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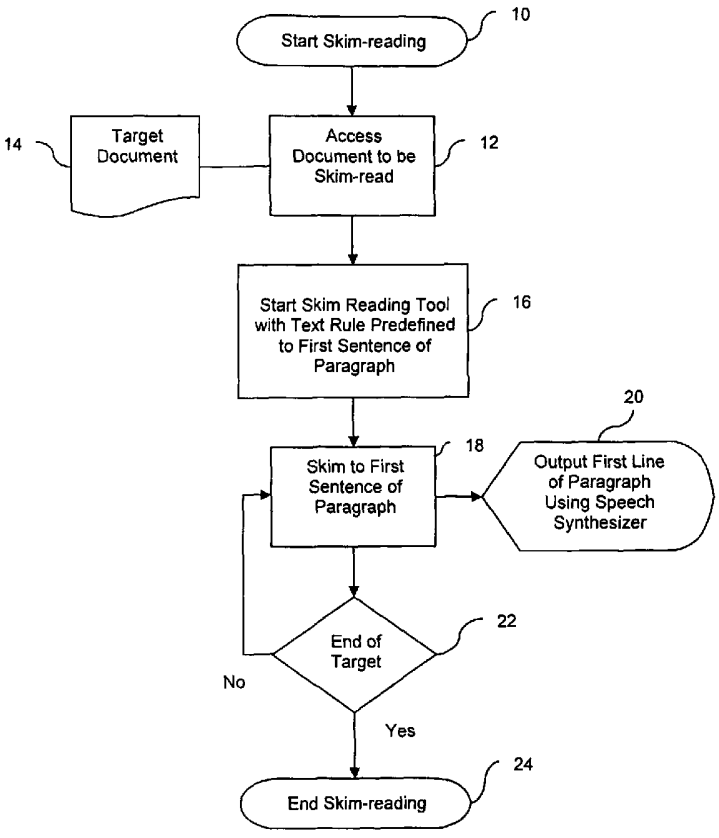
(54) Title: READING ALERTS AND SKIM-READING SYSTEM



(57) Abstract: A screen reader software product including a pattern store containing at least one user-definable array of keywords relating to a subject of interest and skim reading module adapted to apply the at least one array of keywords to a target document whereby only portions of the target document matching the at least one array of keywords are output by the screen reader software to an end user.

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READING ALERTS AND SKIM-READING SYSTEM

FIELD OF THE INVENTION

This invention relates to auditory interfaces for use by blind and low vision individuals. More, particularly, this invention relates to skim readers enabling blind and low vision individuals to scan through textual and non-textual display information in a document of interest.

BACKGROUND OF THE INVENTION

Personal computers and the Internet greatly enhanced communications and access to information from around the world. Typically, visual information is displayed upon a monitor screen and data can be added or manipulated via keystrokes upon an associated keyboard. Feedback is provided visually to the user by the monitor screen. Blind users cannot utilize the information appearing upon the monitor screen while visually impaired users may experience difficulty doing so. Accordingly, screen readers have been developed to assist blind and visually impaired users when they use a personal computer.

One such screen reader is JAWS® for Windows. When installed upon a personal computer, JAWS® provides access to the operating system, software applications and the Internet. JAWS® includes a speech synthesizer that cooperates with the sound card in the personal computer to read aloud information appearing upon the computer monitor screen or that is derived through communicating directly with the application or operating system. Thus, JAWS® provides access to a wide variety of information, education and job related applications. Additionally, JAWS® includes an interface that can provide output to refreshable Braille displays.

SUMMARY OF THE INVENTION

The present invention is a screen reader software product including a pattern store containing at least one user-definable array of keywords relating to a subject of interest and skim reading module adapted to apply the at least one array of keywords to a target document whereby only portions of the target document matching the at least one array of keywords are output by the screen reader software to an end user.

The pattern store may be populated by historical collections of keyword arrays and the target document and the at least one array of keywords are associated together in the pattern store.

A Boolean tag on each keyword instructs the screen reader software to include portions of the target document matching the keyword or exclude portions of the target document matching the keyword responsive to the state of the Boolean tag. Alternatively the screen reader software includes portions of the target document matching the array of keywords or excludes portions of the target document matching the array of keywords responsive to the state of the Boolean tag. An expression parser is communicatively coupled to the reading module whereby keyword logic may be embedded into the at least one array. For example, a keyword search may output portions of a document that contain either "hello" or "goodbye."

An output configuration module is provided to modify a predetermined scope of the portions of the target document matching the at least one array of keywords. The predetermined scope of the portions of the target document are selected from the group consisting of characters, words, lines, sentences, paragraphs, pages, page breaks, and section breaks. Thus, scope quantitatively determines how much of the document proximate to the relevant keywords are output to the end user. The predetermined scope may include an integer value representing how many paragraphs, lines, words or characters are output before and after the keyword-matched portions of the document.

In an alternative embodiment of the invention, a screen reader software product includes an error checking module, a screen reading module communicatively coupled to the error checking module, and an error skimming mode whereby upon activation of the error skimming mode, the screen reader software skips content deemed error-free and only outputs content flagged by the error checking module as containing an error. For example, the error skimming mode may only stop at user-selectable strings patterns such as stray punctuation marks, multiple spaces, missing opening or closing quotes, missing opening or closing parenthesis, missing capital after punctuation or the like. The alert itself may be configurable. For example, a sound or a spoken alert may play responsive to the detection of a possible error.

Optionally, the alert may be played prior to the output of the text (either by voice synthesis, Braille or other medium). Alternatively, the alert may be played subsequent to the output of the text. Each string pattern may be configured independently so that the action taken by the screen reader upon detecting an error is tailored to the preferences of the end user.

The present invention also relates to methods of controlling the output of a computer utilizing a screen reader function to enable a document to be skimmed for display information. The display information includes textual and non-textual features of the target document. The method includes the steps of providing a target document to be skimmed, providing one or more text rules, scanning the target document for concurrence between the text of the target document and the one or more text rules and outputting a portion of the text of the target document responsive to the concurrence in a user-appropriate format. A text rule can be made of one or more elements or parameters. The element can further include a Boolean tag wherein concurrence between text in the target document and the element of the text rule instructs the computer to include or exclude portions of the target document responsive to the state of the Boolean tag. The text rule can also have a Boolean tag wherein concurrence between text in the target document and the text rule instructs the computer to include or exclude portions of the target document responsive to the state of the Boolean tag. The screen reader function of the present invention can be provided by a screen reader program. The screen reader program can be JAWS®, Microsoft® Speech and Window-Eyes™. Optionally, the text of the target document that is output responsive to concurrences is customizable based upon user preferences. The output will be a user-appropriate including speech synthesizers, a refreshable Braille displays and viewers. The method can further prompt the user responsive to the concurrence. The prompt can precede the output of a portion of the text of the target document or it can follow the output. The prompt can instruct the user about the nature of the concurrence, such as describing the type of error in punctuation encountered. The prompt can also requests an action from the user responsive to the nature of the concurrence.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a flowchart of a process according to the present invention. The depicted process utilizes predefined text rules. Concurrences are output utilizing a speech synthesizer.

FIG. 2 is a flowchart of an alternative process according to the present invention. The depicted process allows a user to change the text rules to a desired preference. The skim-reader then executes the process according to the parameters of the selected text rule. Concurrences between the text and the selected text rule are sequentially output to a user-appropriate device.

FIG. 3 is a flowchart of a process depicting the selection, modification or addition of a text rule according to the present invention.

FIG. 4 is a flowchart of a process according to the present invention utilizing a skim-reading summary tool to link to text in a target document.

FIG. 5 is an illustration depicting the general user environment of a system according to the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

The present invention skims a document and only reads units of text containing or not containing keywords. Specify the keywords which should or should not be present and the unit which should be spoken, e.g. line, sentence or paragraph. Each pattern maybe saved and recalled via a Skim Reading History for reuse. For example, a user visits a regular News website and is interested in Political news. They may bring up their Politics Skim Reading Pattern. This may contain the names of persons of interest, places, keywords such as Election, etc. Another day they may be interested in Natural Disasters. They bring up their disaster Skim Reading pattern and review the same news page gleaning different information. A final example is of a researcher reading volumes of information looking for critical dates. They can choose their special pattern for gleaning important dates etc and Skim Read the volumes of information in an extremely timely manner.

Referring to FIG. 1 there is displayed an embodiment of the present invention. In this embodiment a user is able to skim read a document by reviewing the first sentence of each paragraph. For example, a user brings up, or accesses **12**, a lengthy document **14**. Utilizing the invention **16**, the skim reader reads the first sentence of a paragraph **18** and then skips to the first sentence of the next paragraph until the end of the target document is reached **22**. The first sentence of each paragraph is sequentially output to the user by a speech synthesizer **20**. Thus, the user is able to get through the document in far less time than would otherwise be possible.

Referring to FIG. 2 there is displayed another aspect of the skim-reader. The skim reader allows a user to select **28** which text rule or rules he desires to be applied to the target document **14**. For instance, the rule could be a word or group of words, such as "Supreme Court." The skim reader will skim the target document for occurrences of "Supreme Court" in concurrence with the rule **34**. These concurrences **34** with the text rule chosen **28** will be output to the user in a user appropriate format **36**.

The selection, modification or addition of a text rule is depicted in FIG. 3. An implementation of this process allows a user to select from a population of rules **50** or add a new rule **42**. The population of rules can include default rules supplied with the implementation, along with rules previously created by the user. A rule within the population can be modified by selecting the rule and altering its parameters **54**. The term "text rule" as used in the instant application refers to both textual display information and non-textual display information. Text rules can include a word or words, dates, names, and an alphanumeric character or string of characters. These can further include wildcards to broaden the applicability of the text rule. Text rules can also contain non-textual display information including, but not limited to, font format, paragraph format, bulleting, numbering, borders, shading, column format, page breaks, section breaks, tab settings, table structure, image data, case settings, comment field locations, hyperlink settings, data entry forms, and graphical user interface configuration. A text rule can include a Boolean tag instructing the screen reader software to include portions of the target document matching the keyword or exclude portions of the target document matching the keyword responsive to the state of the Boolean tag. A text rule can further include a parameter instructing the output

of concurrences based upon user preferences **56**. For instance, a user could specify the entire sentence to be output. Alternatively, if a user was searching for a word, the output could be limited to that word, possibly also containing information about the location of its occurrence in the target document or containing a few of the surrounding words. In other circumstances a user might desire an entire paragraph to be output wherever the word occurs. By utilizing this feature a user can exert a large degree of control over the output, specifying the minimum for a meaningful output, which can be crucial in effecting the length of time required to get through the target document.

In certain embodiments, the text rule can be an array of keywords. These keywords could relate to a subject of interest for a user. To broaden the scope of a given keyword, the keyword can include wildcard operators. Each keyword can also include a Boolean tag instructing the screen reader software to include portions of the target document matching the keyword or exclude portions of the target document matching the keyword responsive to the state of the Boolean tag. The array can also have a Boolean tag on instructing the screen reader software to include portions of the target document matching the array of keywords or exclude portions of the target document matching the array of keywords responsive to the state of the Boolean tag.

Referring to FIG. 4 there is displayed another aspect of the skim-reader. In this aspect, rather than outputting the results using a speech synthesizer or a Braille display, a summary of a page or other section of a target document **14** can be output to a viewer **60** adapted to facilitate viewing by an individual with impaired vision. Each segment of text displayed by the viewer **60** provides a link back to the text of the target document **14**. Selecting the link **62** enables the user to jump to that position in the original document **14**. When the user is finished with that portion of the target **14**, the user can redisplay the summary **66** to select different links to other sections of the target **14**.

In an alternative embodiment of the invention, common mistakes such as missed capitals after punctuation, missing parentheses or quotes or multiple spaces or tabs are flagged during reading. The idea is that the Screen Reader utilizing a skim reader flags common mistakes which would otherwise be picked up by a sighted reader more

efficiently. While word processors mark such mistakes inline, the screen reader may be instructed to give the information about the errors prior to reading the unit of text so that the reader can skip over text with no mistakes and find the text containing the errors in a more timely manner.

It will be seen that the advantages set forth above, and those made apparent from the foregoing description, are efficiently attained and since certain changes may be made in the above construction without departing from the scope of the invention, it is intended that all matters contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween. Now that the invention has been described,

WHAT IS CLAIMED:

1. A screen reader software product comprising:

a pattern store containing at least one user-definable array of keywords relating to a subject of interest; and

a skim reading module adapted to apply the at least one array of keywords to a target document whereby only portions of the target document matching the at least one array of keywords are output by the screen reader software to an end user.

2. The software product of claim 1 wherein the pattern store is populated by historical collections of keyword arrays.

3. The software product of claim 1 wherein the target document and at least one array of keywords are associated together in the pattern store.

4. The software product of claim 1 further comprising a Boolean tag on each keyword instructing the screen reader software to include portions of the target document matching the keyword or exclude portions of the target document matching the keyword responsive to the state of the Boolean tag.

5. The software product of claim 1 further comprising a Boolean tag on each array of keywords instructing the screen reader software to include portions of the target document matching the array of keywords or exclude portions of the target document matching the array of keywords responsive to the state of the Boolean tag.

6. The software product of claim 1 further comprising an expression parser communicatively coupled to the reading module whereby keyword logic may be embedded into the at least one array.

7. The software product of claim 1 further comprising an output configuration module, the output configuration module adapted to modify a predetermined scope of the portions of the target document matching the at least one array of keywords.

8. The software product of claim 7 wherein the predetermined scope of the portions of the target document are selected from the group consisting of characters, words, lines, sentences, paragraphs, pages, page breaks, and section breaks.

9. A screen reader software product comprising: an error checking module, a screen reading module communicatively coupled to the error checking module, and an error skimming mode whereby upon activation of the error skimming mode, the screen reader software skips content deemed error-free and only outputs content flagged by the error checking module as containing an error.

10. A method of controlling the output of a computer utilizing a screen reader function to enable a document to be skimmed for display information comprising the steps of:

providing a target document to be skimmed;

providing one or more text rules;

scanning the target document for concurrence between the display information of the target document and the one or more text rules; and

outputting a portion of the text of the target document responsive to the concurrence in a user-appropriate format.

11. The method of claim 10 wherein the text rule comprises one or more elements.

12. The method of claim 11 wherein the elements are specified by a user.

13. The method of claim 11 wherein the elements are selected from the group consisting of keywords, punctuation and alphanumeric strings.

14. The method of claim 11 wherein the element further comprises a Boolean tag wherein concurrence between text in the target document and the element of the text rule instructs the computer to include or exclude portions of the target document responsive to the state of the Boolean tag.

15. The method of claim 10 wherein the screen reader function is provided by a screen reader program.

16. The method of claim 15 wherein the screen reader program is selected from the group consisting of JAWS®, Microsoft® Speech and Window-Eyes™.

17. The method of claim 10 wherein the text rule comprises a Boolean tag wherein concurrence between text in the target document and the text rule instructs the computer to include or exclude portions of the target document responsive to the state of the Boolean tag.

18. The method of claim 10 wherein the portion of the text of the target document that is output responsive to concurrences is customizable based upon user preferences.

19. The method of claim 10 wherein the user-appropriate format is selected from the group consisting of a speech synthesizer, a refreshable Braille display and a viewer.

20. The method of claim 1 further comprising the step of prompting the user responsive to the concurrence.

21. The method of claim 20 wherein the prompt precedes the output of a portion of the text of the target document.

22. The method of claim 21 wherein the prompt instructs the user about the nature of the concurrence.

23. The method of claim 20 wherein the prompt follows the output of a portion of the text of the target document.

24. The method of claim 23 wherein the prompt requests an action from the user responsive to the nature of the concurrence.

FIG. 1

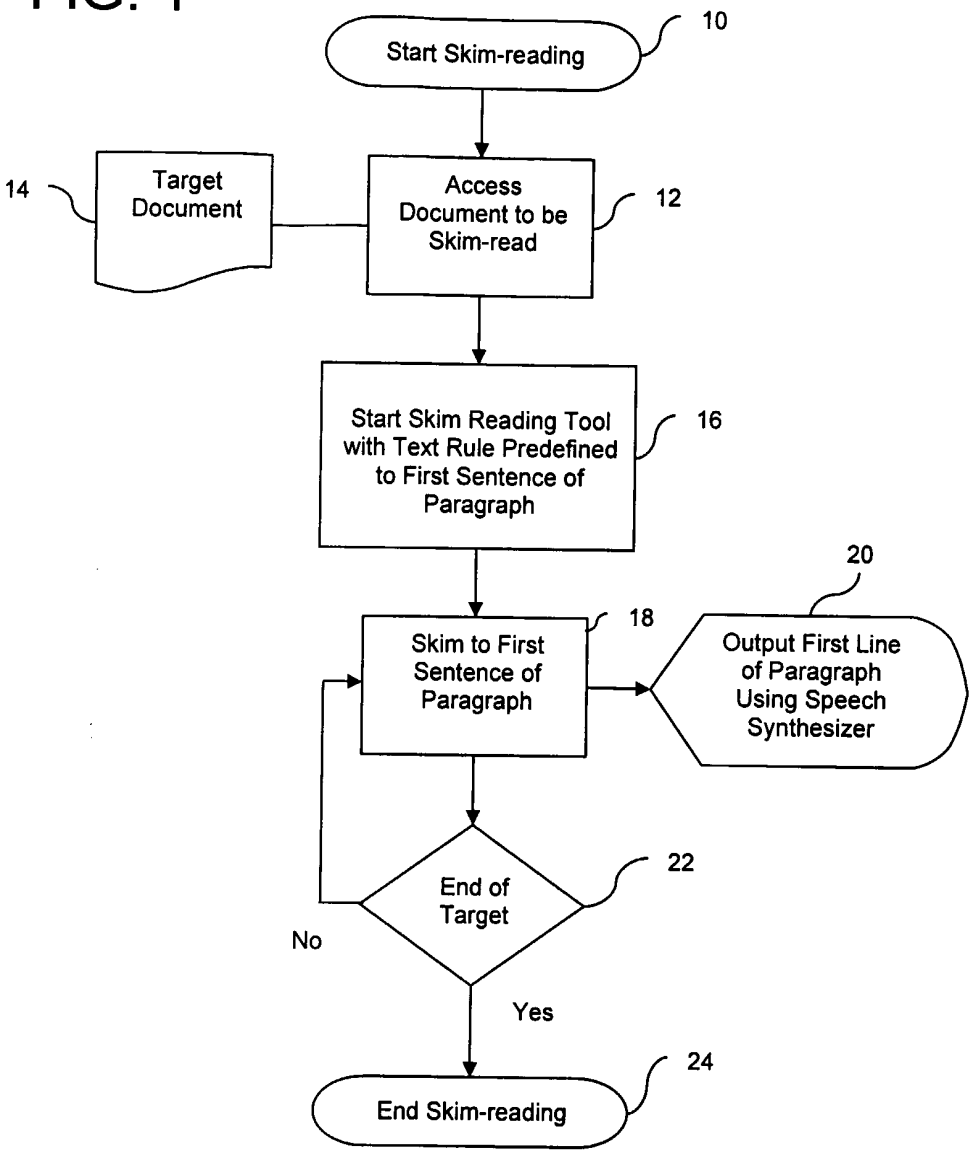

Start Skim-reading
10
Target Document
14
Access Document to be Skim-read
12
Start Skim Reading Tool with Text Rule Predefined to First Sentence of Paragraph
16
Skim to First Sentence of Paragraph
18
Output First Line of Paragraph Using Speech Synthesizer
20
End of Target
22
No
Yes
End Skim-reading
24

FIG. 2

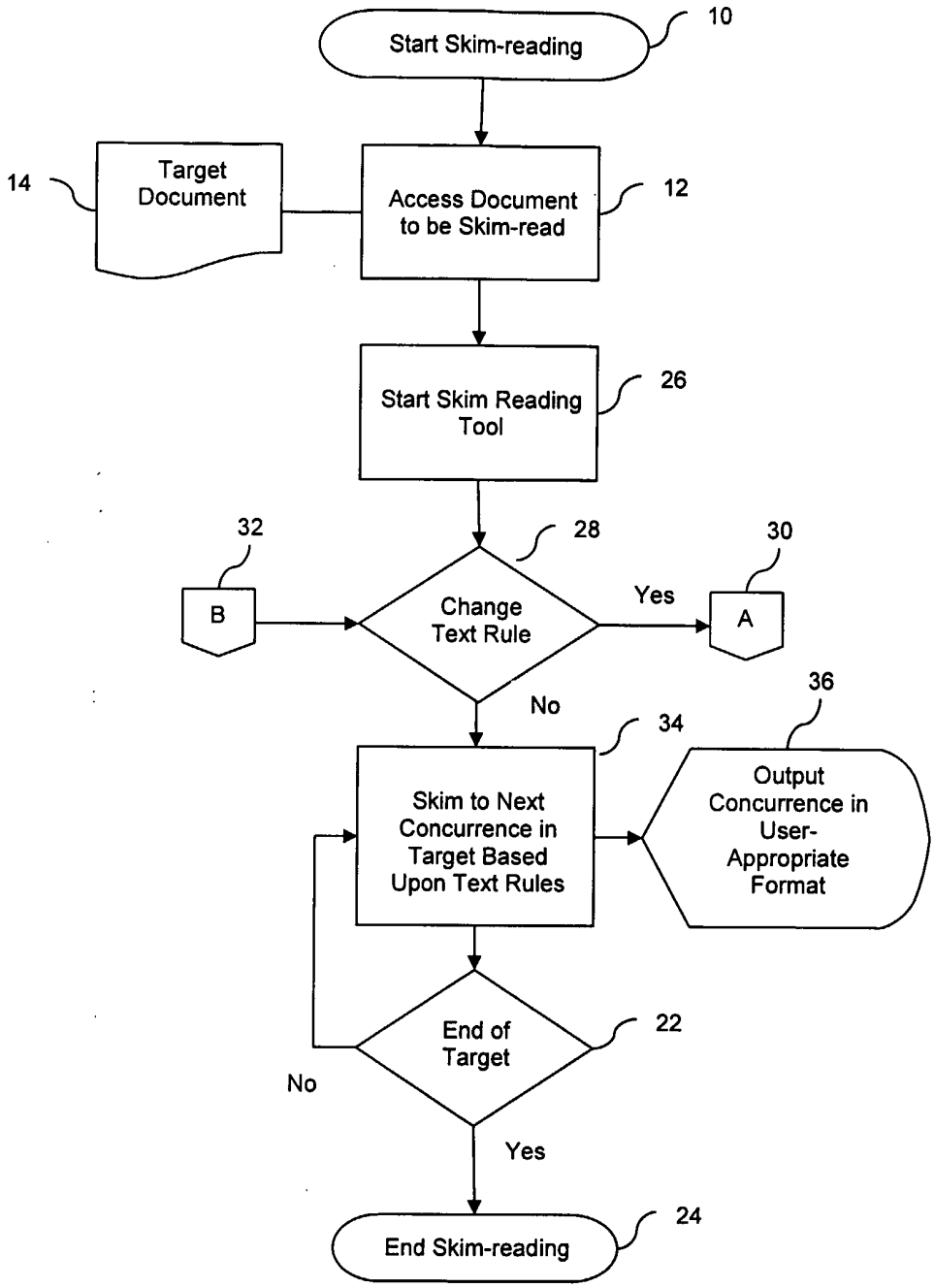

Start Skim-reading
10
Target Document
14
Access Document to be Skim-read
12
Start Skim Reading Tool
26
32
28
30
B
Change Text Rule
Yes
A
No
36
34
Skim to Next Concurrence in Target Based Upon Text Rules
Output Concurrence in User-Appropriate Format
End of Target
22
No
Yes
End Skim-reading
24

FIG. 3

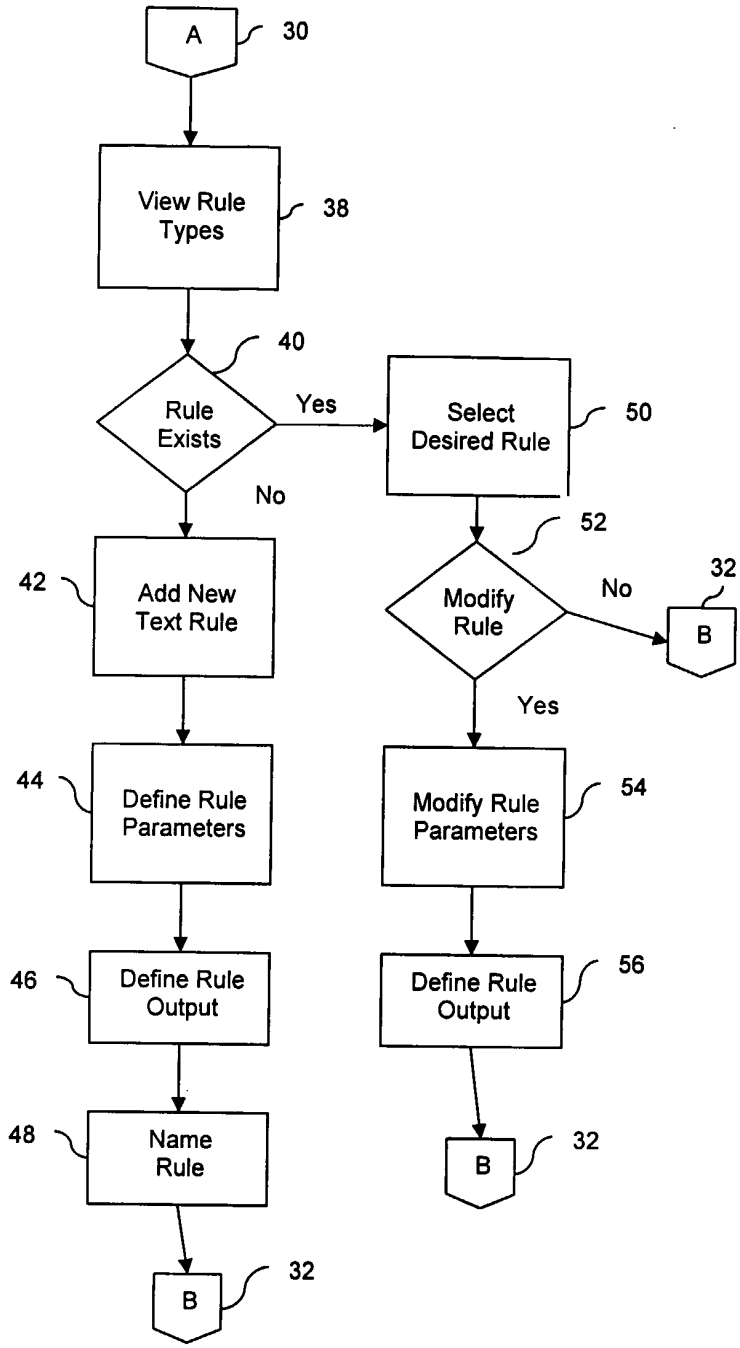

A
30
View Rule Types
38
40
Rule Exists
Yes
No
Select Desired Rule
50
52
Modify Rule
No
32
B
Yes
42
Add New Text Rule
44
Define Rule Parameters
46
Define Rule Output
48
Name Rule
B
32
Modify Rule Parameters
54
Define Rule Output
56
B
32

FIG. 4

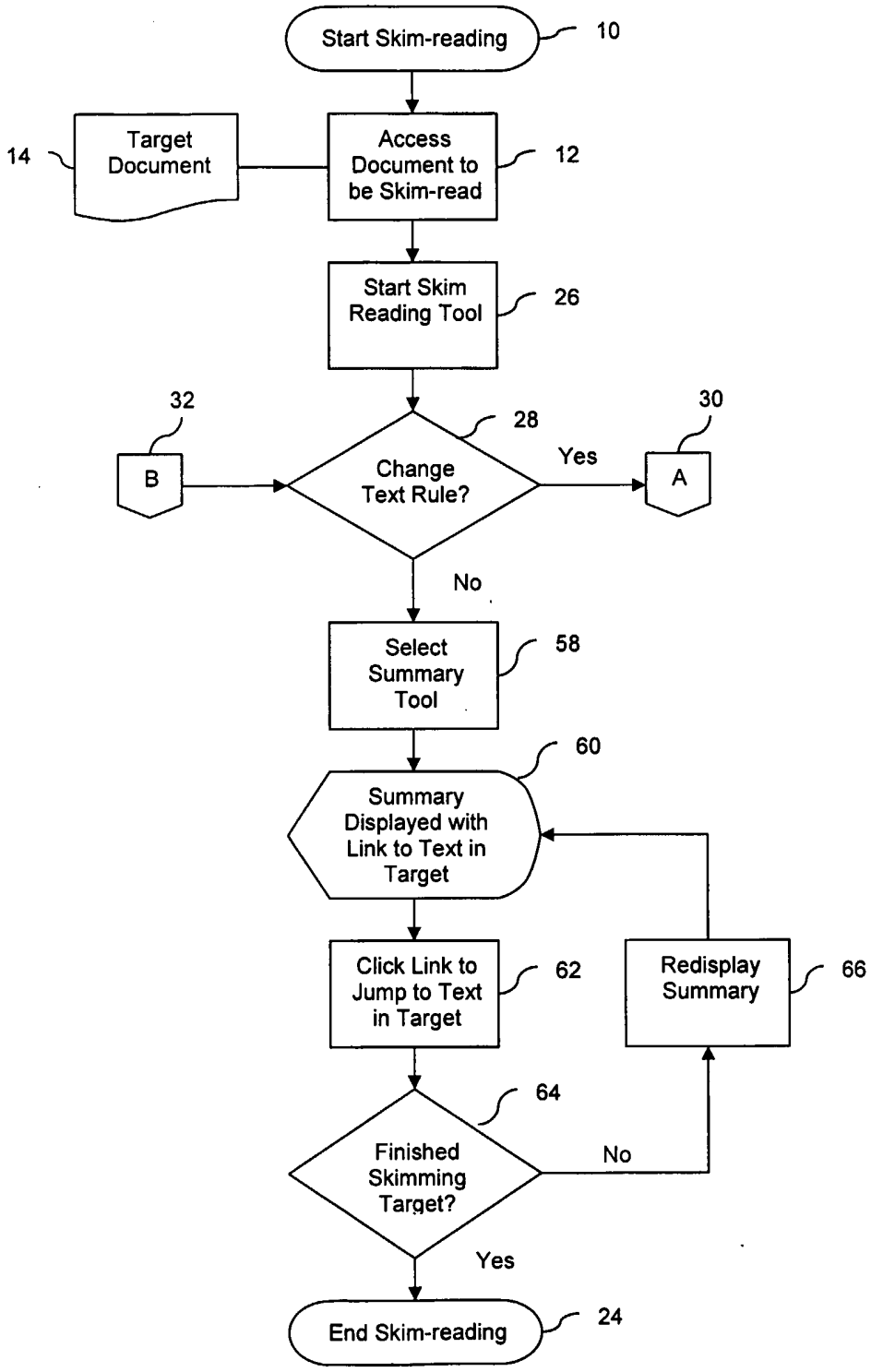
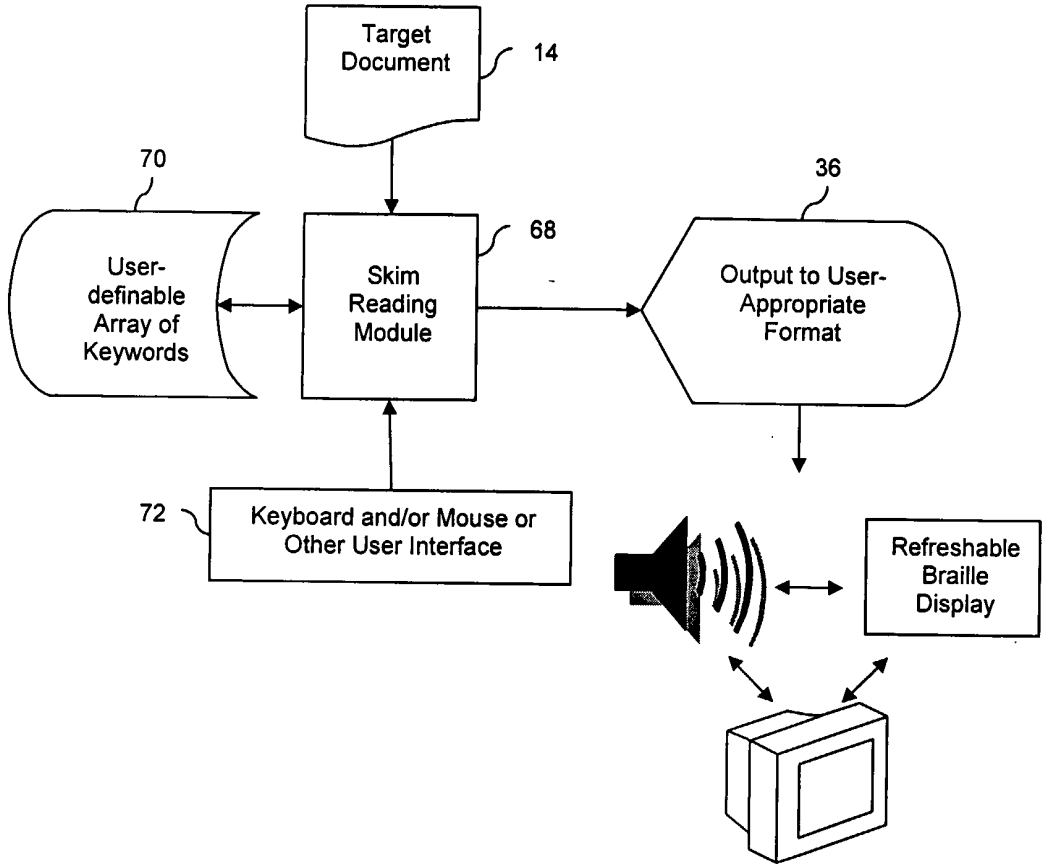

Start Skim-reading
10
Target Document
14
Access Document to be Skim-read
12
Start Skim Reading Tool
26
32
B
28
Change Text Rule?
Yes
30
A
No
Select Summary Tool
58
60
Summary Displayed with Link to Text in Target
Click Link to Jump to Text in Target
62
Redisplay Summary
66
64
Finished Skimming Target?
No
Yes
End Skim-reading
24

FIG. 5


Target Document
14
70
36
68
User-definable Array of Keywords
Skim Reading Module
Output to User-Appropriate Format
72
Keyboard and/or Mouse or Other User Interface
Refreshable Braille Display