

### United States Patent [19]

### Sasaki et al.

[54

**Patent Number:** [11]

5,511,045

**Date of Patent:** [45]

Apr. 23, 1996

4]	TIME MEASUREMENT APPARATUS AND	4,823,367	4/1989	Kreutzfeld 377/24.2
	SYSTEM HAVING RECEPTION OR	5,140,307	8/1992	Rebetez et al 340/539
	TRANSMISSION FUNCTION	5,241,487	8/1993	Bianco 364/569
		5,245,162	9/1993	Takahashi

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[73] Assignee: Casio Computer Co., Ltd., Tokyo,

Japan

[21] Appl. No.: 990,916

Filed: Dec. 15, 1992 [22]

[30] Foreign Application Priority Data

		3-354909 3-360753
and the second s		

[51] Int. Cl.<sup>6</sup> ...... G04F 8/00; G04B 47/00; G08B 23/00

[52] 340/323 R; 340/ 539; 364/569

[58] Field of Search ...... 368/10, 11, 107, 368/113, 2, 3, 9; 340/323 R; 364/569; 377/20, 24, 24.2; 235/377, 380, 382, 384, 385

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5,241,487	8/1993	Bianco	364/569
5,245,162	9/1993	Takahashi	235/377

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Primary Examiner-Vit W. Miska

Attorney, Agent, or Firm-Frishauf, Holtz, Goodman, Langer & Chick

#### [57] ABSTRACT

An apparatus designed to automatically measure the total moving time, split times, time lag, and the like of each of a plurality of moving objects, and determine the arriving order of each moving object. Every time a plurality of moving objects, e.g., runners or vehicles, pass through each predetermined point, pieces of information such as total running/ moving times, split times, time lags, and arriving orders are transmitted, in units of moving objects, to the respective moving objects or a transmission/reception unit arranged at each predetermined point. When moving objects pass through a predetermined point, and their moving times exceed passage times set in units of moving objects, an excess time is informed to each moving object.

### 46 Claims, 15 Drawing Sheets

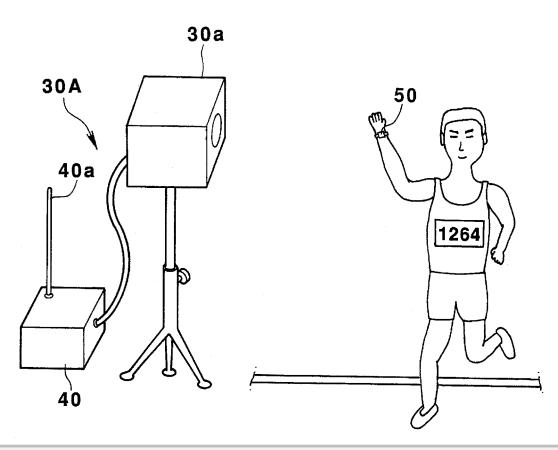
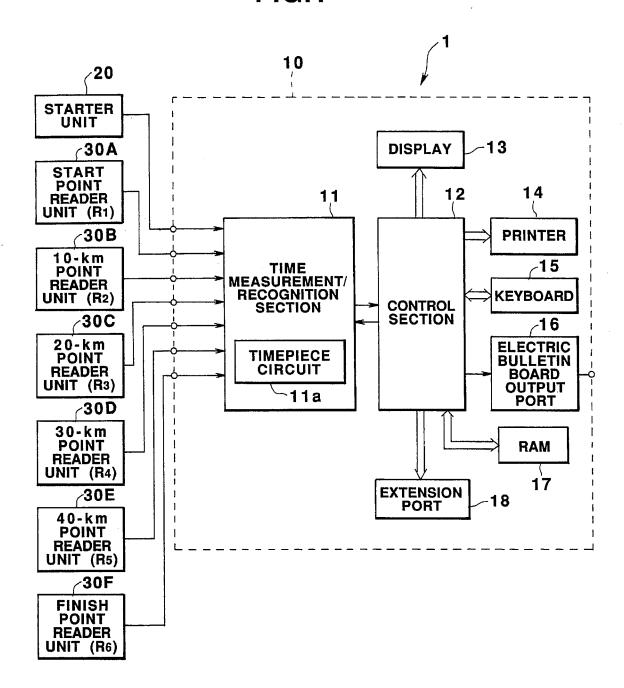




FIG.1

Apr. 23, 1996



5,511,045

FIG.2

Apr. 23, 1996

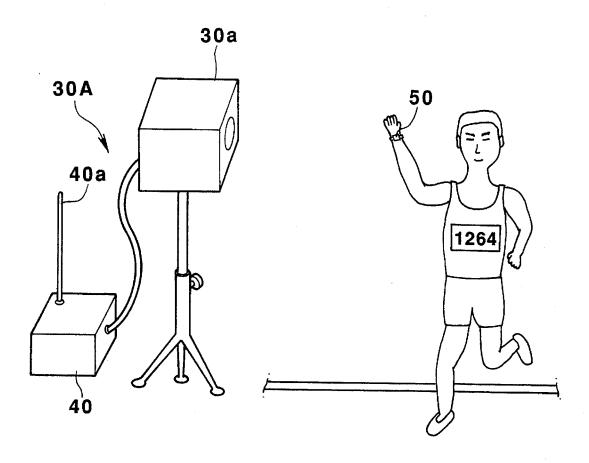
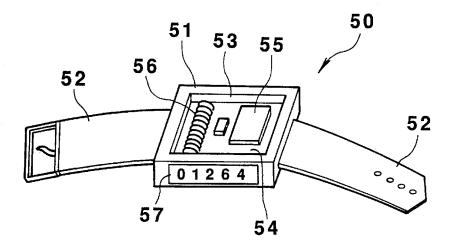


FIG.4





# 5,511,045

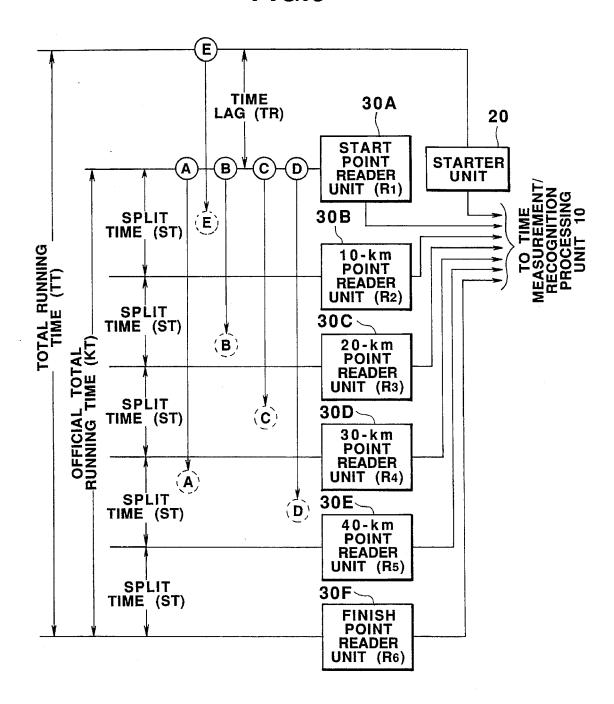
# FIG.3

ADDRESS	CONTENTS
100	START TIME INFORMATION SK
200	DISQUALIFICATION NOTIFICATION SET TIME INFORMATION STS
300	DISQUALIFICATION INFORMATION CHT
301	EXCESS TIME INFORMATION CHO

RUNNER A	
RUNNER	
B RUNNER	
C RUNNER	
D RUNNER	
<u>E</u>	
,	
1	
RUNNER	
N	

ADDRESS	CONTENTS
1000	START POINT PASSAGE TIME INFORMATION TZ
1001	10-km POINT PASSAGE TIME INFORMATION TZ
1002	20-km POINT PASSAGE TIME INFORMATION TZ
1003	30-km POINT PASSAGE TIME INFORMATION TZ
1004	40-km POINT PASSAGE TIME INFORMATION TZ
1005	FINISH POINT PASSAGE TIME INFORMATION TZ
1006	TIME LAG INFORMATION TR
1007	TOTAL RUNNING TIME INFORMATION BETWEEN START AND 10-km POINTS TT
1008	TOTAL RUNNING TIME INFORMATION BETWEEN START AND 20-km POINTS TT
1020	OFFICIAL 10-km POINT PASSAGE TINE INFORMATION KZA
1021	OFFICIAL 20-km POINT PASSAGE TINE INFORMATION KZA
1030	SPLIT TIME INFORMATION BETWEEN 10- AND 20-km POINTS ST
1031	SPLIT TIME INFORMATION BETWEEN 20- AND 30-km POINTS ST
1040	ARRIVING ORDER INFORMATION AT 10-km POINT TJ
1041	ARRIVING ORDER INFORMATION AT 20-km POINT TJ
1050	OFFICIAL ARRIVING ORDER INFORMATION AT 10-km POINT KT
1051	OFFICIAL ARRIVING ORDER INFORMATION AT 20-km POINT KT
1060	ARRIVING ORDER INFORMATION BETWEEN 10- AND 20-km POINTS TJ
1061	ARRIVING ORDER INFORMATION BETWEEN 20- AND 30-km POINTS TJ
2000	START POINT PASSAGE TIME INFORMATION TZ
2001	10-km POINT PASSAGE TIME INFORMATION TZ
1	
3000	START POINT PASSAGE TIME INFORMATION TZ
3001	10-km POINT PASSAGE TIME INFORMATION TZ
3001	10-KIII FOIKT FASSAGE TIME INFORMATION 12

FIG.5



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