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(54) **Title:** TOILET FACILITY SYSTEM

(57) **Abstract:** A public toilet facility system includes a plurality of public toilet facilities each having a facility room, a plurality of toilet stalls therein, a toilet in each stall, an entrance/exit passageway for entering and exiting the facility room, and a door movable to an open position and to a closed-locked position with respect to the passageway; characterized in that the system further includes a central control communicating with all the public toilet facilities for controlling the opening, closing and locking of the doors in the entrance/exit passageway of each of the public toilet facilities.

TOILET FACILITY SYSTEM

FIELD AND BACKGROUND OF THE INVENTION

The present invention relates to a public facility system which includes a plurality of public toilet facilities, and particularly to a central control for controlling the plurality of public toilet facilities from a central location.

Many urban areas throughout the world include public toilet facilities accessible to the public during normal daylight hours. Generally, such public toilet facilities are closed during the night time, to prevent their occupancy by homeless persons or their use for nefarious purposes. At the present time, such systems require that a person be sent to each of the plurality of public toilet facilities, open and close the facility at the proper time, but before closing, to check the facility and each toilet stall in the facility to assure that no person is present at the time of closing. Such opening and closing procedures are therefore relatively expensive and time-consuming, particularly where a plurality of public toilet facilities are present in any particular urban area.

OBJECT AND BRIEF SUMMARY OF THE PRESENT INVENTION

An object of the present invention is to provide a public toilet facility system having advantages in the above respects. Another object of the invention is to provide a public toilet facility system which can also detect defects in any of the public toilet facilities in a more efficient and immediate manner than at the present time.

According to a broad aspect of the present invention, there is provided a public toilet facility system comprising a plurality of public toilet facilities each including a facility room, a plurality of toilet stalls therein, a toilet in each stall, an entrance/exit passageway for entering and exiting the facility room, and a door movable to an open position and to a closed-locked position with respect to the passageway; characterized in that the system further comprises a central control communicating with all the public toilet facilities for controlling the opening, closing and locking of the door in the entrance/exit passageway of each of the public toilet facilities.

Each of the toilet stalls may include an occupancy sensor for sensing the presence of a person therein; with the central control system being in communication with all the occupancy sensors for controlling the opening, closing and locking of the passageway door in the respective public toilet facility. On the other hand, each of the

public toilet facilities may include a monitor for monitoring the entry and exit of persons into the respective facility room via its entry/exit passageway, with the central control system being in communication with the monitor in each of the public toilet facilities for controlling the opening and closing of the passageway door in the respective public toilet facility.

Preferably, as in the described preferred embodiment, each of the facility rooms and each of the toilet stalls includes an occupancy sensor for sensing the presence of a person therein, and each of the public toilet facilities includes a monitor for monitoring the entry and exit of persons into the respective facility room via the entry/exit passageway, in which case the central control system would be in communication with all the occupancy sensors and also with all the monitors for controlling the closing and locking of the passageway door in the respective public toilet facility.

According to further features in the described preferred embodiment, each of the facility rooms includes a loudspeaker in communication with the central control system; and the central control system is programmed to broadcast at least one alerting message via the loudspeaker before closing and locking the passageway door in the respective public toilet facility. In the described preferred embodiments, the central control system is programmed to broadcast a first alerting message at a predetermined time before closing and locking the passageway in the respective public toilet facility, and a second alerting message thereafter but before closing and locking the passageway door in the respective public toilet facility.

In the described preferred embodiment, each of the stalls further includes a distress button manually operable by an occupant and communicating with the central control system, a microphone accessible to an occupant and communicating with the central control system, and/or a speaker in communication with the central control system.

As will be described more particularly below, such a system can be used for automatically opening and closing a public toilet facility from a central remote location, thereby obviating the need for sending a person to the respective facility for opening and closing it, and also for checking the facility, and particularly the toilet stalls, for the presence of a person before closing and locking the facility. In addition, by providing various other sensors in each of the public toilet facilities, such as a flooding sensor,

etc., any problems or malfunctions that may arise during the operation of the system can be immediately communicated to the central control so that the problem can be immediately treated.

Further features and advantages of the invention will be apparent from the description below.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is herein described, by way of example only, with reference to the accompanying drawings, wherein

FIG. 1 is a block diagram illustrating one public toilet facility system constructed in accordance with the present invention;

FIG. 2 is a block diagram schematically illustrating the various elements included in each toilet stall in each toilet facility in the system of FIG. 1;

FIG. 3 is a block diagram illustrating the overall operation of the system of FIG. 1; and

FIG. 4 is a flowchart illustrating the closing routine for closing the door in each facility.

It is to be understood that the foregoing drawings, and the description below, are provided primarily for purposes of facilitating understanding the conceptual aspects of the invention and possible embodiments thereof, including what is presently considered to be a preferred embodiment. In the interest of clarity and brevity, no attempt is made to provide more details than necessary to enable one skilled in the art, using routine skill and design, to understand and practice the described invention. It is to be further understood that the embodiments described are for purposes of example only, and that the invention is capable of being embodied in other forms and applications than described herein.

DESCRIPTION OF A PREFERRED EMBODIMENT

FIG. 1 schematically illustrates a system comprising a plurality of public toilet facilities, each generally designated 2, e.g. as may be found in different locations in a large urban area. Each public toilet facility 2 includes a facility room 3, having a plurality of toilet stalls therein, 10a – – – 10η, as well as other facilities, such as washing sinks, urinals, etc. Persons entering the facility room 3 via an entrance/exit passageway

4 having a door 5 movable by a drive 6 from the illustrated closed position to an open position as shown by broken lines at 5' in FIG. 1.

Each of the public toilet facilities further includes a local control unit 7 which communicates with the various electrical devices, as will be described more particularly below, included in the respective public toilet facility.

The system illustrated in FIG. 1 further includes a remotely-located central control system 8 which communicates with all the local-control units 7 in the respective region, as shown by communication path 9. Communication path 9 may be any desired communication path, such as a wired path, a wireless path, the internet, etc.

FIG. 2 illustrates a toilet stall, generally designated 10, corresponding to each of the plurality of toilet stalls 10a - 10η in each of the toilet facilities 2 in the system of FIG. 1. Thus, as schematically shown in FIG. 2, each toilet stall 10 includes a toilet 11, and an electronic identification device (EID) 12 identifying the respective stall in the respective public toilet facility. Each EID may be of a conventional type which transmits, upon being interrogated, a code identifying the respective stall.

Each stall 10 further includes an occupancy sensor 13 for sensing whether the respective stall is occupied or not. Any type of occupancy sensor can be used for this purpose, for example an electromagnetic type wherein the electromagnetic field is detectably changed by the presence of a person, an ultrasonic sensor wherein transmitted ultrasonic waves are detectably changed by the presence of a person, etc.

Preferably, each stall 10 further includes a distress button 14 manipulatable by an occupant to signal a distress condition, and a microphone 15 accessible to an occupant for communicating with the central control system 8. Each stall 10 may further include a speaker 16, also communicating with the central control system should the central control system wish to establish communication directly with the occupant of a particular stall.

As further shown in FIG. 2, each stall 10 may also include various sensors, such as a flood sensor 17, for automatically communicating a flood or other problematic condition to the central control system 8 so that the condition can be immediately fixed.

As still further shown in FIG. 2, each public toilet facility 2 further includes an electronic identification device (EID) 20 for identifying the respective facility; and an occupancy sensor 21 in the facility room 3 of the respective facility for indicating

whether the facility room is occupied by any person. Occupancy sensor 21 can also be designed so as to detect the presence of any person in the passageway 4, or a separate occupancy sensor 22 may be provided for that passageway.

Further, the passageway 4 of each facility 2 may be monitored by a monitoring device 23 for counting the number of persons entering the facility via passageway 4 and the number exiting from the facility via the same passageway. Such a monitor is used in the illustrated system as a back-up, or as an alternative, to the occupancy sensors 21 since, if the number of persons who have exited is equal to the number of persons who have entered, this would mean that no person is present in the respective facility.

Preferably, monitor 23 is a surveillance camera which can be used, not only for counting the number of persons entering and exiting, but also for identifying such persons and the respective time entered and exited, in case such information is necessary for security purposes, or the like. If desired, another surveillance camera 24 can be provided in the facility room 3, to monitor the persons within that room, the open or closed condition of the stalls therein, or the like.

The facility room 3 of each facility 2 further includes a speaker 25 communicating with the central control 8 via communication path 9, enabling the central control to broadcast alert messages, or other messages, as will be described below particularly during the closing routine for closing and locking the door 5 in each facility, such as to avoid locking-in a person in the facility.

FIG. 3 is a block diagram illustrating the overall operation of the system of FIG. 1 as controlled by the central control 8.

Thus, the central control 8 is programmed to open the doors in all the facilities 2, at the same time or at any desired selected opening times, by controlling the drive motors 6 of each door 5 to drive the respective door to an open condition, as shown by broken lines 5' in FIG. 1.

As indicated by block 32 in FIG. 3, surveillance camera 23 in each facility records and counts each person entering and leaving the facility via its respective passageway 4. This information may be retained within the local control unit 7 of the respective facility, for use later by the central control system 8, or may be immediately communicated to the central control system 8.

In addition, during the normal operation of each facility, sensors, such as flood sensor 17, in each facility monitors any flooding condition or other problematic condition which may arise during the normal operation of the system, and immediately communicates this information to the central control 8. This enables the central control to immediately take whatever action may be called for to fix the problematic condition.

Door 5 of each facility is automatically driven to its closed condition, as shown in full lines in FIG. 1, and locked in such closed condition, according to a closing routine, shown in FIG. 4. It will be assumed that all the facilities are to be closed and locked at a predetermined closing time, e.g. 8:00 pm, but it will be appreciated that some facilities may have different closing times according to their respective locations. The purpose of the routine illustrated in FIG. 4 is to assure that no person will be inadvertently locked in a facility when the doors are closed and locked. If, however, a person is present in a locked facility, this will be indicated to the central control 8 so that appropriate action can be taken, e.g. to investigate or to reopen the locked facility.

As shown by block 41 in FIG. 4, central control 8 is programmed to broadcast a first alert via the main speaker 25 of each toilet facility 2, about 10 minutes before the scheduled closing time, that the facility is to be shortly locked, and therefore all occupants should finish and exit the facility immediately. At that time, all the occupancy sensors 13, 21 and 22, of each facility is interrogated for occupancy, and also the facility is interrogated as to whether the number that have exited equals the number that have entered. If, at that instant, all the occupancy sensors indicate that there are no occupants in the respective facility (block 42) and that the number exiting the facility equals the number entering the facility (block 43), the main door 5 in the respective facility is closed and locked (block 44).

However, if an occupant is sensed, or the exiting number does not equal the entering number, a second alert is broadcast, about five minutes before the closing time, via the main speaker 25, and each speaker 13 in a stall indicated to be still occupied (block 45). This second alert preferably also includes an identification of each toilet stall in the respective facility room indicated as still being occupied by the respective occupancy sensor. The two examinations are then made as in the first alert (block 46, 47), and if both examinations are negative, the central control actuates the main door 5 of the respective facility to its closed and locked condition (block 44).

On the other hand, if the examinations made at the time of the second alert indicate that a person still might be present in the respective facility, a third and final alert is broadcasted (block 48), and the same two examinations are again made (blocks 49 and 50). If these examinations indicate that no person in the facility, the door 5 of the respective facility is driven to its closed and locked condition (block 44), but if either examination indicates that a person is still present, a signal is sent via the central control to alert security (block 52) to check-out the situation.

While the invention has been described with respect to one preferred embodiment, it will be appreciated that many variations may be made. For example, in determining whether an occupant may be present before closing, two tests are made in the described preferred embodiment, one by sensing the presence of an occupant, and the other by determining whether the exit number is equal to the entering number, for the sake of redundancy. It will be appreciated that only one of the above two tests need be made. In addition, while detecting the number of persons entering and exiting is made by a surveillance camera, such an examination can be made by a mere optical sensor for sensing and counting each entering and exiting person. Further, many different problematical or malfunctioning conditions can be detected, by providing appropriate sensors communicating directly with the central control to enable immediate action to be taken to correct a particular condition.

WHAT IS CLAIMED IS:

1. A public toilet facility system, comprising: a plurality of public toilet facilities each including a facility room, a plurality of toilet stalls therein, a toilet in each stall, an entrance/exit passageway for entering and exiting the facility room, and a door movable to an open position and to a closed-locked position with respect to said passageway;

characterized in that said system further comprises a central control communicating with all said public toilet facilities for controlling the opening, closing and locking of the door in the entrance/exit passageway of each of said public toilet facilities.

2. The system according to claim 1, wherein each of said facility rooms, and each of said toilet stalls, includes an occupancy sensor for sensing the presence of a person therein;

and wherein said central control system is in communication with all said occupancy sensors for controlling the opening, closing and locking of the passageway door in the respective public toilet facility.

3. The system according to claim 1, wherein each of said public toilet facilities includes a monitor for monitoring the entry and exit of persons into the respective facility room via its entry/exit passageway, and wherein said central control system is in communication with the monitor in each of said public toilet facilities for controlling the opening, closing and locking of the passageway door in the respective public toilet facility.

4. The system according to claim 3, wherein each of said monitors is or includes a surveillance camera which records the entry and exit of each person, and the time thereof, via the passageway of the respective facility room.

5. The system according to claim 1, wherein each of said facility rooms and each of said toilet stalls includes an occupancy sensor for sensing the presence of a person therein, and each of. said public toilet facilities includes a monitor for monitoring the entry and exit of persons into the respective facility room via its entry/exit passageway;

and wherein said central control system is in communication with all said occupancy sensors, and with all of said monitors, for controlling the opening, closing and locking of the passageway door in the respective public toilet facility.

6. The system according to claim 1, wherein each of said facility rooms includes a loudspeaker in communication with said central control system; and wherein said central control system is programmed to broadcast at least one alerting message via said loudspeaker before closing and locking the passageway door in the respective public toilet facility.

7. The system according to claim 6, wherein said central control system is programmed to broadcast a first alerting message at a predetermined time before closing and locking the passageway in the respective public toilet facility, and a second alerting message thereafter but before closing and locking the passageway door in the respective public toilet facility.

8. The system according to claim 7, wherein each of said facility rooms and each of said toilet stalls includes an occupancy sensor for sensing the presence of a person therein;

and wherein said second alerting message includes an identification of the toilet stall in the respective facility room indicated as still being occupied by the respective occupancy sensor.

9. The system according to claim 8, wherein said central control system is programmed to abort broadcasting said second alerting message if all said occupancy sensors in a respective facility room indicate there is no occupant at that time in the facility room or in any toilet stall in the respective public toilet facility.

10. The system according to claim 7, wherein each of said public toilet facilities includes a monitor for monitoring the entry and exit of persons into the respective facility room via its entry/exit passageway; and wherein said central control system is programmed to abort broadcasting said second alerting message if the monitor in the respective public toilet facility indicates that the number of persons who had entered the respective passageway is equal to the number of persons who had exited the respective passageway.

11. The system according to claim 7, wherein each of said facility rooms and each of said toilet stalls therein includes an occupancy sensor for sensing the presence of a person therein, and each of said public toilet facilities includes a monitor for monitoring the entry and exit of persons into the respective facility room via its entry/exit passageway;

and wherein said central control system is in communication with the occupant sensors and with the monitor of each of said public toilet facilities and is programmed to abort broadcasting said second alerting message if all said occupancy sensors in a respective facility room indicate there is no occupant at that time in the respective public toilet facility, and also the monitor in the respective public toilet facility indicates that the number of persons who had entered the respective passageway is equal to the number of persons who had exited the respective passageway.

12. The system according to claim 10, wherein said monitor in each public toilet facility is or includes a surveillance camera which records the entry and exit of each person, and the time thereof, via the passageway of the respective facility room.

13. The system according to claim 1, wherein each of said toilet stalls further includes a distress button manually operable by an occupant and communicating with said central control system.

14. The system according to claim 1, wherein each of said toilet stalls further includes a microphone accessible to an occupant and communicating with said central control system.

15. The system according to claim 1, wherein each of said toilet stalls further includes a speaker communicating with said central control system.

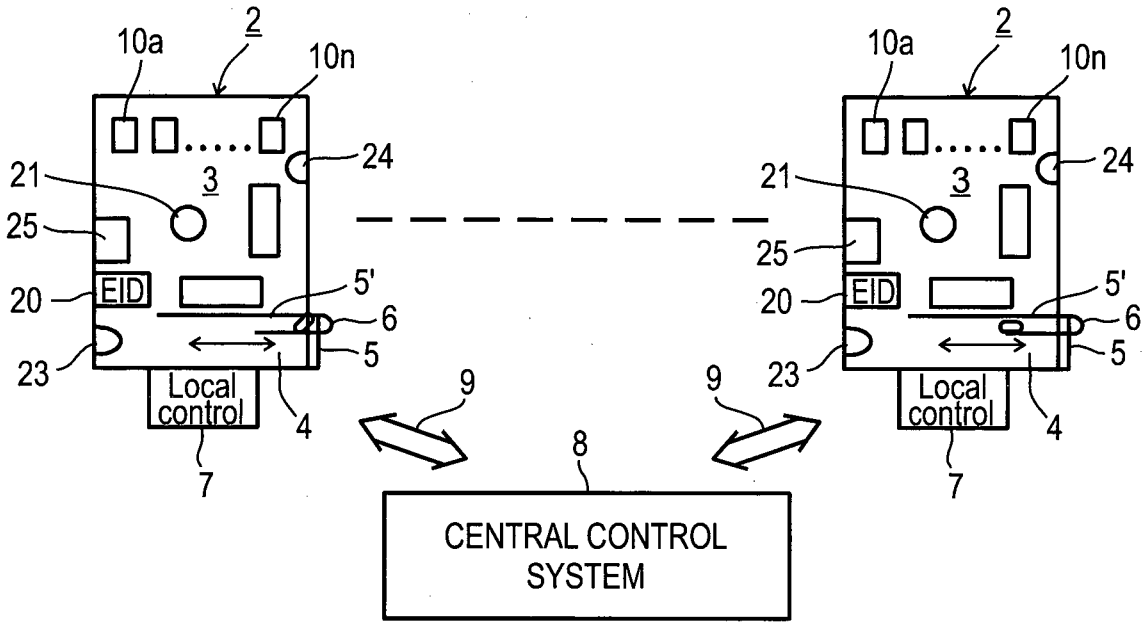
10a
2
10n
24
21
3
25
20
EID
5'
6
23
5
Local control
4
7
9
8
CENTRAL CONTROL SYSTEM

FIG. 1

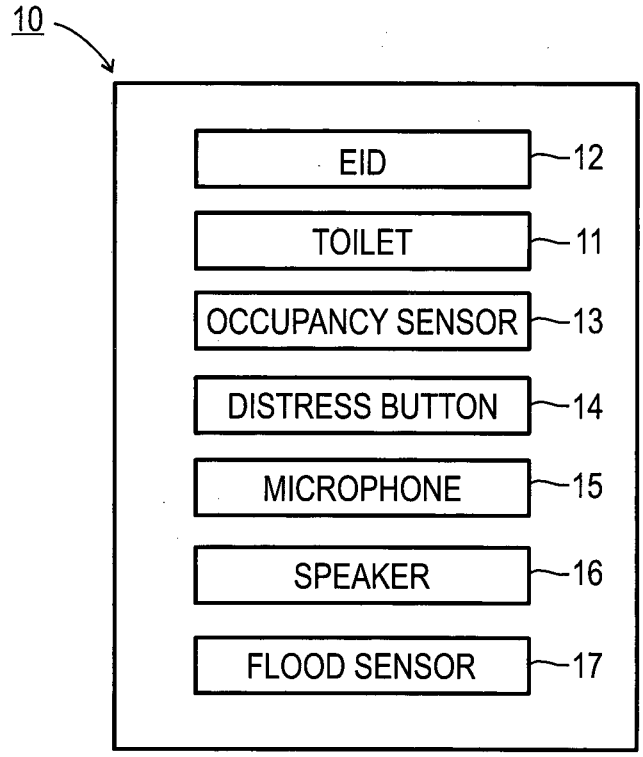
10
EID
12
TOILET
11
OCCUPANCY SENSOR
13
DISTRESS BUTTON
14
MICROPHONE
15
SPEAKER
16
FLOOD SENSOR
17

FIG. 2

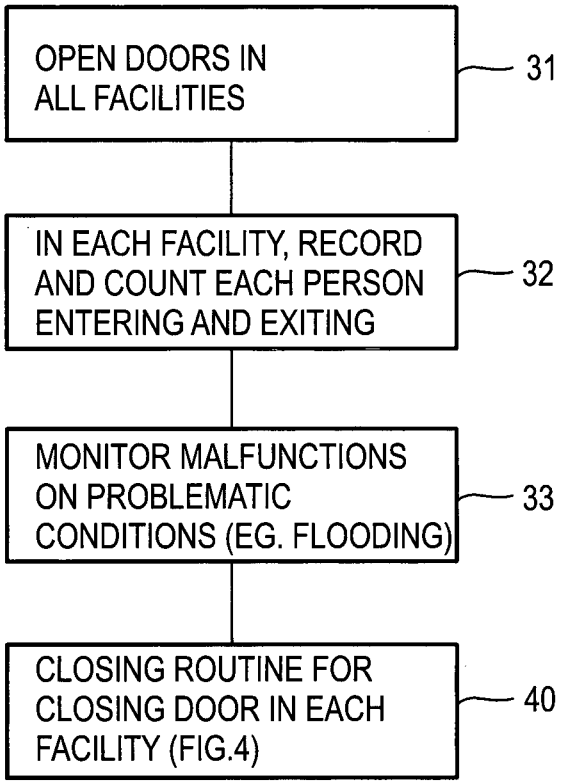
OPEN DOORS IN ALL FACILITIES
31
IN EACH FACILITY, RECORD AND COUNT EACH PERSON ENTERING AND EXITING
32
MONITOR MALFUNCTIONS ON PROBLEMATIC CONDITIONS (EG. FLOODING)
33
CLOSING ROUTINE FOR CLOSING DOOR IN EACH FACILITY (FIG.4)
40

FIG. 3

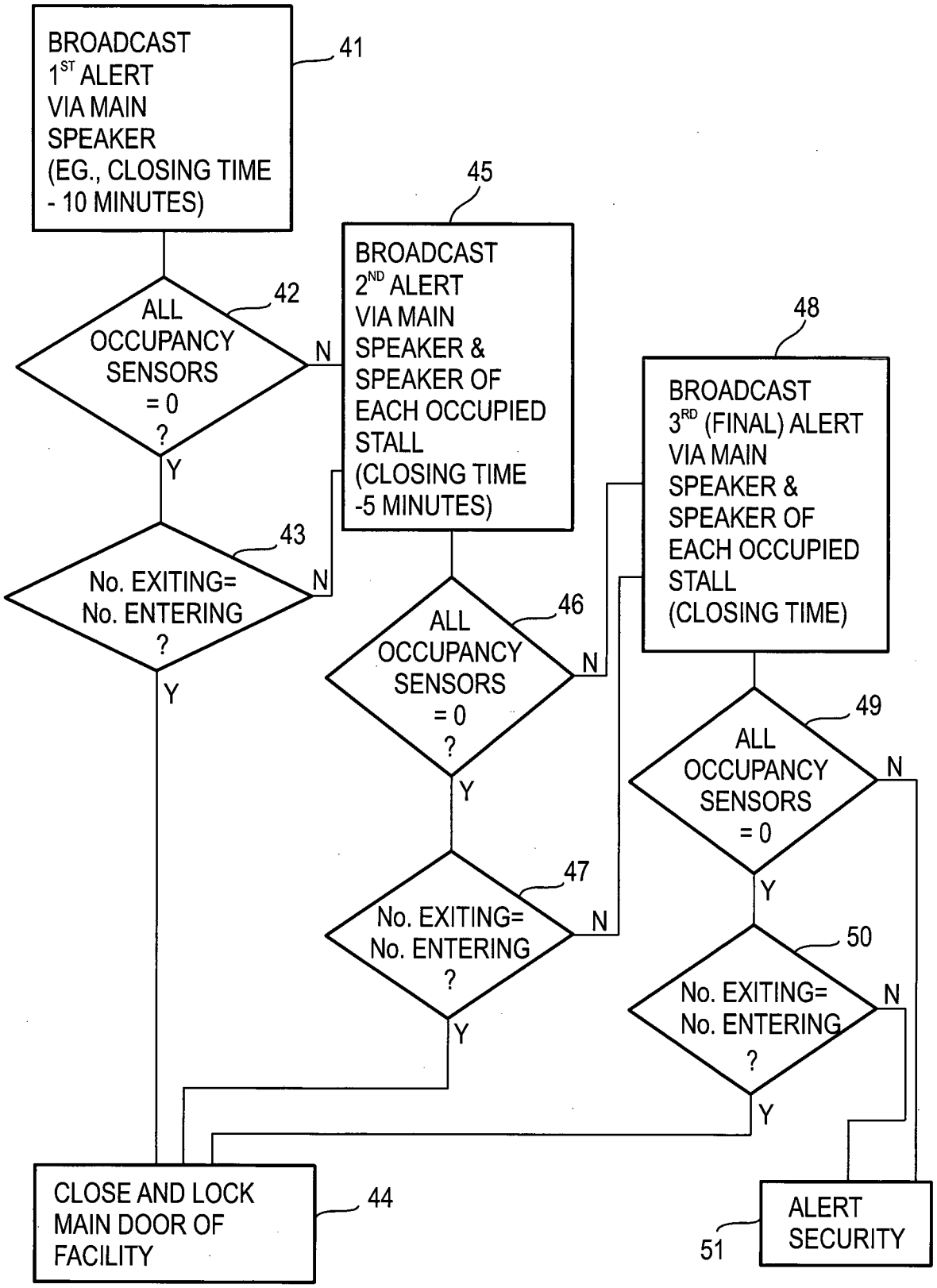
BROADCAST 1ST ALERT VIA MAIN SPEAKER (EG., CLOSING TIME - 10 MINUTES)
41
ALL OCCUPANCY SENSORS = 0 ?
42
N
Y
No. EXITING= No. ENTERING ?
43
N
Y
BROADCAST 2ND ALERT VIA MAIN SPEAKER & SPEAKER OF EACH OCCUPIED STALL (CLOSING TIME -5 MINUTES)
45
ALL OCCUPANCY SENSORS = 0 ?
46
N
Y
No. EXITING= No. ENTERING ?
47
N
Y
BROADCAST 3RD (FINAL) ALERT VIA MAIN SPEAKER & SPEAKER OF EACH OCCUPIED STALL (CLOSING TIME)
48
ALL OCCUPANCY SENSORS = 0
49
N
Y
No. EXITING= No. ENTERING ?
50
N
Y
CLOSE AND LOCK MAIN DOOR OF FACILITY
44
ALERT SECURITY
51

FIG. 4