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[54] **SEMANTIC OBJECT MODELING SYSTEM FOR CREATING RELATIONAL DATABASE SCHEMAS**

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[52] **U.S. Cl.** **395/613**; 395/335; 395/348; 395/352

[58] **Field of Search** 395/613, 335, 395/348, 352

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,930,071	5/1990	Tou et al.	395/604
5,195,178	3/1993	Krieger et al.	395/347
5,212,787	5/1993	Baker et al.	395/612
5,263,167	11/1993	Conner, Jr. et al.	395/604
5,278,946	1/1994	Shimada et al.	395/62
5,295,256	3/1994	Bapat	395/500
5,307,499	4/1994	Yin	395/705
5,418,950	5/1995	Li et al.	395/604
5,499,371	3/1996	Henninger et al.	395/702

FOREIGN PATENT DOCUMENTS

0 560 543 A2	9/1993	European Pat. Off. .
2 253 500	9/1992	United Kingdom .
WO 95/03586	2/1995	WIPO .
WO 95/12172	5/1995	WIPO .

OTHER PUBLICATIONS

Codd, E.F., "Extending the Database Relational Model to Capture More Meaning," *ACM Transactions on Database Systems,* 4(4):397–434, Dec. 1979.

Decorte, G. et al. "An Object–Oriented Model for Capturing Data Semantics," *IEEE Computer Society Press,* pp. 126–135, Feb. 1992.

Kroenke, D.M., "Developing Object–Oriented Database Applications on Microcomputres," *The Second International Conference on Computers and Applications,* The Computer Society of the IEEE, pp. 70–77, Jun. 1987.

(List continued on next page.)

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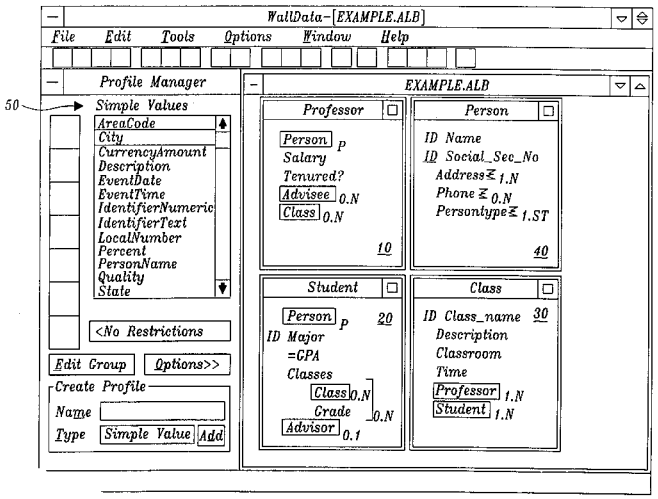
[57] **ABSTRACT**

A computer-based system for allowing a user to create a relational database schema. The system allows a user to create a semantic object data model of the database schema. The semantic object data model is defined by one or more semantic objects, each of which includes one or more attributes that describe a characteristic of the semantic objects. The attributes are defined as being either simple value attributes that describe a single characteristic of the semantic object; group attributes that include one or more member attributes that collectively describe a characteristic of the semantic object; formula attributes that set forth a computation that describes a characteristic of a semantic object; or object link attributes that define a relationship between two or more semantic objects. Once the semantic object data model is created, the system validates the semantic objects to ensure no modeling errors have been made and transforms the semantic objects and their included attributes into a plurality of relational database tables that will store data as defined by the semantic object data model.

29 Claims, 43 Drawing Sheets