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(54) Automated dispatcher for two-stop elevator system.

(57) A method for dispatching an elevator car (C1,C2) from one floor (L) to another floor (30) of a building includes automatically detecting a passenger within an elevator car (C1,C2) parked at a floor (L) of a building, and then sending the elevator car (CC) to another floor (30) of the building in response to the automatic detection of the passenger. A preferred arrangement includes a controller for generating a car dispatch signal (CC) for dispatching an elevator car (C1,C2) from one floor (L) to another (30), a passenger detector which automatically detects a passenger within the car (C1,C2) and which automatically generates a passenger detection signal (PS) receivable by the controller, and a means for causing the controller to generate the car dispatch signal (CC) in response to the passenger detection signal (PS). The car dispatch signal causes parts of the controller to command closing the car doors (16) and sending the car (C1,C2) to the other floor.

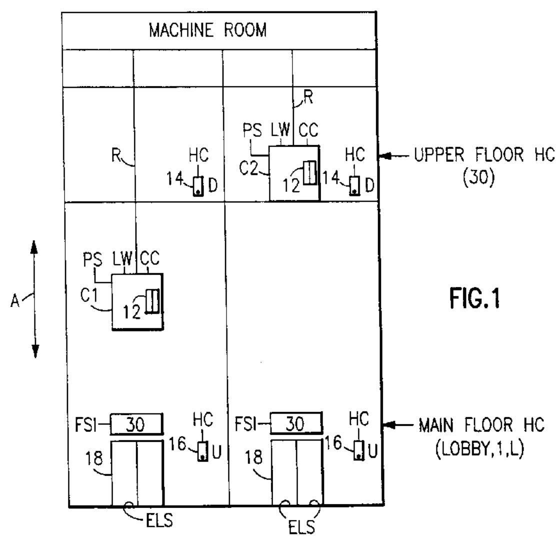

FIG.1

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The present invention relates to elevator systems, and more particularly to dispatchers for elevator systems servicing two floors of a building.

It is known for a passenger to press a car call button to register a car call. The car call signal initiates a command for dispatching an elevator car from one floor (e.g. lobby) to another floor (e.g. 30th floor of a high-rise building) without stopping at any intermediate (2nd-29th) floor. This is known as two-stop express elevator service.

It is a principal object of the present invention to increase overall two-stop elevator system performance.

The present inventors believe that overall two-stop elevator system performance can be improved by removing any requirement for a passenger to take any action to dispatch the car other than occupying the car.

Accordingly, a method for dispatching an elevator car from one floor to another floor of a building includes automatically detecting a passenger within an elevator car parked at a floor of a building, and then sending the elevator car to another floor of the building in response to the automatic detection of the passenger. A preferred arrangement of the present invention includes a controller for generating a car dispatch signal for dispatching an elevator car from one floor to another, a passenger detector which automatically detects a passenger within the car and which automatically generates a passenger detection signal receivable by the controller, and a means for causing the controller to generate the car dispatch signal in response to the passenger detection signal.

The present invention reduces the amount of activity required by a passenger to register a car call, and removes the requirement for a passenger to press a car call button in order for the passenger to register a car call.

Further objects and features of the present invention will become more readily apparent in light of the following detailed description, given by way of example only, when taken in conjunction with the accompanying drawing, in which:

Fig. 1 is a plan view of an exemplary two-car two-stop elevator system;

Fig. 2 is a schematic block diagram of an exemplary control arrangement for the two-car elevator group of Fig. 1, in which the present invention may be implemented;

Fig. 3 is a schematic block diagram of a typical microcomputer-based subsystem;

Fig. 3A is a schematic block diagram of the ROM of Fig. 3, the ROM having the routine of Fig. 4 stored therein;

Fig. 4 is a high-level logic flow diagram of a preferred automatic dispatching routine according to the present invention;

Figs. 5 and 6 are alternative exemplary people/passenger detectors, each of which can detect the presence of a passenger within an elevator car and each of which can generate a passenger detection signal PS;

Fig. 7 is a front elevational view of a passenger P occupying an interior of an elevator car with its front doors and front walls removed; and

Fig. 8 is a front elevational view of an open entryway to an elevator car parked with its doors open at a floor of a building.

Fig. 1 shows two elevator cars C1, C2 of an exemplary two-stop two-car elevator system which serves, for example, two floors 1, 30 of a building (e.g. high-rise) having a plurality (e.g. 50) of floors. Each of the cars C1, C2 travels in up and down directions shown, e.g., by an arrow A. The cars C1, C2 are connected to counterweights (not shown) via ropes R. Drive motors (not shown) for the cars C1, C2 are typically located in a machine room of the building. The building has a main floor--typically, the first floor 1 or a lobby L. The car C2 is shown parked at an upper floor (e.g. 30) while the car C1 is shown traveling to the main floor 1. Each car C1, C2 contains a car operating panel 12 at which a passenger (e.g. Fig. 7) occupying (e.g. standing within) an interior of the car C1 or the car C2 can make a car call to indicate travel to the upper floor 30 or to the main floor 1. The passenger can press a button (not shown) on the panel 12 producing a car call signal CC which identifies the floor (e.g. 30 or 1) to which the passenger intends to travel. A hall call fixture 14 which initiates a hall call signal HC is provided on the upper floor to indicate the desired downward direction of travel by a passenger waiting on the upper floor. At the main floor 1, there is a hall call fixture 16 which permits a passenger to call a car to the main floor 1. A floor service indicator FSI is located above each set of hall doors 18 and includes a display showing service to the upper floor. Passengers awaiting elevator service at the main floor 1 generally occupy an elevator landing space ELS of the floor outside each set of doors 18 for each car C1, C2 of the group.

During operation of the group, various traffic parameter signals can govern the dispatching of the elevator cars. Such parameter signals include, for example, car load condition signals LW, hall call signals HC, car call signals CC, etc. Various apparatus and methods for generating and processing the signals LW, HC, CC, etc., corresponding to car loads, hall calls, car calls, etc., are well understood in the elevator and electronic computer arts. See, for example, commonly-owned U.S. Patent No. 4,330,836, "Elevator Cab Loading Measuring System," issued May 18, 1982, by Donofrio et al, which is hereby incorporated by reference.

The elevator cars C1, C2 of Fig. 1 are operated under the control of an elevator group control system, such as that shown in Fig. 2. Fig. 2 shows an elevator group control system having a two-car group configuration. Associated with each car C1, C2 is a respective electronic controller. Each controller includes, for example, one operational control subsystem OCSS 101, one door control subsystem DCSS 111, one motion control subsystem MCSS 112 and one drive and brake subsystem DBSS 112A, all suitably electrically connected. The DCSS 111, MCSS 112 and the DBSS 112A are under the control of their respective OCSS 101. Various aspects of the group control system of Fig. 2 are described, for example, in US-A-5202540 which is hereby incorporated by reference. In Fig. 2, elevator dispatching is distributed to the separate controllers, one per car. Each OCSS 101 is a microcomputer-based subsystem, while each MCSS, DCSS and DBSS is a microprocessor-based subsystem suitably electrically coupled to and controlled by its respective OCSS. All OCSSs, and thus all controllers, are operationally interconnected by means of two serial communication lines 102,103 in a two-way ring communication system. For clarity, the MCSS, DCSS and the DBSS are shown only in relation to one OCSS; however, it is understood that there are two sets of these subsystems, one set associated with each elevator car and each set of OCSS, MCSS, DCSS and DBSS forming a controller.

The hall call buttons and lights are connected with remote stations 104 and a remote serial communications link 105 to the OCSS 101 by means of a switchover module SOM 106. The car buttons, lights and key switches inside the car are connected through remote stations such as 109 to the OCSS 101 via the remote serial link 110. The car specific hall features such as car direction, position, location and floor service indicators, are connected through remote stations such as 107 to the OCSS 101 via the remote serial link 108. During operation of the elevator cars C1, C2, a car load measurement is read (e.g. periodically) by the respective door control subsystem DCSS 111, and a signal LW is transmitted to the respective motion control subsystem MCSS 112 and, via the MCSS 112, also to the respective operational control subsystem OCSS 101.

The dispatching function for each elevator car is executed by its respective OCSS 101 forming a part of the respective controller. Each OCSS 101 includes readily available hardware components such as a microprocessor, a volatile memory (e.g. Random Access Memory - RAM), a non-volatile memory (e.g. Read Only Memory - ROM, EEPROM or Flash EPROM), various input and output ports, appropriate address, data and control buses, additional associated circuitry, optional external memory, optional video display, and suitably stored (e.g. in ROM, etc., and/or RAM) conventional software components such as a BIOS, an operating system, communications software, car dispatching routines responsive to the signals LW, HC, CC, etc., and each subsystem 111, 112,112A includes various conventional hardware and software components, all as are well understood by those skilled in the elevator and electronic computer arts. See, for example, Fig. 3.

According to a first preferred arrangement of the present invention, an automated dispatcher includes a passenger detector or sensor 109A (Fig. 2) associated with (e.g. located within the interior of) at least one elevator car (e.g. C2) for automatically generating a passenger detection signal PS which indicates a presence of at least one passenger occupying the car (e.g. C2), and also includes at least one controller (such as one controller of Fig. 2) which is connected electrically to the detector 109A (e.g. via link 110) and which has stored therein (e.g. in the ROM of the OCSS - Fig. 3A) any suitable instructions to perform an automated dispatching routine as shown, for example, in the high-level logic flow diagram of Fig. 4. In response to the passenger detection signal PS, the respective controller (e.g. the OCSS 101 for the car C2) automatically registers a car call and automatically generates a Car Dispatch signal CD (Fig. 2) which is transmitted to the respective MCSS 112 electrically connected to the respective DCSS 111. The signal CD commands the DCSS 111 to cause the respective car (e.g. car C2) to close its doors and also commands the MCSS 112 to cause this car C2 to travel to an opposite (e.g. the main) floor.

A second preferred arrangement of the present invention includes equal pluralities of passenger detectors and automated dispatching routines. A detector is associated with each car C1, C2 of the group while an identical automated dispatching routine (e.g. Fig. 4) is stored within each controller of the group. The routine of Fig. 4 is stored and executed within each OCSS 101 of the group. Preferably, the Fig. 4 routine for a respective car is executed while the car is parked with its car and hall doors open at a floor. The routine of Fig. 4 requires, for example, approximately 100 milliseconds for execution by an OCSS 101.

Passenger/people detectors for generating passenger detection signals PS, which indicate the presence of a passenger within an elevator car, are known and/or readily realizable. See, for example, U.S. Patent No. 4,799,243, "Directional People Counting Management," issued January 17, 1989, by Zepke; and U.S. Patent No. 4,303,851, "People and Object Counting System," issued December 1, 1981, by Mottier, which are hereby incorporated by reference and which correspond to Fig. 5 and Fig. 6 of the present application, respectively. In Fig. 5, radiation detector elements 2, 3 are electrically coupled to an evaluator 6 and optically coupled via a mask ll and a lens 20 to a region 8. In Fig. 6, video cameras with a sync line connection are electrically coupled to a counter via pulse generators, detectors, clock and a decoder, and optically coupled to an area AR via a mirror. Preferably, a detector of Fig. 5 or a detector of Fig. 6 is located to view a region 8 or an area AR present within the interior of an elevator car (e.g. C2). Desirably, the detector 109A is located, e.g., at an upper rear corner of the interior of the elevator car (e.g. C2) as shown in Fig. 7. Of course, the location of the detector can vary and many hardware components shown in Figs. 5 and/or 6 can alternatively be realized by equivalent suitable software stored within the OCSS 101 or elsewhere, all as are well understood by those skilled in the art in view of the instant disclosure.

Many categories, types and combinations of detectors or sensors 109A are employable within the present invention to generate a signal PS which indicates the presence of a passenger within the car. Such detectors and sensors are well known and include, for example:

1. Loadweighing sensors which measure a load in the car after all doors open and after ascertaining that any passengers on board have departed by detecting a suitable (e.g. every 100 milliseconds) time period of no load.
2. Motion sensors which measure a passenger in the car after all doors open and after ascertaining that any passengers on board have departed by detecting a suitable (e.g. every 100 milliseconds) time period of no motion. See, e.g., Fig. 6.
3. Infrared sensors which detect a passenger in the car after all doors open and after ascertaining that any passengers on board have departed by detecting a suitable (e.g. every 100 milliseconds) time period of no passengers present within the car. See, e.g., Fig. 5.
4. Multiple (e.g. double) light rays or infrared beams which can detect motion into the elevator car as opposed to motion out of the elevator car.
5. Alternatively, approach sensors AS which detect an approaching passenger at an elevator landing space ELS of the floor immediately outside of an elevator car with all doors open can be used. See, e.g., Fig. 8.

When one of the sensors 109A detects a presence of a passenger within a respective car, the automated dispatching routine (e.g. Fig. 4) causes a car call for the opposite floor to be automatically registered within the respective OCSS 101.

Fig. 4 shows a preferred embodiment of the automated dispatching routine according to the present invention and includes steps 200-270.

<u>Figure 4</u>

In a step 200, the routine ascertains whether the respective car is parked at the floor 1 such as the main floor or lobby. If the car is not parked at the floor 1, a step 202 queries if any car is parked at the floor 1. If yes in step 202, the routine jumps to a location B. If no in step 202, a step 204 queries if any car has started motion to the floor 1. If a car has begun such motion, the routine jumps to the location B. If the answer to the step 204 is no, the routine jumps to a location A and the OCSS executes the steps 235-270. If a step 235 decides that no car call is registered for this car to an opposite floor, a step 240 then automatically registers a car call (i.e. automatically generates a suitable signal CD) for this car to the opposite floor (e.g. to the main floor 1 for the car C2 parked at the upper floor in Fig. 1), a step 250 starts door dwell time (i.e. initiates action to close the car doors). After the doors are closed, step 260, the car is sent to the opposite floor. If yes in the step 235, the routine jumps to a location C, and the steps 250-270 are executed.

If the respective car is parked at the main floor 1 when the step 200 is executed, the routine in an optional step 210 decides if the car is almost empty, i.e. contains less than a predetermined load weight (e.g. 300 pounds). The signal LW is utilized for the decision in the step 210. If no in the step 210, the routine proceeds to the location A and the remainder of the steps 235-270 are executed. If yes in the step 210, the routine proceeds to a step 220 which queries whether a car call for this car to the opposite (e.g. upper floor) has already been registered. For example, if the car C1 is parked at the floor 1, a passenger in the car C1 may have pressed the car call button on the respective panel 12 to cause a registration of a car call to the upper floor. If yes in the step 220, the routine proceeds to the location C and the steps 250, 260, 270 are executed. If no in the step 220, a step 230 ascertains whether a passenger occupies the car. The step 230 causes, for example, the OCSS to examine for a presence of the signal PS. If no passenger occupies the car, no passenger detection signal PS is present or is generated by the detector 109A; the routine then proceeds to the location B. If a passenger occupies the car (e.g. as shown in Fig. 7) while the step 230 is being executed by the OCSS 101, the step 235 is executed. If no in the step 235, the step 240 causes a car call for this car to the opposite (e.g. upper floor) to be registered automatically within the OCSS. The OCSS, in the step 240, then automatically generates a suitable Car Dispatch signal CD to the MCSS 112 coupled to the DCSS 111. The signal CD initiates the steps 250, 260, 270 which result in the car being dispatched to the opposite floor.

Suitably coding all instructions to perform the routine of Fig. 4 and otherwise implementing the present invention are well within the skill of the elevator and electronic computer arts in view of the instant specification.

While there has been shown and described what is at present considered preferred embodiments of the present invention, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the scope of the present invention which shall be limited only by the appended claims. For example, the present invention could employ the controller arrangement and/or operate in conjunction with the dispatching routines described in U.S. Patent 4,305,479, "Variable Elevator Up-Peak Dispatching Interval," issued to Bittar et al. on December 15, 1981, which is hereby incorporated by reference. Additionally, the present invention can be employed within a medium-rise or a low-rise building.

Claims

1. A method for dispatching an elevator car from one floor to another floor of a building, comprising:
   automatically detecting the person of a passenger within an elevator car parked at one floor of a building; and then
   sending the elevator car to another floor of the building in response to a passenger being automatically detected by said detecting step.

2. A method as claimed in claim 1, further comprising the step of automatically registering a car call to the other floor in response to the passenger being automatically detected by said detecting step.

3. An arrangement for dispatching an elevator car, comprising:
   a controller for generating a car dispatch signal for dispatching an elevator car from one floor to another floor of a building;
   a passenger detector for automatically detecting the person of a passenger within an elevator car and for automatically generating a passenger detection signal, said passenger detector being electrically connected to said controller so that a passenger detection signal generated by said passenger detector is receivable by said controller; and
   means for causing said controller to generate a car dispatch signal in response to said passenger detection signal.

4. An arrangement as claimed in claim 3, wherein said controller includes an electronic computer having instructions for generating a car dispatch signal stored therein.

5. An arrangement as claimed in claim 3 or 4, wherein said passenger detector is located within the interior of the elevator car.

6. An arrangement as claimed in claim 3 or 4, wherein said passenger detector is located at an entryway to the elevator car.

7. A method for dispatching an elevator car, comprising:
   ascertaining whether an elevator car is parked at one floor of a building;
   automatically generating a passenger detection signal if a passenger is inside the elevator car; and
   automatically generating a car dispatch signal in response to the passenger detection signal.

8. A method as claimed in claim 7, further comprising:
   closing doors of the elevator car in response to the car dispatch signal; and then sending the elevator car to another floor of the building.

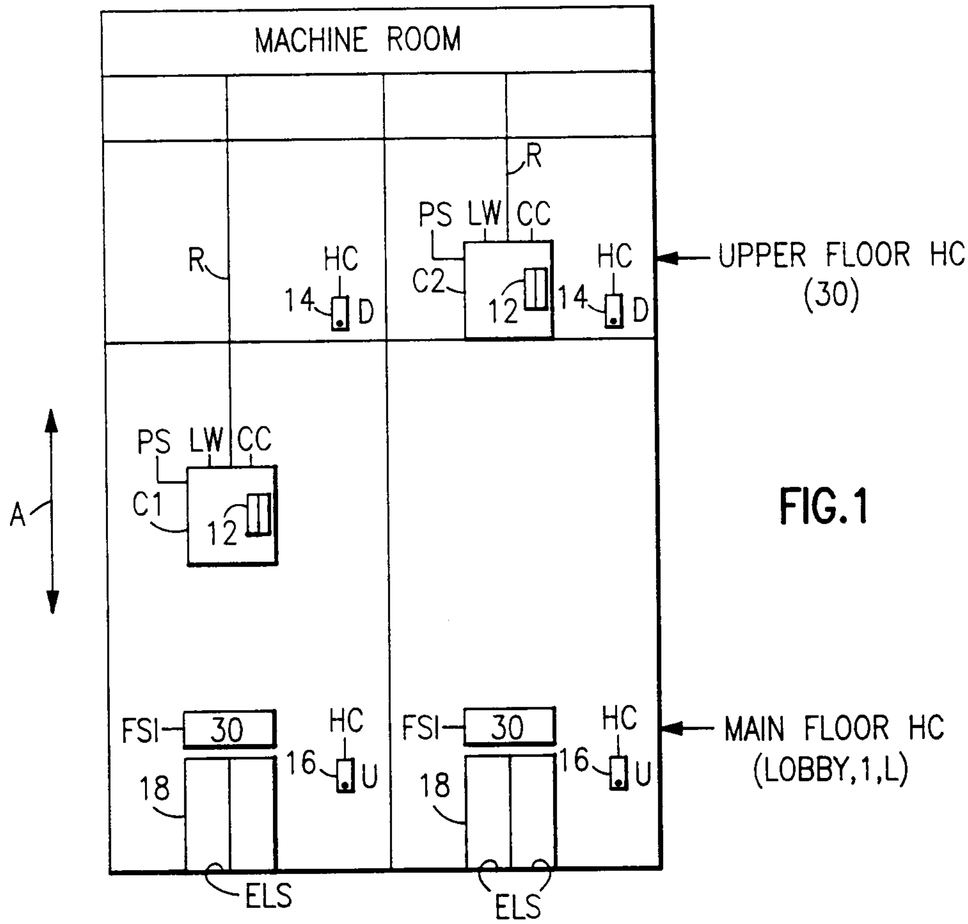
MACHINE ROOM
R
PS LW CC
C2
12
HC
14
D
UPPER FLOOR HC (30)
C1
A
FSI
30
16
U
18
ELS
MAIN FLOOR HC (LOBBY,1,L)

FIG.1

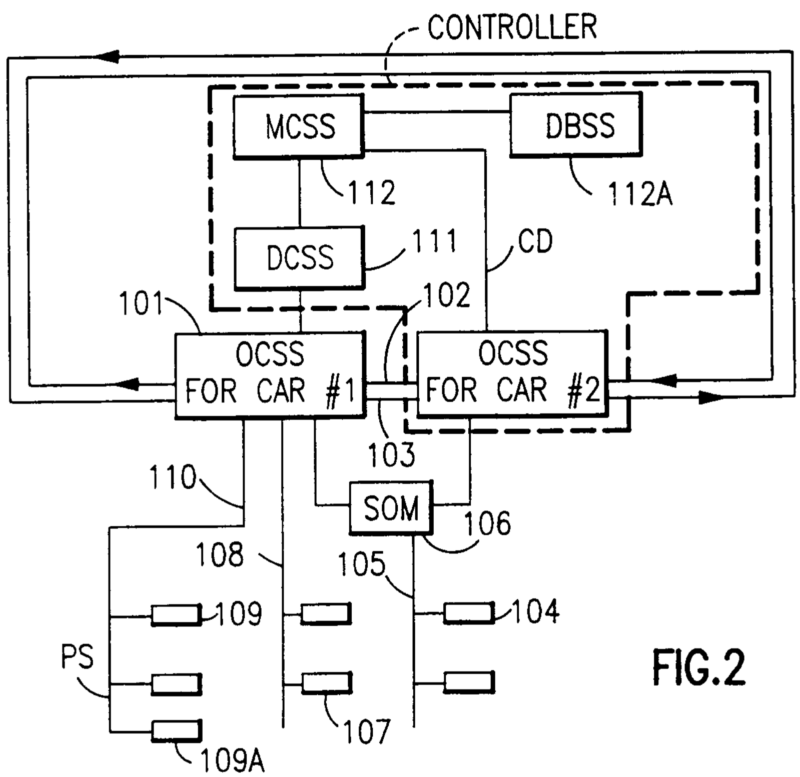
CONTROLLER
MCSS
DBSS
112
112A
DCSS
111
CD
101
102
OCSS FOR CAR #1
OCSS FOR CAR #2
103
110
SOM
106
108
105
109
104
PS
107
109A

FIG.2

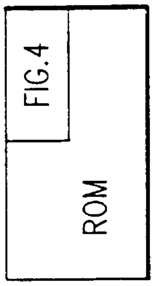

FIG.3A

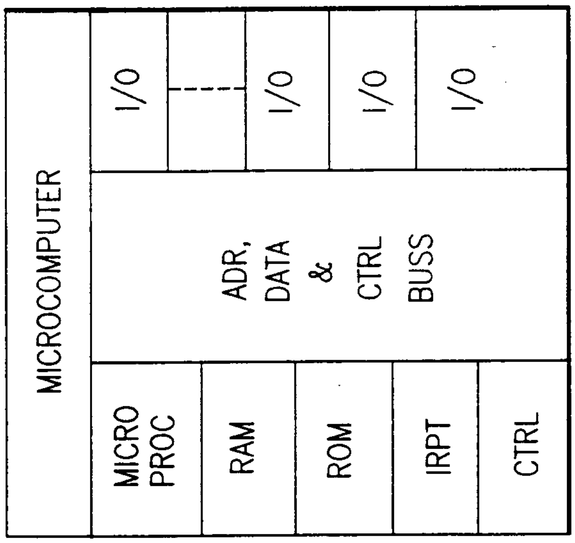

FIG.3

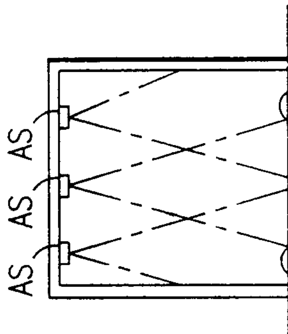

FIG.8
Prior Art

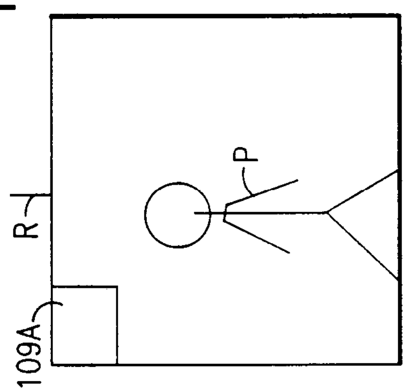

FIG.7

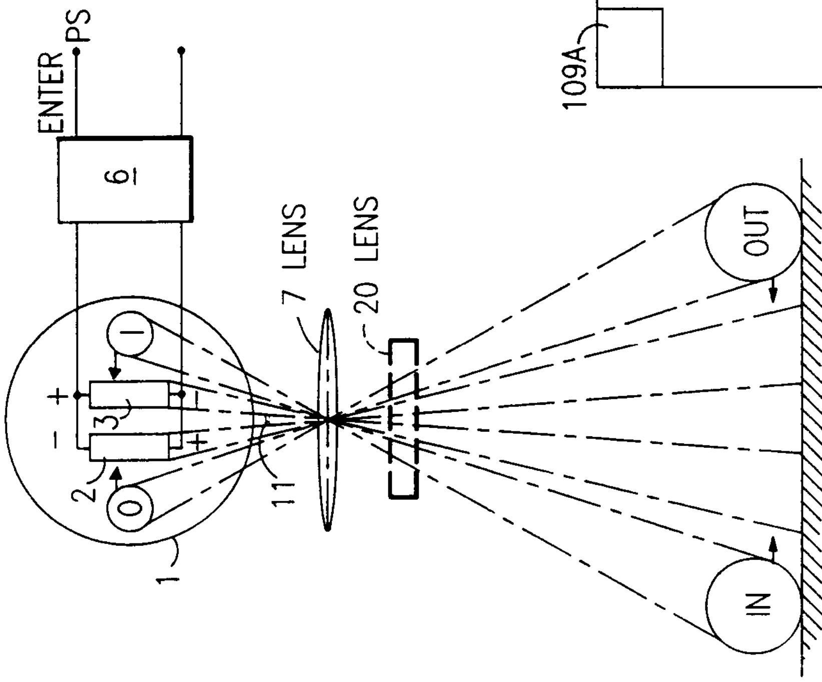

FIG.5
Prior Art

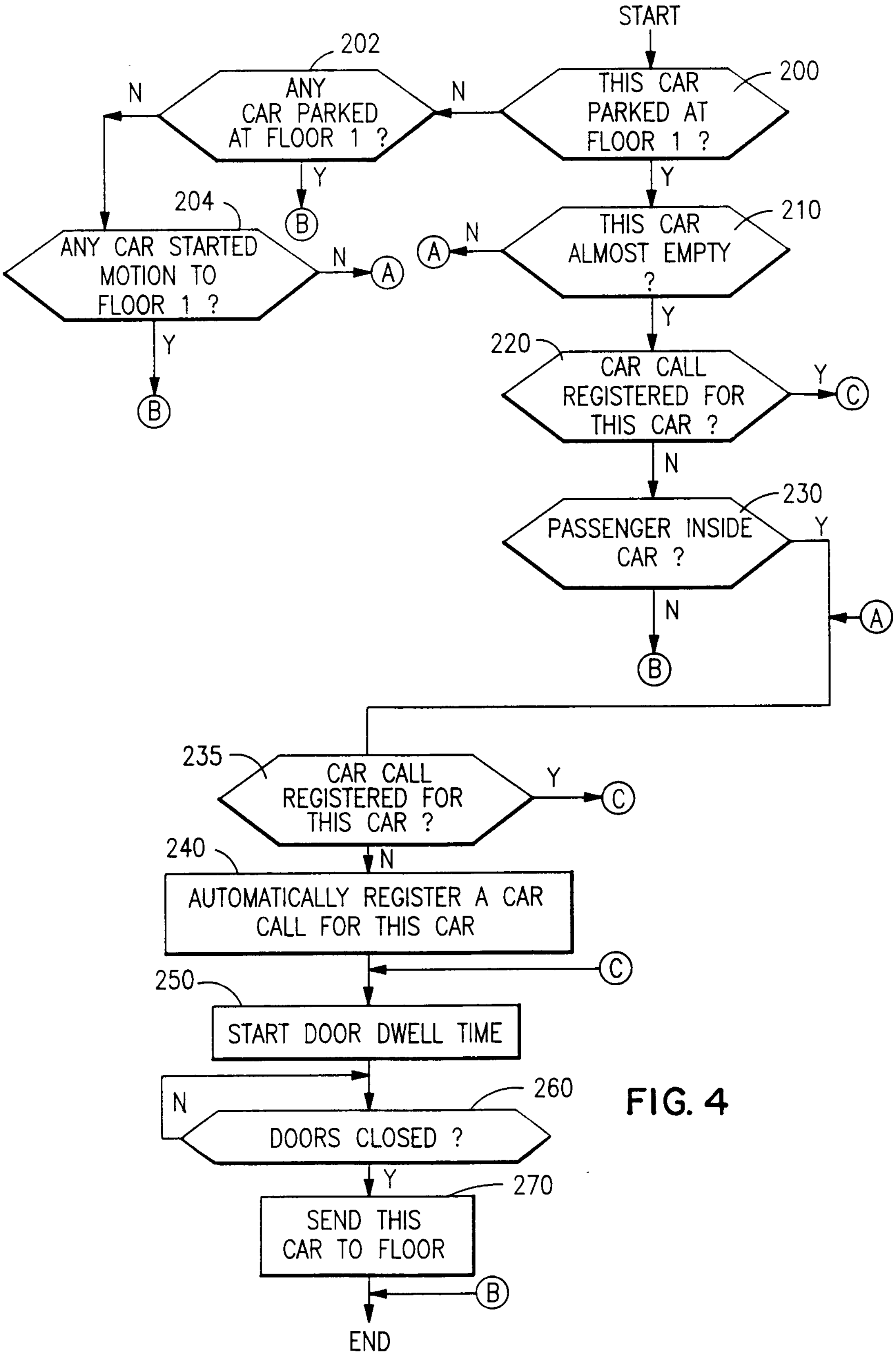
START
THIS CAR PARKED AT FLOOR 1 ?
200
N
Y
ANY CAR PARKED AT FLOOR 1 ?
202
N
Y
B
ANY CAR STARTED MOTION TO FLOOR 1 ?
204
N
A
Y
B
THIS CAR ALMOST EMPTY ?
210
N
A
Y
CAR CALL REGISTERED FOR THIS CAR ?
220
Y
C
N
PASSENGER INSIDE CAR ?
230
Y
N
B
A
CAR CALL REGISTERED FOR THIS CAR ?
235
Y
C
N
AUTOMATICALLY REGISTER A CAR CALL FOR THIS CAR
240
C
START DOOR DWELL TIME
250
DOORS CLOSED ?
260
N
Y
SEND THIS CAR TO FLOOR
270
B
END

FIG. 4

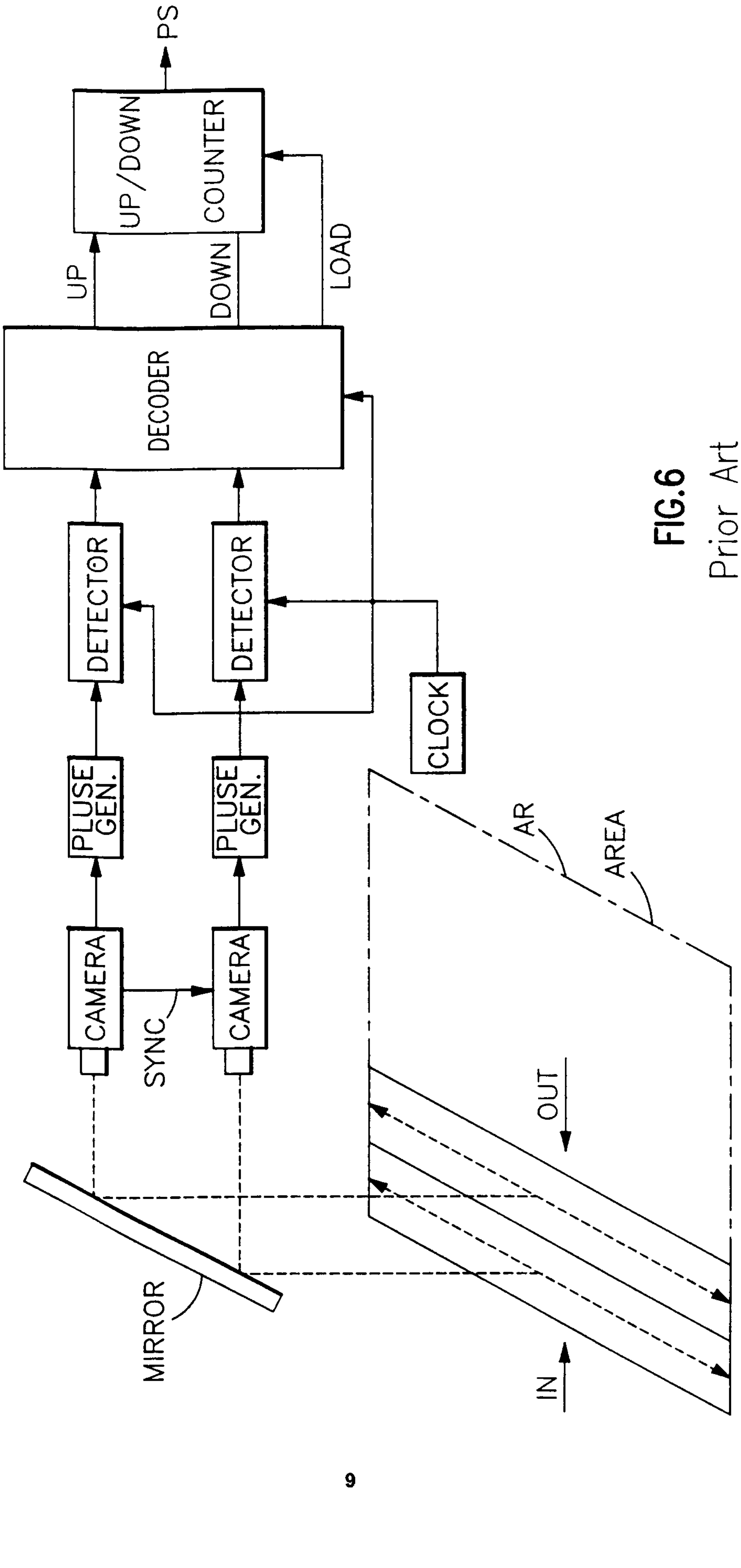

FIG.6
Prior Art

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 93309871.7

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	GB - A - 2 230 622 (HITACHI LTD.) * Totality * --	1-6	B 66 B 1/20
Y	GB - A - 2 230 622 --	7	
Y	US - A - 5 168 133 (OTIS) * Fig. 5A *	7	
A	--	8	
X	GB - A - 2 148 499 (WESTINGHOUSE) * Fig. 1 *	1,3,4, 5	
A	----	7	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)
B 66 B 1/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	24-02-1994	NIMMERRICHTER

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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L : document cited for other reasons

& : member of the same patent family, corresponding document

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