation of Pertinent Prior Art

[7] The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: US 5787202 A; US 6035062 A.

[8] Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID P. RASHID whose telephone number is (571)270-1578 and fax number (571)270-2578. The examiner can normally be reached Monday - Friday 7:30 - 17:00 ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (571) 272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David P. Rashid/
Examiner, Art Unit 2624

/Bhavesh M Mehta/
Supervisory Patent Examiner, Art Unit 2624

David P Rashid
Examiner
Art Unit 26244

Notice of References Cited	Application/Control No. 10/524,430	Applicant(s)/Patent Under Reexamination PRYMUS ET AL.	
	Examiner DAVID P. RASHID	Art Unit 2624	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,787,202	07-1998	Ueno, Shugoro	382/227
*	B	US-6,035,062	03-2000	Takasu et al.	382/187
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

App #: 10-524430

EAST INTERFERENCE SEARCH HISTORY

Databases: US-PGPUB; USPAT; USOCR; EPO; JPO; IBM_TDB

Ref#	Hits	Search Text
S43	3	(((various or different) adj2 handwritt$3) and (detect$3 or recognition or recogniz$3)).clm.
S44	1	(display$3 near recognized near handwriting).clm.
S45	3	((display$3 near handwriting) and (user near recogniz$3)).clm.
S46	35	((handwritt$3 near user) and (detect$3 or recognition or recogniz$3)).clm.
S47	1	((display$3 near handwriting) and template).clm. and @pd<"20020718"
S48	1	((display$3 near handwriting) and template).clm.
S49	2	(compar$3 near user near handwriting).clm.
S50	1	(((various or different) adj2 user) and handwritt$3 and (detect$3 or recognition or recogniz$3)).clm.
S51	0	(((multiple) adj2 user) and handwritt$3 and (detect$3 or recognition or recogniz$3)).clm.
S52	2	(((multiple) adj2 handwriting) and (detect$3 or recognition or recogniz$3)).clm.
S53	4	(((multiple) adj2 user) and handwrit$3 and (detect$3 or recognition or recogniz$3)).clm.
S54	284	(handwriting adj (detect$3 or recognition or recogniz$3)).clm.
S55	3	((handwriting adj (detect$3 or recognition or recogniz$3)) and (multiple near user)).clm.
S56	0	((handwriting adj (detect$3 or recognition or recogniz$3)) and (multiple near pattern)).clm.
S57	1	((handwriting adj (detect$3 or recognition or recogniz$3)) and (multiple near handwritings)).clm.

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10524430	PRYMUS ET AL.
	Examiner	**Art Unit**
	DAVID P RASHID	2624

ORIGINAL		INTERNATIONAL CLASSIFICATION									
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED				
382	189	G	0	6	K	9 / 00 (2006.01.01)					
CROSS REFERENCE(S)		G	0	6	K	9 / 18 (2006.01.01)					
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)										
382	186										

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	17	17	33	33										
2	2	18	18	34	34										
3	3	19	19												
5	4	20	20												
4	5	21	21												
6	6	23	22												
7	7	22	23												
8	8	24	24												
9	9	25	25												
10	10	26	26												
11	11	27	27												
12	12	28	28												
13	13	29	29												
14	14	30	30												
15	15	31	31												
16	16	32	32												

/DAVID P RASHID/ Examiner.Art Unit 2624 (Assistant Examiner)	10/16/2009 (Date)	**Total Claims Allowed:** 34	
/BHAVESH M MEHTA/ Supervisory Patent Examiner.Art Unit 2624 (Primary Examiner)	10/22/2009 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 4

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10524430	PRYMUS ET AL.
	Examiner	**Art Unit**
	Rashid, David P	2624

SEARCHED			
Class	**Subclass**	**Date**	**Examiner**
382	189	10/16/2009	DPR

SEARCH NOTES		
Search Notes	**Date**	**Examiner**
382/186,187 (text search only - see search history printout)	11/15/2007	DPR
text search only - see search history printout	10/16/2009	DPR

INTERFERENCE SEARCH			
Class	**Subclass**	**Date**	**Examiner**
	see search history printout	10/16/2009	DPR

/DAVID P RASHID/ Examiner.Art Unit 2624	

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10524430	PRYMUS ET AL.
	Examiner	Art Unit
	Rashid, David P	2624

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	11/15/2007	06/17/2008	01/16/2009	07/06/2009	10/16/2009				
1	1	✓	✓	✓	✓	=				
2	2	✓	✓	✓	✓	=				
3	3	✓	✓	✓	✓	=				
5	4	✓	✓	✓	✓	=				
4	5	✓	✓	✓	✓	=				
6	6	✓	✓	✓	✓	=				
7	7	✓	✓	✓	✓	=				
8	8	✓	✓	✓	✓	=				
9	9	✓	✓	✓	✓	=				
10	10	✓	✓	✓	✓	=				
11	11	✓	✓	✓	✓	=				
12	12	✓	✓	✓	✓	=				
13	13	✓	✓	✓	✓	=				
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19	19	✓	✓	✓	✓	=				
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29	29	✓	✓	✓	✓	=				
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31	31	✓	✓	✓	✓	=				
32	32	✓	✓	✓	✓	=				
33	33	✓	✓	✓	✓	=				
34	34	✓	✓	✓	✓	=				

App #: 10-524430

EAST SEARCH HISTORY

Databases: US-PGPUB; USPAT; USOCR; EPO; JPO; IBM_TDB

Ref#	Hits	Search Text
S28	1	(display$3 near handwriting) and pda and template and @pd<"20020718"
S29	11	(display$3 near handwriting) and pda and @pd<"20020718"
S30	8	(display$3 near handwriting) and (user near recognition) and @pd<"20020718"
S31	14	(display$3 near handwriting) and (user near recogniz$3) and @pd<"20020718"
S32	3	(display$3 near (custom or user) near handwriting) and @pd<"20020718"
S33	36	((PRYMUS adj ERIKA) or (PERSSON adj MAGNUS)).inv.
S34	0	S33 and (handwriting and template).clm.
S35	1	S33 and (template).clm.
S36	2	(("5732152") or ("20010026262")).PN.
S37	6	(display$3 near recognized near handwriting) and @pd<"20020718"
S38	1	((match$3 or compar$3) near handwrit$3 near letters)
S39	78	("5682439").URPN.
S40	16	("5666438").URPN.
S41	13	("5267327" | "5315667" | "5502461" | "5666438" | "5673337" | "5710832" | "5787202").PN. OR ("6035062").URPN.
S42	4	("5787202").URPN.
S58	306	(382/189).CCLS.

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United States Patent and Trademark Office
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BIB DATA SHEET

CONFIRMATION NO. 6160

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/524,430	08/09/2005 RULE	~~380~~ 382 DPR	2624	ZICO0006

APPLICANTS

Erika Prymus, Bara, SWEDEN; DPR
Magnus Persson, Malmo, SWEDEN;

**** CONTINUING DATA ***************************

This application is a 371 of PCT/SE03/01226 07/18/2003 DPR

**** FOREIGN APPLICATIONS ***************************

SWEDEN 0202446-1 08/16/2002 DPR

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

Foreign Priority claimed ☑ Yes ☐ No 35 USC 119(a-d) conditions met ☑ Yes ☐ No Verified and Acknowledged /DAVID RASHID/ Examiner's Signature	☐ Met after Allowance DPR Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		SWEDEN	6	34	4

ADDRESS

GLENN PATENT GROUP
3475 EDISON WAY, SUITE L
MENLO PARK, CA 94025
UNITED STATES

TITLE

Presenting recognised handwritten symbols

FILING FEE RECEIVED		
1930	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

BIB (Rev. 05/07).

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

22862 7590 10/28/2009

GLENN PATENT GROUP
3475 EDISON WAY, SUITE L
MENLO PARK, CA 94025

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

Jessica Pallach	(Depositor's name)
	(Signature)
January 26, 2010	(Date)

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

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$300	$0	$1810	01/28/2010

EXAMINER	ART UNIT	CLASS-SUBCLASS
RASHID, DAVID	2624	382-189000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Michael A. Glenn
2 Glenn Patent Group
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Zi Decuma AB

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Lund, Sweden

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
☒ Issue Fee
☒ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 07-1445 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.
☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date January 26, 2010

Typed or printed name Michael A. Glenn Registration No. 30,176

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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Electronic Patent Application Fee Transmittal

Application Number:	10524430
Filing Date:	09-Aug-2005
Title of Invention:	PRESENTING RECOGNISED HANDWRITTEN SYMBOLS
First Named Inventor/Applicant Name:	Erika Prymus
Filer:	Michael Glenn/Jessica Pallach
Attorney Docket Number:	ZICO0006

Filed as Large Entity

U.S. National Stage under 35 USC 371 Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl issue fee	1501	1	1510	1510
Publ. Fee- early, voluntary, or normal	1504	1	300	300

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1810**

Electronic Acknowledgement Receipt

EFS ID:	6885735
Application Number:	10524430
International Application Number:	
Confirmation Number:	6160
Title of Invention:	PRESENTING RECOGNISED HANDWRITTEN SYMBOLS
First Named Inventor/Applicant Name:	Erika Prymus
Customer Number:	22862
Filer:	Michael Glenn/Jessica Pallach
Filer Authorized By:	Michael Glenn
Attorney Docket Number:	ZICO0006
Receipt Date:	26-JAN-2010
Filing Date:	09-AUG-2005
Time Stamp:	17:55:42
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$1810
RAM confirmation Number	4232
Deposit Account	071445
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Issue Fee Payment (PTO-85B)	IssueFeeTransZICO0006--efiled012610.pdf	100656 4d5957d095ef10f3dada1a7da2bd771ed8155767	no	1
Warnings:					
Information:					
2	Fee Worksheet (PTO-875)	fee-info.pdf	32259 f6d24127a3e81ff007dfdaa1e41960f5dfe6d897	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	132915		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,430	03/16/2010	7680334	ZICO0006	6160

22862 7590 02/24/2010

GLENN PATENT GROUP
3475 EDISON WAY, SUITE L
MENLO PARK, CA 94025

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 983 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Erika Prymus, Bara, SWEDEN;
Magnus Persson, Malmo, SWEDEN;

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Erika (Oknelid) Prymus
Patent No.	:	7,680,334 B2
Date Issued	:	March 16, 2010
Serial No.	:	10/524,430
Filed	:	August 9, 2005
Confirmation Number	:	6160
Examiner	:	David Peter Zarka
Title	:	PRESENTING RECONGISED HANDWRITTEN SYMBOLS
Attorney Docket No.	:	ZICO0006

September 19, 2011

Mail Stop: Certificate of Correction Branch
Commissioner for Patents
Office of Patent Publication
P.O. Box 1450
Alexandria VA 22313-1450

Request for Certificate of Correction Under 37 CFR 1.322

Dear Sir:

Applicants, by their attorney, request a Certificate of Correction for the above-referenced patent. The correction requested involves a mistake made by the Patent Office. No new matter is provided with this Certificate of Correction. Attached is Form PTO/SB/44 (1 page) indicating the requested correction on the Letters Patent.

Please see the attached copies of the Issue Notification dated February 24, 2010, Decision on Petition for Name Change dated October 2, 2006, and Petition for Name Change dated February 15, 2005.

Applicant does not believe any fees are due with this submission. However, if fees are deemed necessary, authorization is given to the Commissioner to charge any fees and credit any overpayments to Deposit Account No. 07-1445 (Order No. ZICO0006).

Respectfully submitted,



Michael A. Glenn
Reg. No. 30,176

Customer No. 22862

PTO/SB/44 (09-07)
Approved for use through 08/31/2013. OMB 0651-0033
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 displays a valid OMB control number.
(Also Form PTO-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 7,680,334 B2

APPLICATION NO.: 10/524,430

ISSUE DATE : March 16, 2010

INVENTOR(S) : Erika Prymus and Magnus Persson

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On Page 1, please correct the last name of Inventor 1 Erika "Oknelid" to Erika --Prymus--. Inventor 1 should read as:

Erika Prymus, Bara (SE)

MAILING ADDRESS OF SENDER (Please do not use customer number below):

Glenn Patent Group
3475 Edison Way, Suite L
Menlo Park, CA 94025

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.0 hour to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Attention Certificate of Corrections Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,430	03/16/2010	7680334	ZICO0006	6160

22862 7590 02/24/2010

GLENN PATENT GROUP
3475 EDISON WAY, SUITE L
MENLO PARK, CA 94025

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 983 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Erika Prymus, Bara, SWEDEN;
Magnus Persson, Malmo, SWEDEN;

IR103 (Rev. 10/09)

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UNITED STATES PATENT AND TRADEMARK OFFICE

02 OCT 2006

Commissioner for Patents
United States Patent and Trademark Office
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www.uspto.gov

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

In re Application of	:	
OKNELID, Erika et al.	:	
Application No.: 10/524,430	:	DECISION ON
PCT No.: PCT/SE03/01226	:	
Int. Filing Date: 18 July 2003	:	PETITION
Priority Date: 16 August 2002	:	
Attorney's Docket No.: 08806.0174-00	:	UNDER 37 CFR 1.182
For: PRESENTING RECOGNISED HANDWRITTEN SYMBOLS	:	

This is a decision regarding applicants' response to "Petition For Name Change Under 37 C.F.R. §1.182," filed 07 July 2006.

BACKGROUND

On 07 February 2006, the Office mailed Decision, indicating that the inventors on the declaration did not match the inventors on the international application.

On 07 July 2006, applicants filed this petition to correct the name of Erika Oknelid to Erika Prymus.

DISCUSSION

The inventors in the international application are Erika Oknelid and Magnus Persson. The inventors on the declaration are Erika Prymus and Magnus Persson. When an inventor listed in the international application changes his or her name, a petition as described in MPEP 605.04(c) is required.

The balance of the $400 petition fee will be charged to deposit account no. 06-0916, as authorized. Erika Prymus has supplied a declaration stating that she is an inventor in the international application, was known as Oknelid prior to her marriage and is now Prymus. This submission satisfies the requirements of MPEP 605.04(c).

CONCLUSION

Applicant's petition under 37 CFR 1.182 is **GRANTED**.

COPY

This application is being forwarded to the National Phase Processing Branch Division of PCT Operations for further processing. The application has a 35 U.S.C. 371(c)(1), (c)(2) and (c)(4) date of 09 August 2005.

Erin P. Thomson

Erin P. Thomson
Attorney Advisor
PCT Legal Administration

Telephone: 571-272-3292
Facsimile: 571-273-0459

COPY

PATENT
Customer No. 22,852
Attorney Docket No. 08806.0174-00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	
Erika Oknelid et al.	
Application No.: 10/524,430	Group Art Unit: Unassigned
Filing Date: February 15, 2005	Examiner: Unassigned
For: PRESENTING RECOGNISED HANDWRITTEN SYMBOLS	

MAILSTOP PCT
Commissioner for Patents
Office of PCT Legal Administration
P.O. Box 1450
Alexandria, VA 22313-1450
Sir:

PETITION FOR NAME CHANGE OF INVENTOR UNDER 37 C.F.R. 1.182

In response to the Decision mailed on February 7, 2006 regarding Applicants' response to Notification of Missing Requirements and in accordance with MPEP § 605.04(c), Applicants hereby petition under 37 C.F.R. § 1.182 to change the name of inventor Erika Oknelid to Erika Prymus.

Applicants include in this Petition an affidavit signed by the inventor under both names setting forth the procedure whereby the change of name was effected. The affidavit attaches a document in support of the description of the procedure used to effect the change of name. The document is an original extract from a population registry. Also enclosed is the Petition fee of $130.00 due in accordance with 37 C.F.R. § 1.17(h).

In light of the above, Applicants respectfully request that the PCT Legal Office accept this Petition to effect the name change of the inventor.

If there is any fee due in connection with the filing of this Petition, please charge the fee to our Deposit Account No. 06-0916.

COPY

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

By: _____
Milan S. Kapadia
Reg. No. 55,982

Date: July 7, 2006

COPY

PATENT
Customer No. 22,852
Attorney Docket No. 08806.0174

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	
Erika Oknelid et al.	Group Art Unit: Unassigned
Application No.: 10/524,430	Examiner: Unassigned
Filing Date: February 15, 2005	
For: PRESENTING RECOGNISED HANDWRITTEN SYMBOLS	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

AFFIDAVIT UNDER MPEP § 605.04(c)

1. I, Erika Prymus, state that I am a co-inventor of the subject matter claimed in the patent application referenced above.

2. Before acquiring my current name, my previous name was Erika Oknelid.

3. My last name changed from Oknelid to Prymus as a result of marriage.

4. I effected this name change by completing a document, supplied by the local Swedish tax office, indicating my wish to change my name after marriage. The tax office recorded the change in my name in the population registration. I attach to this Affidavit an original extract of the population registration, which evidences my change of name.

BEST AVAILABLE COPY

COPY

5. I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that the 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, and that such willful false statements may jeopardize the validity of the application or any patents issuing thereon.

Dated: May 30, 2006 By: _____
Erika Prymus

Dated: May 30 2006 By: _____
Erika Oknelid

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Swedish Tax Agency

Telefon: 0771-567567

EXTRACT OF THE POPULATION REGISTER

Date
2006-06-26

COPY

Erika Prymus
Aspgatan 1
230 40 BARA

Personal identity no.	1978-06-22-4080
Name	Prymus, Erika Emy Neta
Residential address	Aspgatan 1 230 40 BARA
Population registration	Registered 2002-07-29
County	Skåne
Municipality	Svedala
Parish	Värby
Citizen of	Sweden
Civil status	Married 2003-08-16
Name as single	Oknelid
Place of birth (residence)	Räng
County	Malmöhus
Sex	Female

Husband ----------

Personal identity no.	1975-02-20-0657
Name	Prymus, Michael
Residential address	Aspgatan 1 230 40 BARA
Population registration	Registered 2002-07-29
County	Skåne
Municipality	Svedala
Parish	Värby
Citizen of	Sweden

SKV 7725 L utgåva 7 05-10

* Indicates middlename

www.skatteverket.se

BEST AVAILABLE COPY

Swedish Tax [redacted]ncy

Telefon: 077i-567567

EXTRACT OF THE POPULATION REGISTER

Date
2006-06-26

COPY

Erika Prymus
Aspgatan 1
230 40 BARA

Name as single	Prymus
Place of birth	Lodz
Country	Poland
Sex	Male

END OF EXTRACT

SKV 7785 L utgåva 7 05-10

* Indicates middlename

www.skatteverket.se

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Electronic Acknowledgement Receipt

EFS ID:	10980549
Application Number:	10524430
International Application Number:	
Confirmation Number:	6160
Title of Invention:	PRESENTING RECOGNISED HANDWRITTEN SYMBOLS
First Named Inventor/Applicant Name:	Erika Prymus
Customer Number:	22862
Filer:	Michael Glenn/Christine Ortt
Filer Authorized By:	Michael Glenn
Attorney Docket Number:	ZICO0006
Receipt Date:	19-SEP-2011
Filing Date:	09-AUG-2005
Time Stamp:	16:42:41
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Certificate of Correction	ZICO0006-CertofCorrRqst.pdf	743011 ed60b72883179797a26fe993da5bb130143b0e42	no	13

Warnings:	
Information:	

Total Files Size (in bytes):	743011

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,680,334 B2
APPLICATION NO. : 10/524430
DATED : March 16, 2010
INVENTOR(S) : Erika Prymus and Magnus Persson

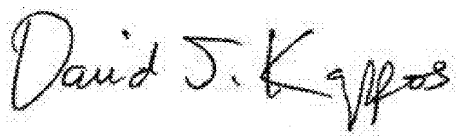
It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Title page, below Item (12), Delete "Oknelid et al." and insert --Prymus et al.--.

Title page, Item (75) Inventors:
Please correct the last name of Inventor 1 Erika "Oknelid" to Erika --Prymus--. Inventor 1 should read as:

Erika Prymus, Bara (SE)

Signed and Sealed this
Twenty-fifth Day of October, 2011



David J. Kappos
Director of the United States Patent and Trademark Office