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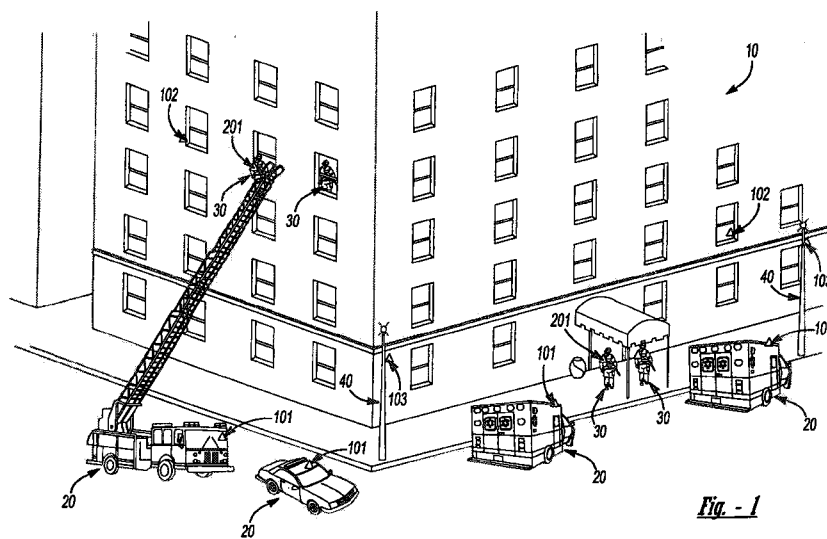


Fig. - 1

(57) Abstract: Methodologies are disclosed for determining the height of a target [201] and its horizontal location in three dimensional space using a network of base stations [101,102,103]. In one embodiment recursive two dimensional trilateration is used to determine the height, in another embodiment height is provided externally and used to correct the ranges used in two dimensional trilateration.



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A. CLASSIFICATION OF SUBJECT MATTER***H04W 64/00(2009.01)i***

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)

H04W 64/00; H04B 1/38; H04L 12/28; H04Q 7/38

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

Korean utility models and applications for utility models
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(Chinese Patents and application for patent)

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

eKOMPASS(KIPO internal) & Keywords: location, mobile device, building, base station, height

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2008-0026770 A1 (Pavan K. Rudravaram et al.) 31 January 2008 See abstract; paragraph [0030] - paragraph [0059]; figures 2,6,7	1-28
A	US 6999780 B1 (Wei Zhao) 14 February 2006 See abstract; column 5, line 9 - column 8, line 21; figures 3,4	1-28
A	EP 1569490 A1 (AVAYA TECHNOLOGY CORP.) 31 August 2005 See abstract; paragraph [0015] - paragraph [0037]; figure 6	1-28
A	US 2003-0216142 A1 (K. TORBJORN WIGREN) 20 November 2003 See abstract; paragraph [0015], [0016], [0082], [0083]; figure 11	1-28

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

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2008-0026770 A1	31.01.2008	US 7616965 B2	10.11.2009
		WO 2008-016781 A2	07.02.2008
		WO 2008-016781 A3	11.12.2008
US 6999780 B1	14.02.2006	US 2006-194588 A1	31.08.2006
		US 7640025 B2	29.12.2009
EP 1569490 A1	31.08.2005	AT 353532 T	15.02.2007
		CA 2496598 C	19.01.2010
		CA 2496598-A1	11.08.2005
		DE 602005000533 D1	22.03.2007
		DE 602005000533 T2	31.05.2007
		EP 1569490 B1	07.02.2007
		JP 2005-229617 A	25.08.2005
		KR20060041702A	12.05.2006
		US 2005-176406 A1	11.08.2005
		US 7272394 B2	18.09.2007
		US 2003-0216142 A1	20.11.2003
EP 1506686 A1	16.02.2005		
PL 373426A1	22.08.2005		
US 7203499 B2	10.04.2007		
WO 03-098957 A1	27.11.2003		