

(12) **United States Patent**
Brill et al.

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(45) **Date of Patent:** **Sep. 30, 2003**

(54) **METHOD AND SYSTEM FOR DEFINING AND RECOGNIZING COMPLEX EVENTS IN A VIDEO SEQUENCE**

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* cited by examiner

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(57) **ABSTRACT**

Given a system which detects simple events, one can define a complex event by constructing a list of sub-events. In order to recognize a complex event, the system keeps a record of the sub-events that have occurred thus far and the objects involved in these sub-events. Whenever the first sub-event in a complex event's sequence is recognized, an activation for that complex event is created. The activation contains an indication of the identity of the object involved in the event. The activation also includes an index initialized to one. If a newly detected event matches the next sub-event in any of the currently open complex events, the index for that complex event is incremented. If the index reaches the total number of sub-events in that complex event, the complete complex event is recognized. Thus any desired alarm is generated. Since the complex event that was just recognized may also be a sub-event of another complex event, the activation lists are consulted again to see if the indices of any other complex event activations can be advanced.

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Related U.S. Application Data

(60) Provisional application No. 60/098,475, filed on Aug. 31, 1998.

(51) **Int. Cl.**⁷ **G06K 9/68**; G06K 9/00; H04N 7/18

(52) **U.S. Cl.** **382/226**; 382/103; 348/155

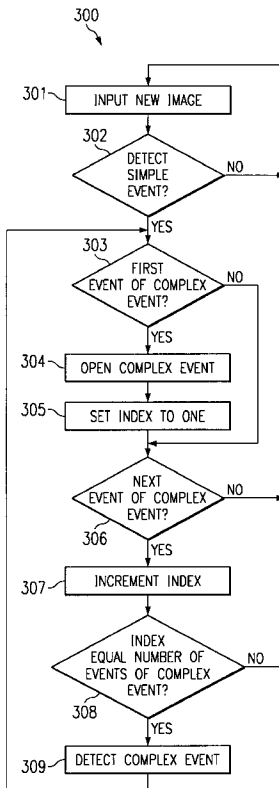
(58) **Field of Search** 382/218, 219, 382/224, 225, 226, 103; 348/142, 143, 152, 153, 154, 155; 386/69; 340/511

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U.S. PATENT DOCUMENTS

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6 Claims, 4 Drawing Sheets



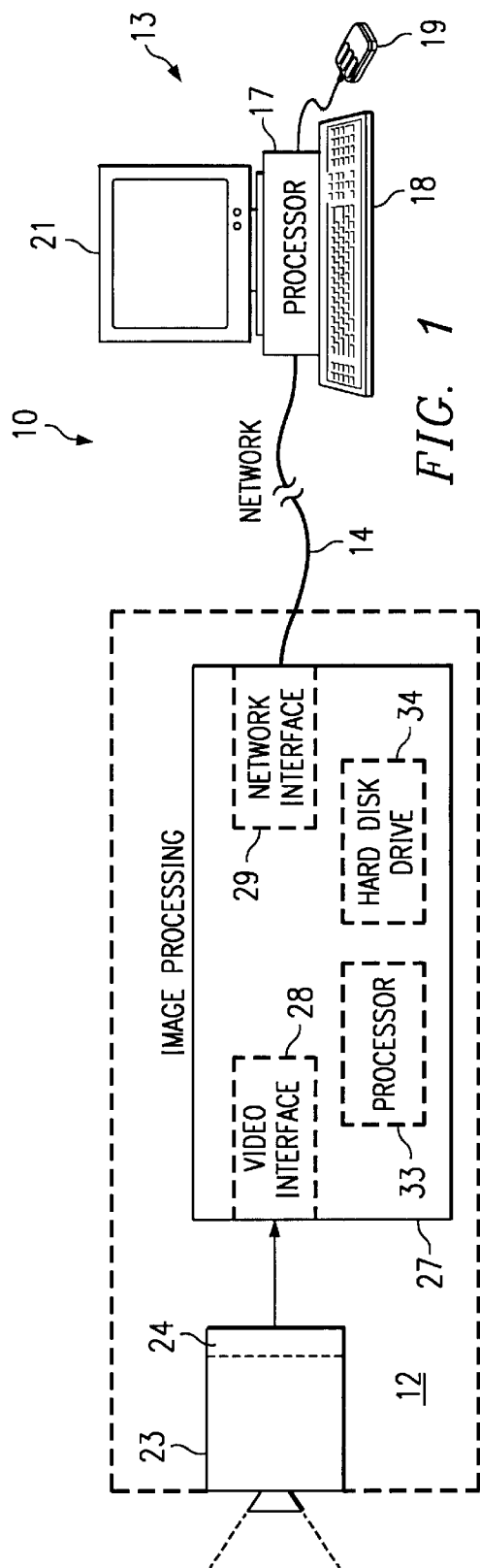


FIG. 1

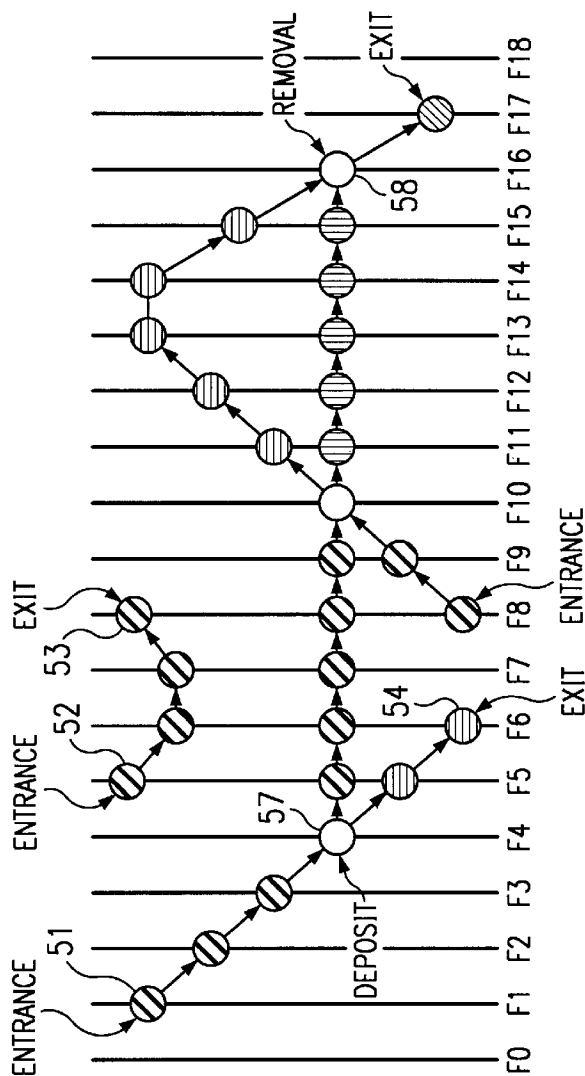


FIG. 2

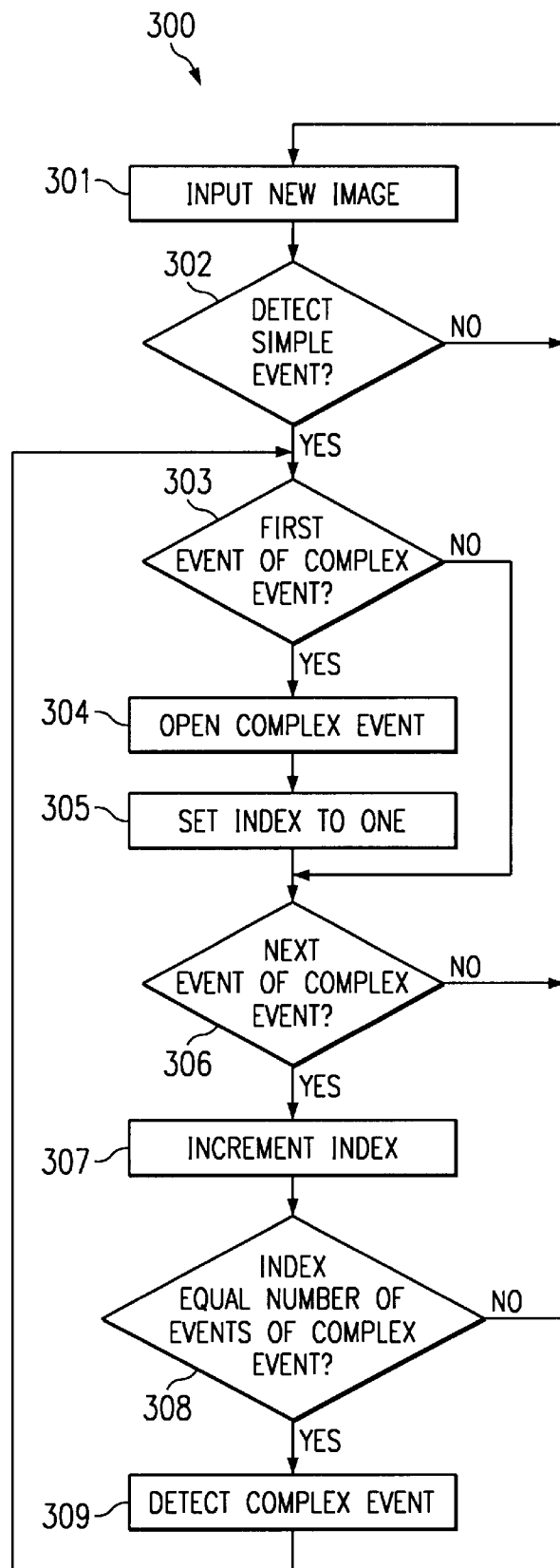


FIG. 3

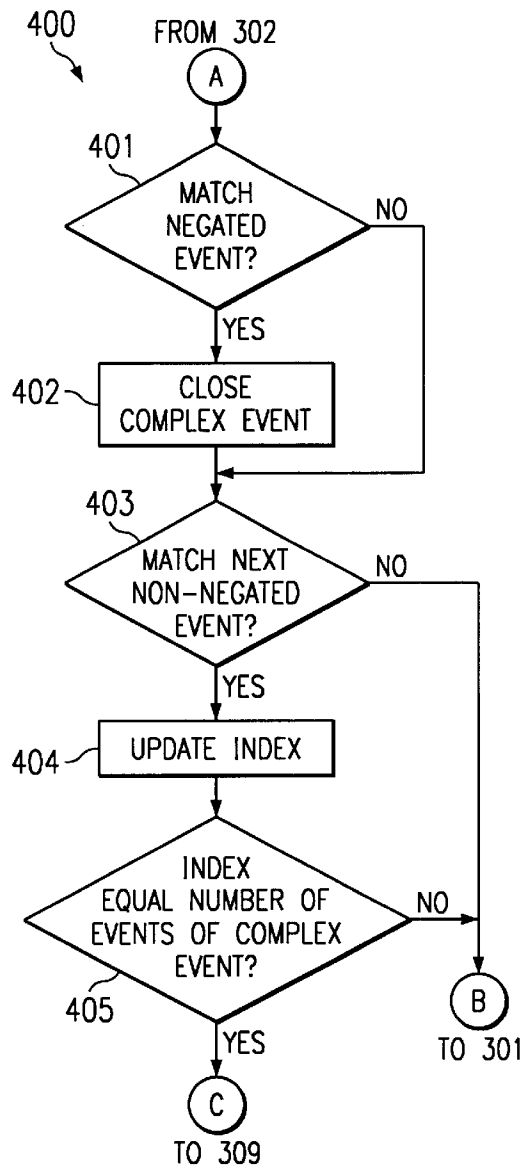


FIG. 4

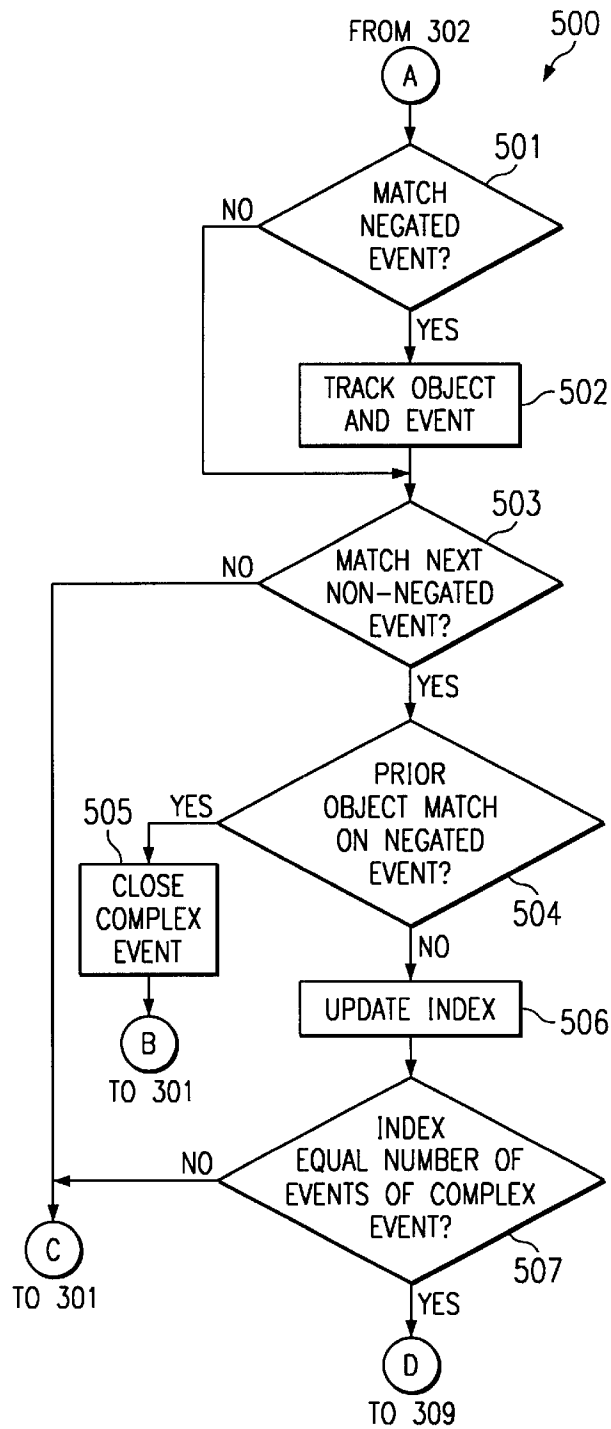


FIG. 5

Name :

Events: enter exit loiter alone leave deposit remove
 move rest incar outcar lightsout lightson

Objects: person box briefcase notebook car object unknown

Days of week: Monday Tuesday Wednesday Thursday
 Friday Saturday Sunday

Time of day: from 12:00 am until 12:00 am

Regions: PC_area outside_the_door phone_area

Duration:

Actions: beep log flash plot voice popup

FIG. 6

Name :

Loiter by the door
Deposit/Remove
Leave the computer
Deposit
Exit
Loiter by the phone
Enter
Lights On/Off
cmonitor1
Remove

Enter
Remove
~Deposit
Exit

Actions: beep log flash plot voice popup

FIG. 7

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