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Gehring et al.

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(30) **Foreign Application Priority Data**

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(51) **Int. Cl.**

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G06K 9/34	(2006.01)
G06K 9/36	(2006.01)
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H04N 7/18	(2006.01)
B60Q 1/48	(2006.01)
G08G 1/123	(2006.01)
G05D 1/00	(2006.01)

(52) **U.S. Cl.** **382/104**; 382/103; 382/113; 382/173; 382/181; 382/291; 348/116; 348/118; 348/148; 340/932.2; 340/933; 340/958; 340/995.25; 340/995.28; 701/1; 701/23; 701/300

(58) **Field of Classification Search** 382/103, 382/104, 113, 173, 181, 199, 203, 291; 340/932.2, 340/933, 935, 937, 958, 995.25–995.28; 348/113, 116, 118–120, 148–149; 701/1, 701/23–28, 207–212, 300–302

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,906,940	A *	3/1990	Greene et al.	382/100
4,931,937	A *	6/1990	Kakinami et al.	701/300

(Continued)

FOREIGN PATENT DOCUMENTS

DE	297 23 648 U1	6/1999
DE	101 41 464	3/2004
DE	103 23 915	2/2005
JP	2001-343212	12/2001
JP	2002-172988	6/2002
JP	2002-172989	6/2002

OTHER PUBLICATIONS

Robert Sedgewick, Algorithms in C, Chapter 4, pp. 35 to 49, Chapter 5, pp. 187-189, Chapter 5.6, pp. 230-249, Addison-Wesley Pub. Comp. Inc. 1998.

Paul J. Besl, A Method for Registration of 3-D Shapes, IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 14, No. 2, Feb. 1992, pp. 239-256.

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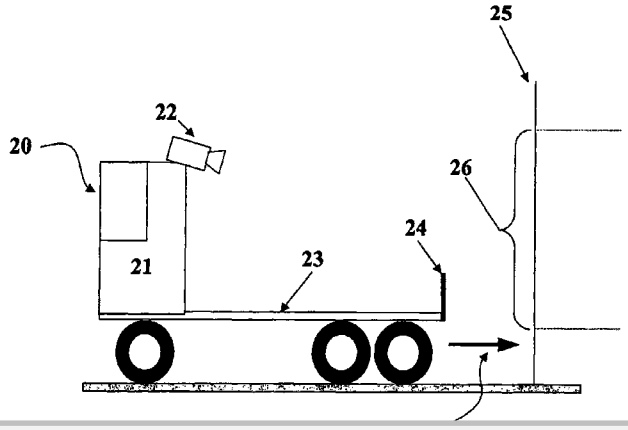
(57) **ABSTRACT**

Many day-to-day driving situations require that an operator of a motor vehicle guide the motor vehicle along a specific course and bring the vehicle to a stop at a specific location, for example in a parking bay or at a loading platform. To assist a vehicle operator in such situations, a method and a suitable device for implementing this method, include detecting the potential target objects in the image data of an image sensor and identifying the potential target objects as potential destinations in a multi-stage exclusionary method, whereupon a trajectory describing an optimized travel path is computed at least in relation to the most proximate destination. By using the multi-stage exclusionary method according to the present invention, it is possible to reliably identify potential destinations in complex image scenarios solely on the basis of their geometric form, even when the destinations have not been encoded by specific symbols.

19 Claims, 3 Drawing Sheets



U.S. PATENT DOCUMENTS

4,970,653	A *	11/1990	Kenue	701/301
5,220,508	A *	6/1993	Ninomiya et al.	701/207
5,245,422	A *	9/1993	Borcherts et al.	348/119
5,351,044	A *	9/1994	Mathur et al.	340/901
5,386,285	A *	1/1995	Asayama	340/435
5,487,116	A *	1/1996	Nakano et al.	382/104
5,517,412	A *	5/1996	Unoura	701/23
5,555,312	A *	9/1996	Shima et al.	382/104
5,555,555	A *	9/1996	Sato et al.	382/104
5,612,686	A *	3/1997	Takano et al.	340/903
5,646,614	A *	7/1997	Abersfelder et al.	340/932.2
5,680,313	A *	10/1997	Whittaker et al.	701/300
5,790,403	A *	8/1998	Nakayama	701/28
5,832,116	A *	11/1998	Rezzouk	382/199
5,844,505	A *	12/1998	Van Ryzin	340/988
5,991,427	A *	11/1999	Kakinami et al.	382/104
6,172,601	B1 *	1/2001	Wada et al.	340/436
6,507,660	B1 *	1/2003	Wirtz et al.	382/103
6,744,380	B2 *	6/2004	Imanishi et al.	340/937
6,794,987	B2 *	9/2004	Schiffmann et al.	340/435
6,894,606	B2 *	5/2005	Forbes et al.	340/435
6,952,488	B2 *	10/2005	Kelly et al.	382/104
7,116,246	B2 *	10/2006	Winter et al.	340/932.2
7,209,221	B2 *	4/2007	Breed et al.	356/5.02
2002/0130953	A1	9/2002	Riconda et al.	348/115
2004/0056950	A1	3/2004	Takeda	348/92
2005/0002558	A1	1/2005	Franke et al.	382/154

* cited by examiner

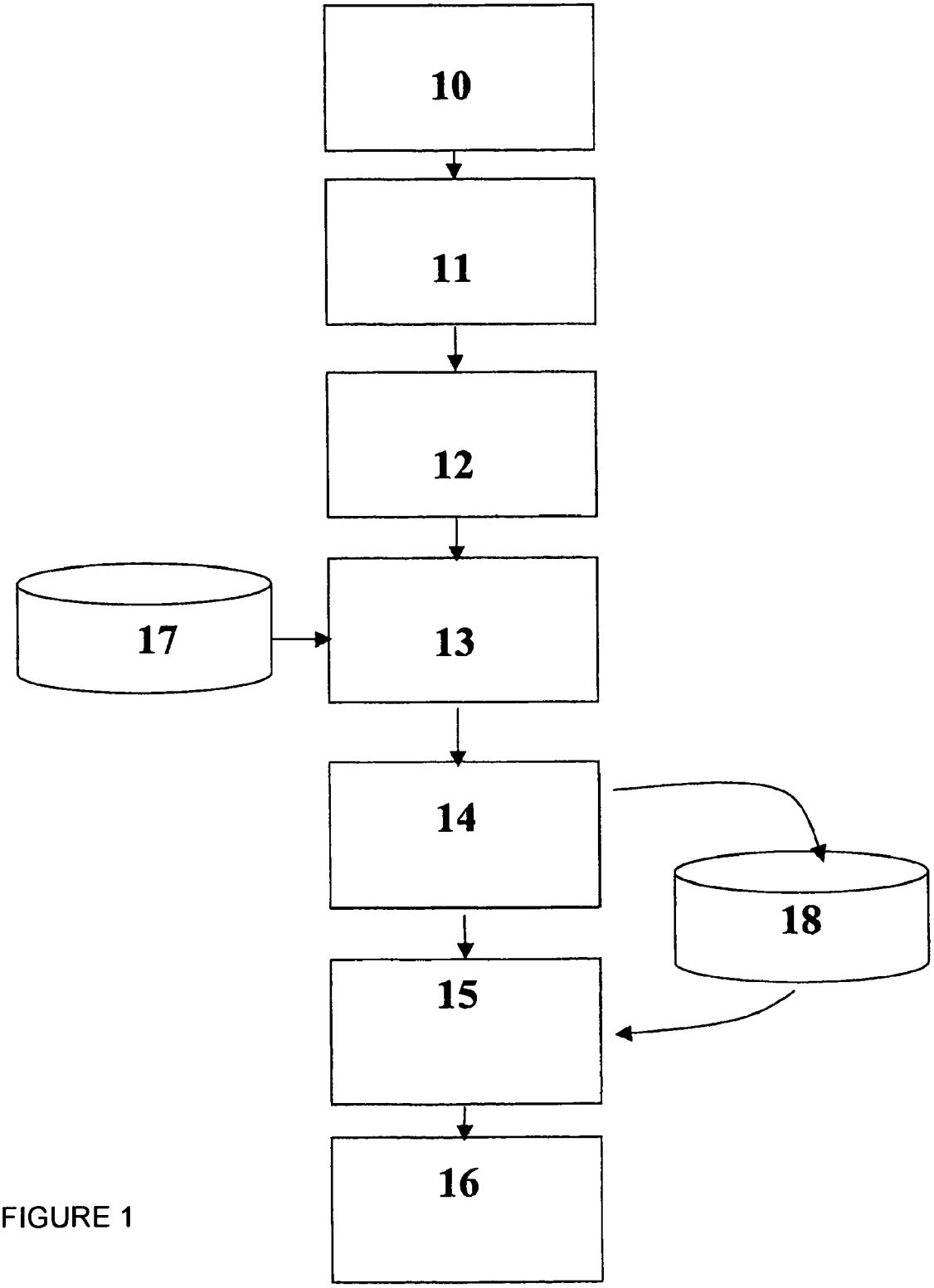


FIGURE 1

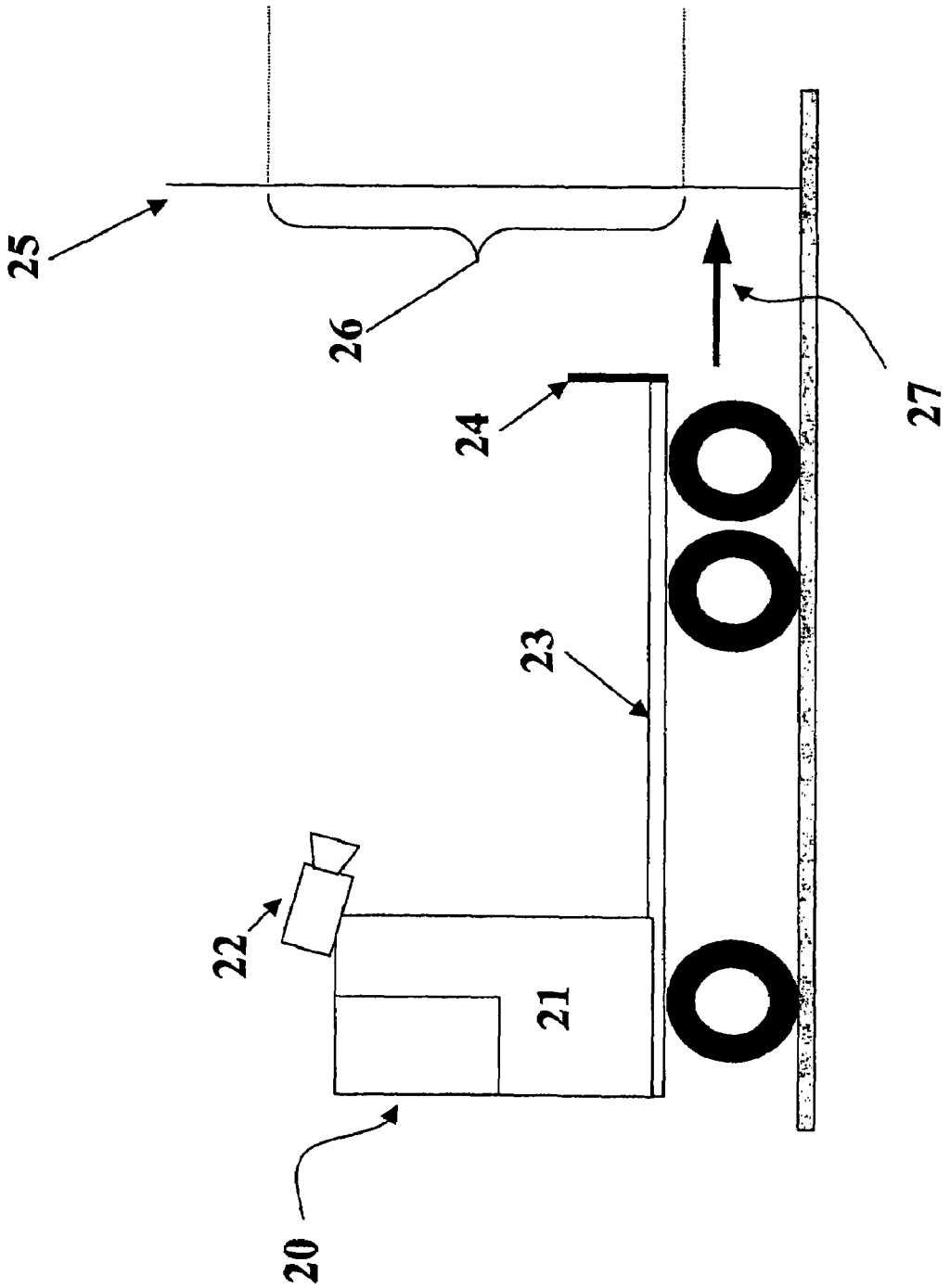


Figure 2

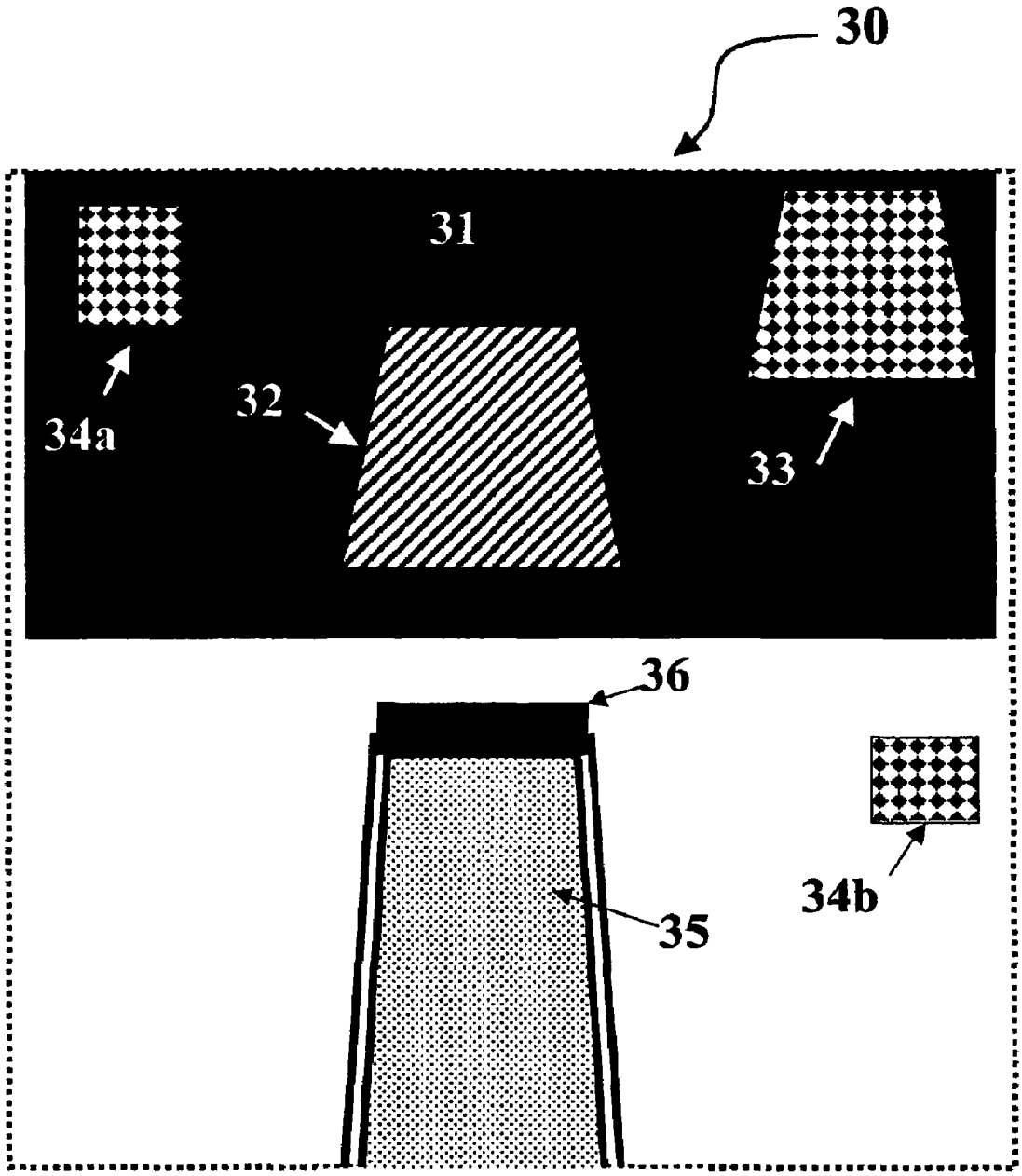


Figure 3

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