

(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.**<sup>7</sup> ..... **G06K 9/68**; G06K 9/00; H04N 7/18

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

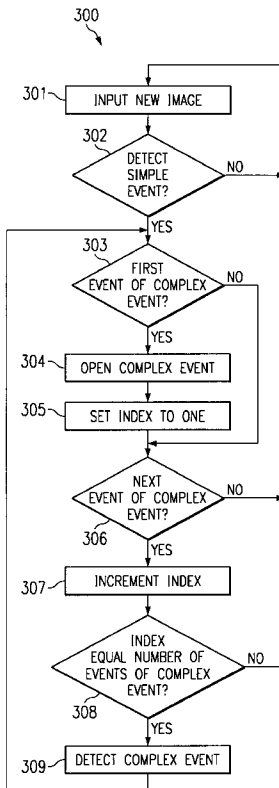
(58) **Field of Search** ..... 382/218, 219, 382/224, 225, 226, 103; 348/142, 143, 152, 153, 154, 155; 386/69; 340/511

(56) **References Cited**

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**6 Claims, 4 Drawing Sheets**



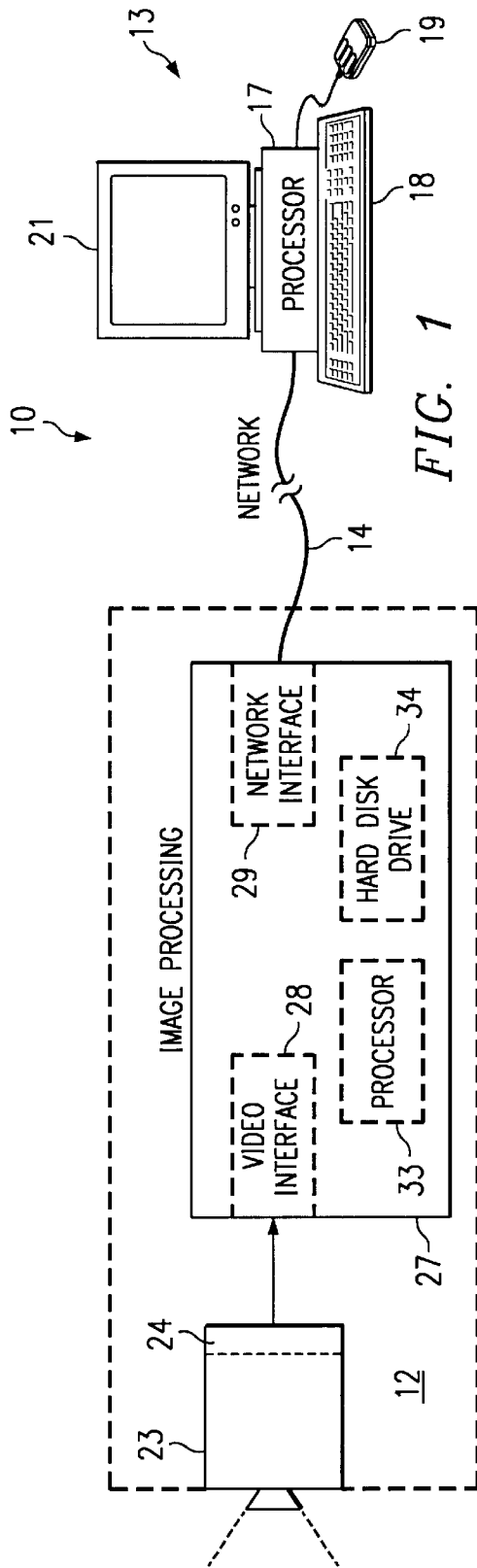


FIG. 1

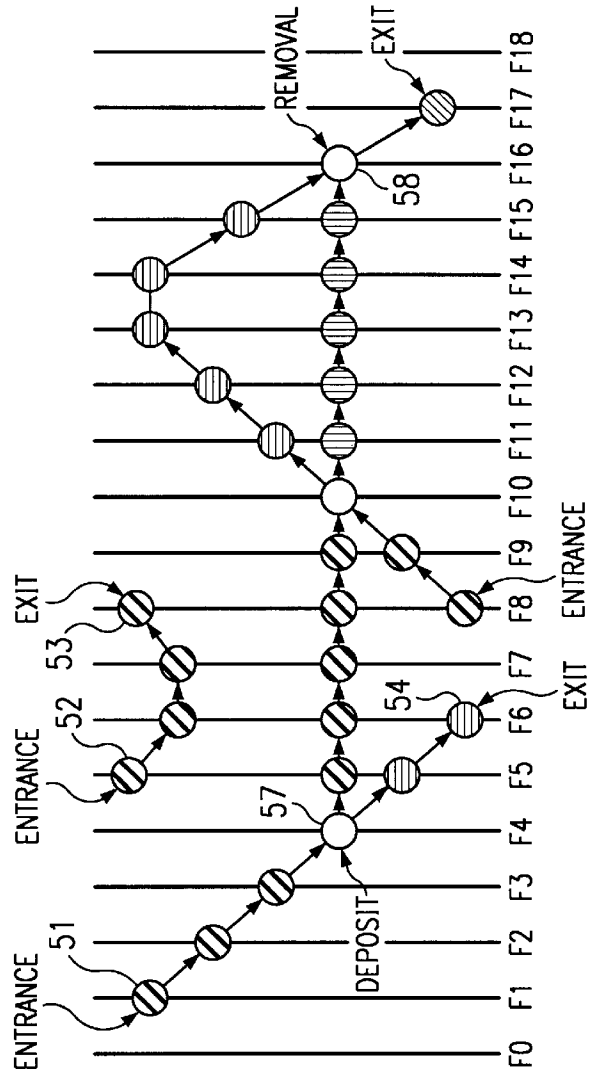


FIG. 2

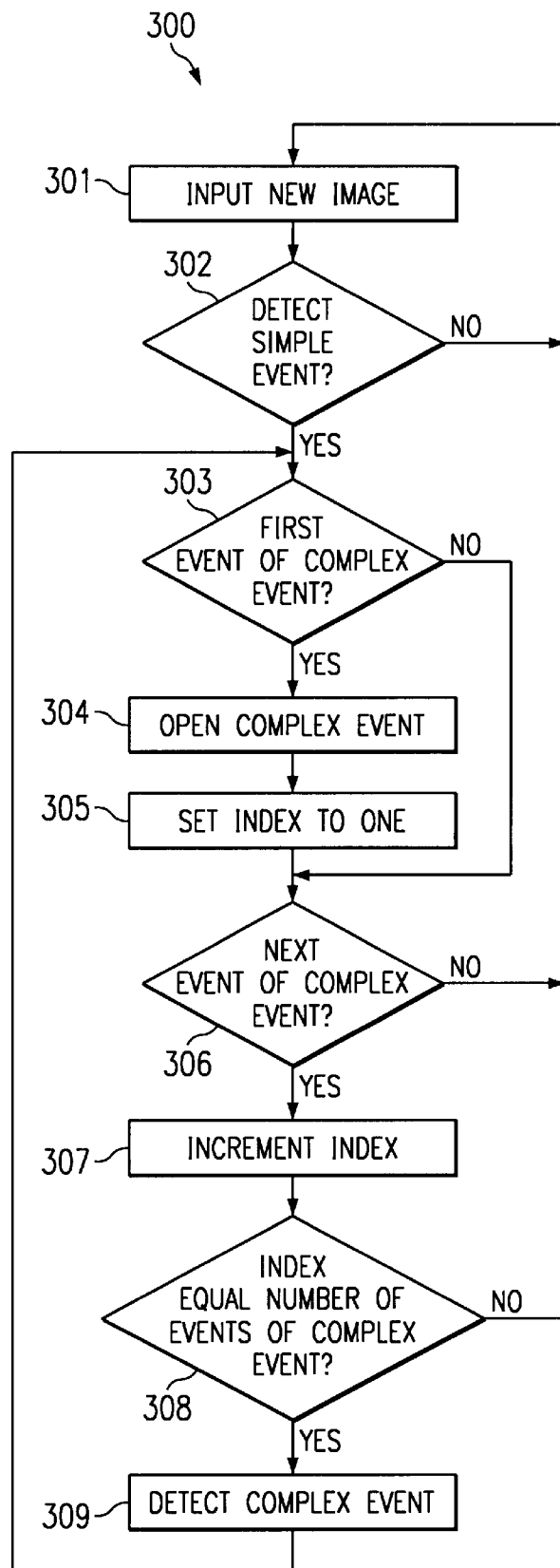


FIG. 3

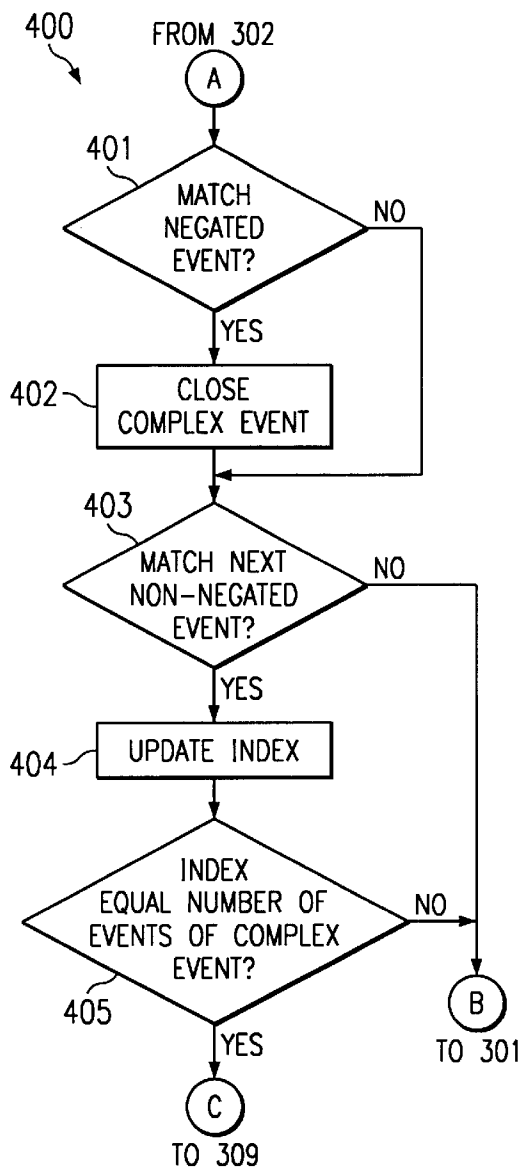


FIG. 4

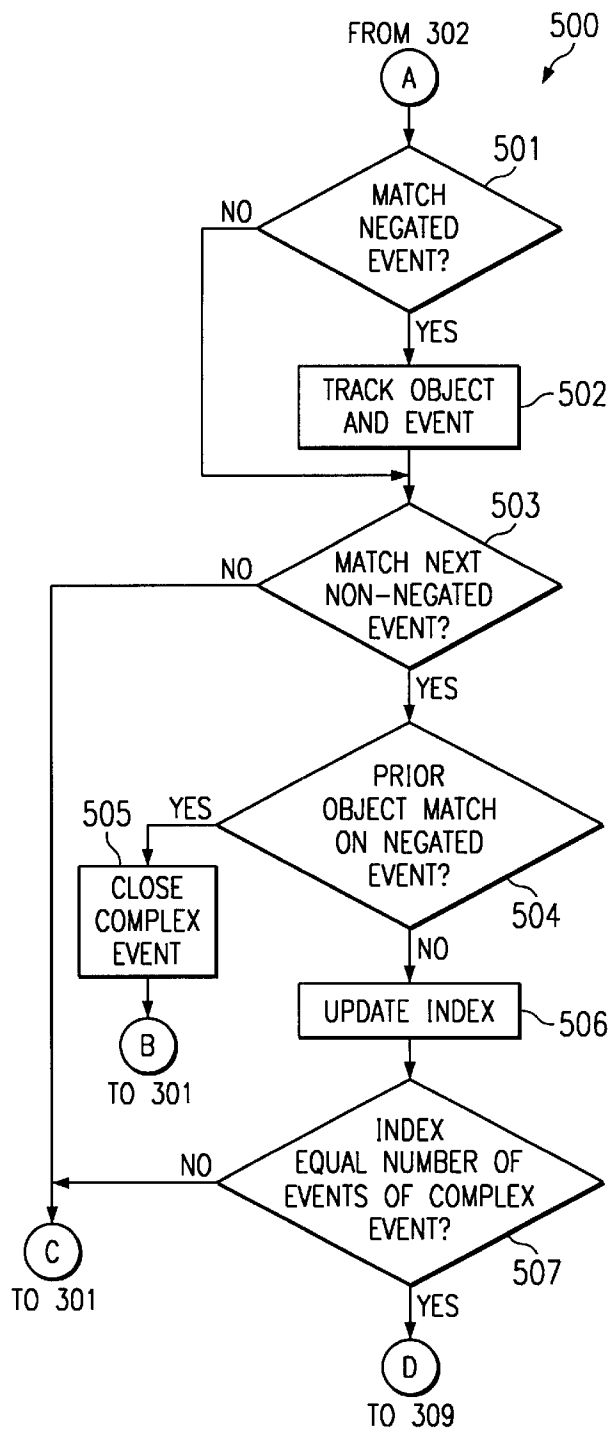


FIG. 5

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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