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# United States Patent [19]

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**Braden-Harder et al.**

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[54] **APPARATUS AND METHODS FOR AN INFORMATION RETRIEVAL SYSTEM THAT EMPLOYS NATURAL LANGUAGE PROCESSING OF SEARCH RESULTS TO IMPROVE OVERALL PRECISION**

R. Pohlmann et al, "The Effect of Syntactic Phrase Indexing on Retrieval Performance for Dutch Tests", *Conference Proceedings of RIAO 97*, Computer-Assisted Information Searching in Internet, McGill University, Quebec, Canada, Jun. 25-27, 1997, vol. 1, pp. 176-187.

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(List continued on next page.)

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[21] Appl. No.: **08/898,652**

## [57] ABSTRACT

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[51] Int. Cl.<sup>6</sup> ..... **G06F 17/00**

Apparatus and accompanying methods for an information retrieval system that utilizes natural language processing to process results retrieved by, for example, an information retrieval engine such as a conventional statistical-based search engine, in order to improve overall precision. Specifically, such a search ultimately yields a set of retrieved documents. Each such document is then subjected to natural language processing to produce a set of logical forms. Each such logical form encodes, in a word-relation-word manner, semantic relationships, particularly argument and adjunct structure, between words in a phrase. A user-supplied query is analyzed in the same manner to yield a set of corresponding logical forms therefor. Documents are ranked as a predefined function of the logical forms from the documents and the query. Specifically, the set of logical forms for the query is then compared against a set of logical forms for each of the retrieved documents in order to ascertain a match between any such logical forms in both sets. Each document that has at least one matching logical forms is heuristically scored, with each different relation for a matching logical forms being assigned a different corresponding predefined weight. The score of each such document is, e.g., a predefined function of the weights of its uniquely matching logical forms. Finally, the retained documents are ranked in order of descending score and then presented to a user in that order.

[52] U.S. Cl. .... **707/5; 707/3; 707/4**

[58] Field of Search ..... **707/5, 4, 3; 364/419.19; 395/708**

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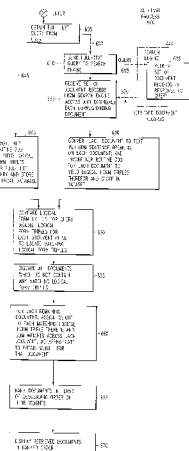
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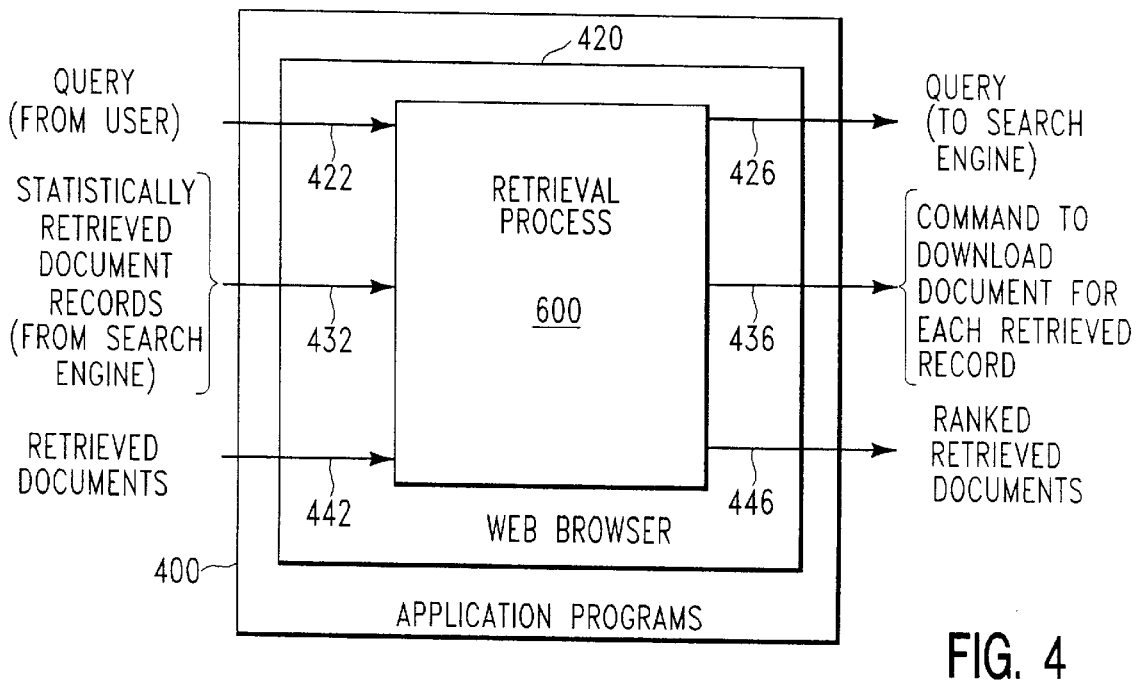
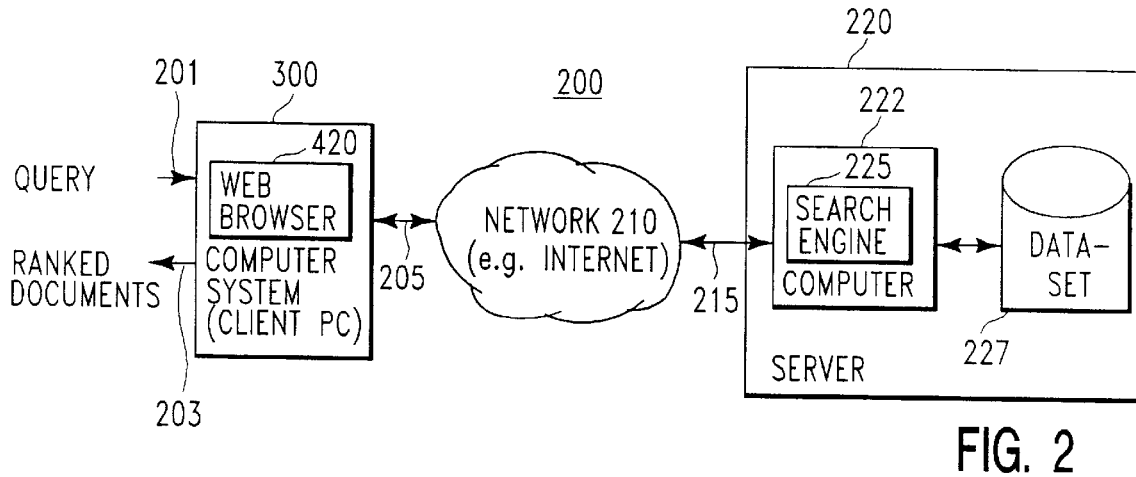
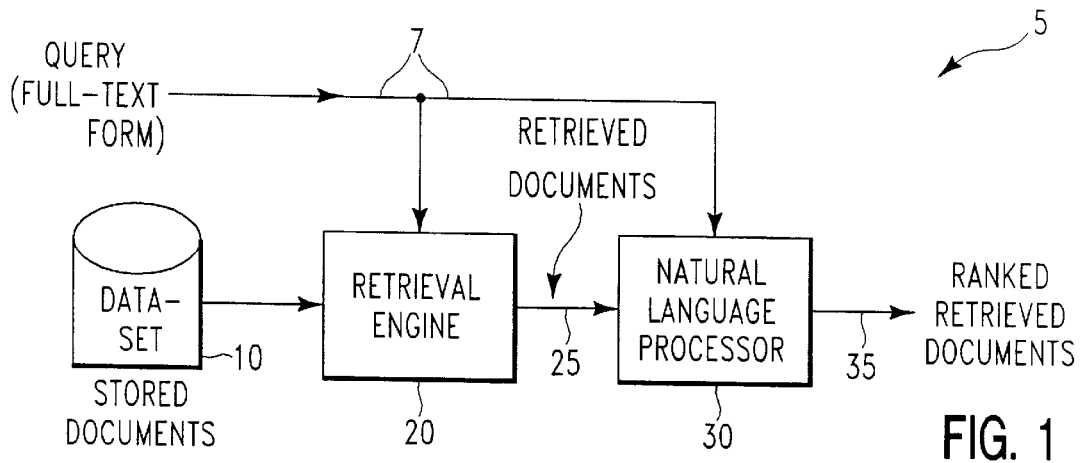
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**123 Claims, 14 Drawing Sheets**



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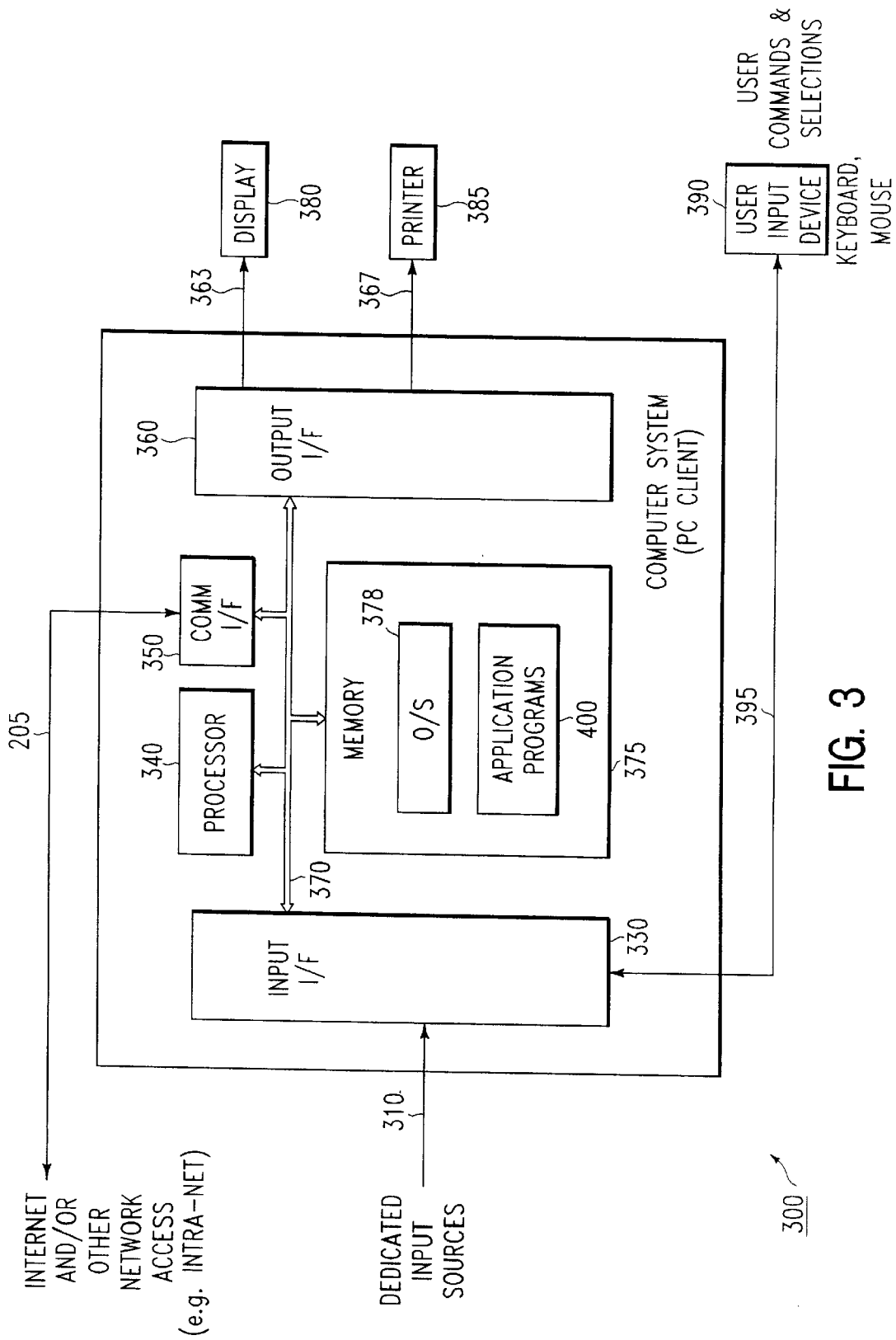


FIG. 3

510 INPUT STRING: THE OCTOPUS HAS THREE HEARTS.

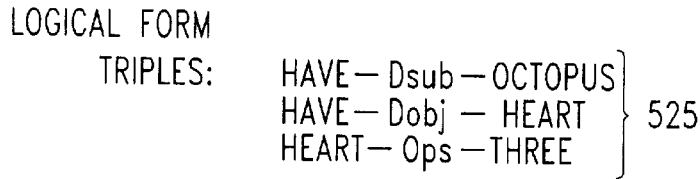
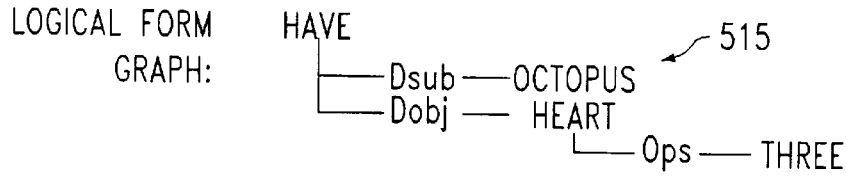


FIG. 5A

530 INPUT STRING: THE OCTOPUS HAS THREE HEARTS AND TWO LUNGS.

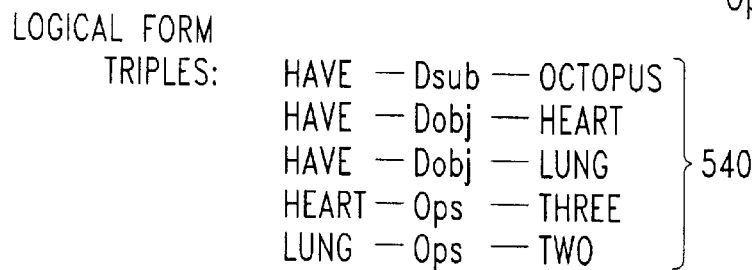
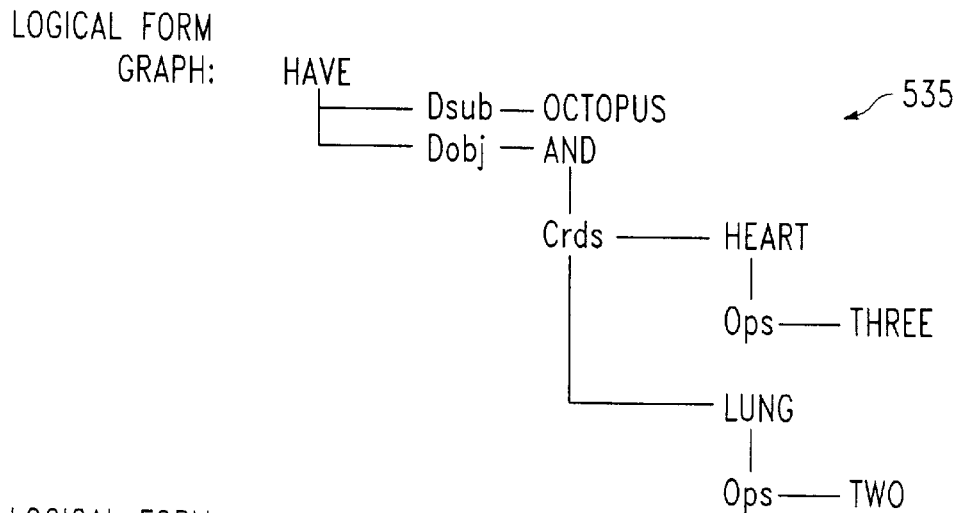


FIG. 5B

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